MAHINDRA TECH PARKS
AT
MAHINDRA WORLD CITY, JAIPUR
FOR
MAHINDRA WORLD CITY JAIPUR LTD

TENDER
FOR
CIVIL AND STRUCTURAL WORKS
(BLOCK B2)

VOLUME - I

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April 2011
MAHINDRA WORLD CITY (JAIPUR) LIMITED, JAIPUR

BID FOR CONSTRUCTION OF MAHINDRA TECHNOLOGY PARK AND ALLIED WORKS WITHIN THE IT/ITES SEZ

Bid No : MWCJL/MTP/B2/Civil/11-12/T-01 dated 20.04.2011
Date of Issue : Between 22.04.2011 to 26.04.2011

Name of Work: Construction of Civil Structure and finishes for B2 Block.

Bid Document issued to:

M/s ..........................................................................................
..........................................................................................
..........................................................................................

By

Mahindra World City (Jaipur) Limited
411, Neelkanth Tower#1,
Bhawani Singh Marg, C-Scheme
Jaipur-302001
Phone No: 0141-3003495-98
Fax : 0141-3003499
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BOOK-2 - TECHNICAL SPECIFICATION OF WORKS & BILL OF QUANTITIES

BOOK-3 - BID DRAWINGS
MAHINDRA WORLD CITY (JAIPUR) LIMITED, JAIPUR


(CIVIL WORKS)

NAME OF WORK : CONSTRUCTION OF MAHINDRA TECHNOLOGY PARK


TIME: 10:00 HOURS TO 17:00 HOURS

LAST DATE AND TIME FOR RECEIPT OF BIDS : Date: 3.05.2011 (Hard Copy Submission)

Time: 15:00 Hrs.
INVITATION FOR BID

(IFB)
MAHINDRA WORLD CITY (JAIPUR) LIMITED, JAIPUR

INVITATIONS FOR BIDS (IFB)

Bid No.:MWCJL/MTP/B2/Civil/11-12/T-01 dated 20.04.2011

1. MAHINDRA WORLD CITY (JAIPUR) LIMITED having its Registered office at 411, Neelkanth Tower#1, Bhawani Singh Marg, C-Scheme, Jaipur -302001, is developing an IT/ITES SEZ and invites item rate Bids for the below mentioned works from the selected Bidders.

2. Bid document can be downloaded from our web site http://www.mahindraworldcity.com/content.aspx?act=tenders&citi=jaipur. Hard copies of the document can be obtained from the Architect office at the below mentioned address by paying Rs. 5000.00 only upto 26.04.2011.

   M/s Rajinder Kumar Associates
   B-6/17 Shopping Center,
   Safdarjung Enclave
   New Delhi 110029, India
   T: (91)112-6179093
   F: (91) 112-6186874

3. Bids must be delivered to Mahindra World City (Jaipur) Limited, 411, Neelkanth Tower#1, Bhawani Singh Marg, C-Scheme, Jaipur -302001, on or before 15:00 Hours on 3.05.2011 in Hard Copy. If the office happens to be closed on the date of receipt of the Bids as specified, the Bids will be received on the next working day at the same time and venue. Contractors who download tender document from our website will have to pay tender document fee of Rs 5,000/- at the time of its submittal through D.D favourable Rajinder Kumar Associates payable at Delhi otherwise it shall not be considered.

4. Other details can be seen in the Bidding documents.

TABLE - IFB 1

<table>
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<th>Bid security / EMD (Rs.)</th>
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<td>Construction of Mahindra Technology Park and Allied Works within the IT/ITES SEZ</td>
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<td>Rs.5000/- by DD</td>
<td>Ten (10) Months.</td>
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EMD in the form of DD (Rs. 2,00,000/-) in favour of M/s Mahindra World City (Jaipur) Ltd. along with offer.

Payment towards cost of document will be made thru Draft in favour of Rajinder Kumar Associates, Delhi.
SECTION 1: INSTRUCTIONS TO BIDDERS

(ITB)


**Section 1: Instructions to Bidders**

**Table of Clauses**

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A. General Instructions

1. Scope of Bid

1.1 Mahindra World City (Jaipur) Limited (“MWCJL”), (hereinafter referred to as “Employer”) invite Bids for the Construction of Mahindra Technology Park And Allied Works within IT/ITES SEZ being developed by it (as defined in these documents and referred to as "the Works") detailed in the table No.IFB-1.

2. One Bid per Bidder

2.1 Each Bidder shall submit only one Bid for one Contract.

2.2 Bid documents are not transferable

3. Cost of Bidding

3.1 The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for those costs.

4. Site visit

4.1 The Bidder, at the Bidder’s own responsibility and risk is encouraged to visit and examine the Site (as defined in Clause 1 of GCC) and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a Contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense.

4.2 After visiting the site the bidder shall confirm the fact of actual visit of the site to the employer which will be testimony to the fact that in fact site is available for commencing the work.

4.3 The Contractor shall be deemed to have inspected, tested and examined the site and surroundings and to have satisfied himself as to all the conditions, factors and risks which can be reasonably obtained or inferred from the inspections, tests and examinations that may influence or affect the progress and cost of Contract Works.

B. Bidding Documents

5. Contents of Bidding Documents

5.1 The set of bidding documents comprises the documents listed in the table below and addenda issued in accordance with Clause 8 (if any)

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| Book-2 | 1 Technical Specifications & Bill of Quantities |
| | 2 Vendor Selection data format |

| Book-3 | 1 Bid Drawings |
5.2 Qualification of Bidders: To be qualified for award of contract, bidders are required to
   
   a) Submit a written power of attorney authorising the signatory.
   b) Update the following information submitted with the application for qualification.
      i) Financial strength.
      ii) Works in hand
      iii) Litigation if any.
      iv) Submission of vendor data format is mandatory along with competitive offer

6. Clarification of Bidding Documents
   
6.1 Bidders requiring any clarification of the Bidding documents may contact following person:

   Mr. N.S. Bhatia  Manager (Contracts)
   Mobile No. 09929093365, 0141-3003412
   All such quarries shall be made at least three days before date of submission of Bids as per Clause 16.

C. Preparation of Bids

7. Language of the Bid
   
7.1 All documents relating to the Bid shall be in the English language.

8. Documents comprising the Bid
   
8.1 The Bid submitted by the Bidder shall comprise the following:

   a) The Bill of Quantities wherein the Bidder shall fill in the rates; original plus one photocopy duly signed and stamped by the Bidder on each page.
   b) Specifications and Drawing Volumes original plus one photocopy duly signed and stamped by the Bidder on each page.
   c) any other materials required to be completed and submitted by bidders in accordance with these instructions

   The Financial Bid (BOQ) under Sections 5 of Sub-Clause 5.1 shall be filled in without exception.

9. Item Rate Contract
   
9.1 The Contractor shall note that unless otherwise stated, the Tender is strictly on item rate basis contract.

10. Currencies of BID and payment
10.1 The rates and the prices given are in Indian Rupees.

11. **Bid Validity**

Bids shall remain valid for a period not less than 60 (sixty) days after the date for Bid submission specified in Clause 16. A Bid corrected by the Bidder as valid for a shorter period shall be rejected by the Employer as non-responsive.

12. **Bid Security**

The Bidder shall furnish as a part of his Bid, a Bid security in the amount as shown in column 3 of the table IFB-1. The Bid security shall be in favour of **Mahindra World City (Jaipur) Limited** in the form of a Demand Draft or Banker’s Cheque or Pay order payable at Jaipur.

The Bid Security of unsuccessful Bidders will be returned within 30 days of the end of the Bid validity period specified in Sub-Clause 11.1.

The Bid Security of the successful Bidder will be adjusted with Performance Security when the Bidder has signed the Agreement and furnished the required Performance Security.

The Bid Security may be forfeited

(a) if the Bidder does not accept the correction of the Bid Price, pursuant to Clause 18; or

(b) in the case of a successful Bidder, if the Bidder fails within the specified time limit to

   (i) sign the Agreement; or

   (ii) furnish the required Performance Security within 10 days from the date of Letter of Acceptance.

No interest shall be paid on any Bid security/Performance Security/ or Guarantee in lieu thereof.

13. **Format and Signing of Bid**

The Bidder shall prepare the Bid as specified in Clause 8 in single copy

The Rate in the original copy of the Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. All pages of the Bid where entries or amendments have been made shall be signed by the person or persons signing the Bid.

The Bid shall contain no alterations or additions or omission or interlocation except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the Bidder, in which case such corrections shall be signed by the person or persons signing the Bid.

14. **Salient Points**

The Scope of work proposed in this Bid is for:

Civil and Structural works & Finishes.
The manpower, material, equipment and services provided under the contract have to be arranged by the bidder himself from his own available resources. If required, bidder shall provide evidence of the origin of materials and services. This provision is subject to provision of clause 21 of condition of contract for supply of material.

The drawings issued with these Tender Documents are Tender Drawings. Tender Drawings are prepared in such detail as are necessary to give a comprehensive idea of the works. The Good for Construction Drawings will be issued during the construction stage based on the requirements as per the construction program submitted by the Contractor as per General Condition of Contract Clause 11.

The workmanship required is of very high standard and the shuttering materials proposed to be used shall be new. The vertical elements like columns, walls, bottom and sides of beams and slabs shall be shuttered with plastic coated ply boards and slabs either with plastic coated plywood or M.S. sheets. The no. of turns of shuttering material shall be limited to as long as the concrete surface is smoothly accepted by the Engineer-in-Charge. The Contractor has to get the shuttering system approved by the Consultants before the commencement of work. M.S. adjustable tubular props shall be used for staging and casurina poles are not accepted for the staging.

The bills of quantities enclosed are for civil works and related works for 2 Nos. of Software Blocks and single / double levels of basement car parking & service areas as marked in drawings.

Civil works connected with Plumbing/Electrical and related works are not considered in the bill of quantities.

The Bidder should make himself acquainted with the site conditions, level and any other information required for giving a proper quote.

Bidders requiring any technical clarification should seek it from Employer’s office before quoting and any ambiguity regarding quantities/specification and drawings will not be entertained after the Bids are finalised.

The Contractor should make his own arrangement of water for construction purposes and make all necessary arrangement for water pumps and installation pipe line, etc. with prior permission with the Employer.

Power shall be made available at one point. Contractor shall arrange further distribution at his cost. Contractor to pay the consumption charges as per actual. All arrangements for drawing the power, installation of Energy meter shall be made by the Contractor at his own expense. Contractor shall make arrangement for Diesel generator for back up power at his cost Contractor shall provide Electricity for other agencies appointed by Employer and charge them accordingly by installing sub meters.

**D. Submission of Bids**

15. **Sealing and Marking of Bids**

The Bidders are not expected to include any conditions contrary to Bid provisions. However, if it is necessary to include certain conditions, the same should be submitted with proper reasons, in a separate sealed cover. The covers should be suitably super scribed indicating the contents. All letters, enclosures, and Bill of quantities shall be submitted in duplicate. Bidder should clearly indicate on each copy under their full signature, whether it is the Original or duplicate copy.
The Bidder shall submit the original Bid in one sealed envelop marking as “FINANCIAL BID for Construction Of Mahindra Technology Park And Allied Works At IT/ITES SEZ” At Mahindra World City, Jaipur”.

The envelopes shall be addressed to the Employer at the following address:

Mahindra World City (Jaipur) Limited
411, Neelkanth Tower#1,
Bhawani Singh Marg, C-Scheme
Jaipur -302001

Deadline for Submission of the Bids

Bids must be received by the Employer at the address specified above no later than 15:00 hours on 3rd May 2011. In the event of the specified date for the submission of Bids declared a holiday for the Employer, the Bids will be received up to the appointed time on the next working day.

The Employer may extend the deadline for submission of Bids by issuing an amendment indicating the revised deadline.

E. Bid Opening and Evaluation

16. Process to Be Confidential

Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a Contract shall not be disclosed to Bidders or any other persons not officially concerned with such process. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

The employer may at its absolute discretion, ask the bidders for any clarification including breakdown of rates, subject to this no bidder shall contact the employer relating to the bid from the time of opening to the time of contract awarded.

17. Correction of Errors

Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer as follows:
(a) Where there is a discrepancy between the rates in figures and in words, the rate in words will govern; and
(b) Where there is a discrepancy between the unit and the line item total resulting from multiplying the unit rate by the quantity, the unit rate as quoted will govern.

The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid will be rejected.

18. Employer's Right to Accept any Variation

The Employer reserves the right to accept or reject any variation, deviation from the Bid document, or any alternative offer. Variations, deviations and alternative offers and other factors which are in excess of the requirements of the Bidding documents or otherwise result in unsolicited benefits for the Employer shall not be taken into account in Bid evaluation.
Acceptance of tender on behalf of employer (Mahindra World City [Jaipur] Ltd) shall be done by the committee empowered in this behalf or by officer of company duly authorised in this behalf.

It is made clear that the employer is not bound to accept lowest or any tender (bid). The employer reserves the right to reject any or all tenders received for consideration without assigning any reasons and without incurring any liability to affected bidders.

F. Award of Contract

19. Award Criteria
The Employer will negotiate with the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents. On completion of negotiations the Employer will award the Contract to the most suitable Bidder.

20. Employer's Right to Accept any Bid and to Reject any or all Bids
Notwithstanding Clause 20, the Employer reserves the right to accept or reject any Bid or part of the Bid, and to cancel the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

21. Notification of Award and Signing of Agreement
The Bidders whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid validity. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Employer will pay the Contractor in consideration of the execution, completion, and maintenance of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

The Agreement will incorporate all Agreements between the Employer and the successful Bidder. Within 10 days of issue of Letter of Acceptance, the successful Bidder will sign the Agreement and deliver it to the Employer.

Upon accepting the Performance Security for the Successful Bidder and signing of the Agreement, the Employer shall issue a ‘Notice to Proceed’ to the Contractor, in which the date of commencement of the Contract shall be indicated.

Upon furnishing of the Performance Security by the successful Bidder, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful.

22. Performance Security
Within 10 days of receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a Performance Security valid till Completion of the Contract in the form of a bank guarantee in Employer’s prescribed format for an amount equivalent to 5% of the Contract price by adjusting Bid Security:

Failure of the successful Bidder to comply with the requirements of Sub-Clause 23.1 shall constitute a breach of Contract, cause for annulment of the award, forfeiture of the Bid security and any such other remedy the Employer may take under the Contract, and the Employer may resort to awarding the Contract to any other Bidder, on sole discretion of Employer.
23. **Time Period for commencement of work**
   The Contractor shall have to start the work within Ten (10) days from the date of issue of Letter of Intent.

24. **Corrupt or Fraudulent Practices**
   The Employer expects the Bidders, Suppliers, Contractors, and Consultants, observe the highest standard of ethics and integrity during the procurement and execution of such Contracts. Therefore, the Employer will reject the Bid/ terminate the contract with no obligations and blacklist such Bidder / contractor, barring him from participation in future Bidding in the event he is found indulging in any malpractice such as gift, bribe, or other inducements to any person with a view to influence the placing or operation of the Contract.

   The bidder hereby undertakes that if the information given in bidding documents or otherwise be found to be untrue or false, he will be liable to be disqualified and his security will be forfeited and further it is discovered to be false during the contract period affecting prejudicially the interest of employer, the contract will be terminated and security deposit will be liable to be forfeited.
SECTION-2

LETTER OF ACCEPTANCE AND AGREEMENT FORM

Table of Forms:

- LETTER OF ACCEPTANCE & PROCEED THE WORK
- AGREEMENT FORM
Letter of Acceptance  
(letterhead paper of the Employer)

To,  
………………………  
………………………  

Dear Sirs,

This is to notify that your Bid and subsequent negotiations for the execution of CONSTRUCTION OF MAHINDRA TECHNOLOGY PARK AND ALLIED WORKS WITHIN THE IT/ITES SEZ for the negotiated Contract Price of Rs.………………….. (Rupees ……………………………………………………………………) is hereby accepted by Mahindra World City (Jaipur) Limited.

You are hereby requested to furnish Performance Security Deposit in the prescribed format of the Bank Guarantee attached herewith for an amount of Rs. ……………………………………. within ten (10) days, of receipt of this Letter Of Acceptance, valid up to 180 days from the Date Of Intended Completion i.e. ………………… any extension thereof and sign the Contract, failing which action as per Sub-Clause 21.1 of Instruction to Bidders shall be taken.

Subsequent to furnishing the requisite security, you are hereby instructed to proceed with the execution of the said works as the site will be handed over to you on __ __2011 in accordance with the Contract documents. The stipulated date of commencement and stipulated completion dates will be ______________ and ______________ respectively.

Thank you

Yours faithfully,

Chief Operating Officer  
Mahindra World City (Jaipur) Limited  
411, Neelkanth Tower#1,  
Bhawani Singh Marg, C-Scheme  
Jaipur -302001
Agreement Form (On stamp paper of Rs 100/-)

Agreement

This Agreement, made the ______- 2011, between Mahindra World City (Jaipur) Limited (hereinafter called “the Employer”) of the one part and

__________________________________________

__________________________________________

(name and address of Contractor) (hereinafter called “the Contractor” ) of the other part.

Whereas the Employer is desirous that the Contractor execute CONSTRUCTION OF MAHINDRA TECHNOLOGY PARK AND ALLIED WORKS WITHIN THE IT/ITES SEZ (Bid No. MWCJL/MTP/B2/Civil/11-12/T-01 (hereinafter called “the Works”) and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a Contract price of Rs. _____________ (Rupees__________________________________________)

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.

3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:

i) Letter of Acceptance;
ii) Contractor’s Bid;
iii) Contract Data;
iv) Conditions of Contract (including Special Conditions of Contract);
v) Specifications;
vii) Drawings;
vi) Bill of Quantities and Rates; and
viii) Any other document listed in the Contract Data as forming part of the Contract.

In witness whereof the Parties thereto have caused this Agreement to be executed the day and year first before written.
The Common Seal of
______________________________________________________________

was hereunto affixed in the presence of:

Signed, Sealed and Delivered by the said
______________________________________________________________
______________________________________________________________
______________________________________________________________

in the presence of:

Binding Signature of Employer ____________________________________________

Binding Signature of Contractor ____________________________________________
SECTION 3: CONDITIONS OF CONTRACT
General Conditions of Contract

A. General

1. Definitions

The following terms shall have the meaning hereby assigned to them except where the context otherwise requires:

ARCHITECT / CONSULTANT:
Rajinder Kumar Associates
B-6/17 Shopping Center, Safdarjung Enclave
New Delhi 110029, India
T: (91)11-26162930 / 26162931
F: (91) 11-26186874

Bill of Quantities or BOQ means the priced and completed bill of quantities and rates forming part of the Contract.

The Contract is the binding between the Employer and the Contractor to execute, complete and maintain the Works. It consists of the documents listed in Clause 2.2 below.

The Contractor shall mean the successful Bidder and their heirs and legal representative, assigns and successors on whom the work order or letter of intent has been issued by the Employer.

The Contractor's Bid is the completed Bidding document submitted by the Contractor to the Employer.

The Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Date of Commencement is the date as stated in the Letter to Proceed from the Employer to the Contractor.

Actual Date of Commencement is the date from which the Contractor started his work.

Days are calendar days; months are calendar months.

A Defect is any part of the Works not completed in accordance with the Contract.

The Defects Liability Period is 24 months calculated from the Actual Completion Date

The Employer is the Party who will employ the Contractor to carry out the Works.

Engineer in Charge shall be HEAD (Infrastructure & Development) of the Employer or person nominated by him.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer in Charge by issuing an extension of time.
The **Actual Completion Date** is the date on which the Engineer in Charges shall issue the Completion Certificate as per Clause 28.

The **Site Possession Date** shall be the date within seven days from the date of issue of Notice to proceed with the work.

**Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

**Plant** is any integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

The **Site** is located at **Mahindra World City (Jaipur) Limited, IT/ITES SEZ. Village: Kalwada, Tehsil: Sanganer, District: Jaipur**

**Specification** means the Specification of the Works referred in the Contract and any modification or addition made or approved by the Engineer in Charge in writing.

**Temporary Works** are works designed, constructed, installed, and removed by the Contractor which are needed for construction or installation of the Works.

**A Variation** is a written instruction given by the Engineer in Charge which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, and turn over to the Employer, as defined in the Contract Data.

**Party and Parties** is the Employer and the Contractor individually and the word Parties shall be construed accordingly

**Relevant Authority** shall mean all Parties which have jurisdiction on the works.

### 2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer in Charge will provide instructions clarifying queries about the Conditions of Contract.

2.2 The documents forming the Contract shall be as follows and their order of priority shall be interpreted in the given order

   (i) Agreement
   
   (ii) Letter of Acceptance, Notice to proceed with work.
   
   (iii) Contractor’s Bid
   
   (v) Conditions of Contract including Special Conditions of Contract
   
   (vi) Bill of Quantities
   
   (vii) Drawings
   
   (viii) Specifications
   
   (ix) any other document listed in the Contract Data as forming part of the Contract.

### 3. Legal Construction

3.1 Subject to provision of clause, the Work Order shall be in all aspect, construed and operated as Contract under Indian Contract Act 1872, and in accordance with Indian
Laws enforce for the time being and is subject to the jurisdiction of the court, Jaipur only.

4. **Language and Law**

4.1 The language of the Contract shall be English only and the Law governing the Contract shall be Law of Republic Of India and the law which will govern the conduct of the contract and according to which the contract shall be in force in the state of Rajasthan, it will include the exemption granted under various enactments.

5. **Communications**

5.1 Communications between Parties which are referred to in the conditions are effective only when given in writing. A notice shall be effective only when it is delivered. In the case delivery is refused, it will be deemed to be received if service is effected by postal agency. Any letter, notice and notification under the contract shall be served on the party concerned when received by fax, telex, courier deliver or registered post letter at the following address of contractor or employer.

Address of Contractor :

Address of Employers

Corporate Address

Mahindra World City (Jaipur) Limited

411, Neelkanth Tower#1,

Bhawani Singh Marg, C-Scheme

Jaipur -302001

Phone No: 0141-3003495-98

Fax : 0141-3003499

6. **Personnel**

6.1 The Contractor shall submit organisation chart indicating the key personnel to carry out the functions stated in the Schedule or other personnel approved by the Engineer in Charge. The Engineer in Charge will approve any proposed replacement of key personnel only if their qualifications, abilities, and relevant experience are substantially equal to or better than those of the personnel listed in the Schedule.

6.2 If the Engineer in Charge or Construction Manager asks the Contractor to remove a person who is a member of the Contractor’s staff or his work force the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

7. **Insurance** and obligation under labour and environment law :

7.1 Notwithstanding that the Contractor is to indemnify the Employer and submit the policies in original to the Employer, the Contractor shall take All Risks and Workmen’s Compensation insurance policies to cover the whole project as envisaged under the Contract and without limiting the obligations, responsibilities, duties and/or liabilities of the Contractor, the Contractor shall effect at his own costs for others insurance policies deemed necessary in the joint names of the Employer and the Contractor to cover the Contract works as given below:
Insurance requirements are as under:

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Policy for Insurance cover required</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>All risk insurance for works</td>
</tr>
<tr>
<td>2</td>
<td>Loss or damage to Employer’s Equipment &amp; material.</td>
</tr>
<tr>
<td>3</td>
<td>Other Employers property</td>
</tr>
<tr>
<td>4</td>
<td>Personal injury or death insurance:</td>
</tr>
<tr>
<td></td>
<td>a) Third Party</td>
</tr>
<tr>
<td>5</td>
<td>Motor Vehicle Insurance</td>
</tr>
<tr>
<td>6</td>
<td>Third Party liability insurance (Including the name of Employer)</td>
</tr>
<tr>
<td>7</td>
<td>Contractor’s Equipments (Including liability arising out of usages of such equipment)</td>
</tr>
<tr>
<td>8</td>
<td>PAN No.</td>
</tr>
<tr>
<td>9</td>
<td>EPF No.</td>
</tr>
</tbody>
</table>

8  **Possession of the Site**

8.1 The Employer shall give possession of the Site to the Contractor alongwith the acceptance letter.

9  **Settlement of Dispute**

9.1 If any dispute of any kind whatsoever shall arise between the Employer and the Contractor in connection with or arising out of the Contract, including without prejudice to the generality of foregoing, any question regarding its existence, validity or termination or the execution of the works, whether during the process of works or after completion and whether before or after termination or breach of the Contract, the Parties shall seek to resolve any such dispute or difference by referring the matter to Engineer in Charge. The Engineer in Charge will give its decision within fifteen (15)
days of referring the dispute. Either Party if not in Agreement with Engineer in
Charge’s decision, may within fifteen days of decision by the Engineer in Charge refer
to the senior management of the Employer, who will give its decision with thirty (30)
days of referring the dispute. Either Party if not in Agreement with senior management
decision, may refer to arbitration pursuant to Clause no. 10 of General Conditions of
Contract.

10 Procedure for Disputes Resolution

10.1 The Arbitration shall be conducted in accordance with the arbitration procedure stated
below.

The procedure for arbitration will be as follows:

10.1.1 In case of dispute or difference arising between the Employer and a Contractor
relating to any matter arising out of or connected with this Agreement, such
disputes or difference shall be settled in accordance with the Arbitration and
Conciliation Act, 1996. The arbitral tribunal shall consist of three (03)
arbitrators one each to be appointed by the Employer and the Contractor. The
third Arbitrator shall be chosen by the two Arbitrators so appointed by the
Parties and shall act as Presiding arbitrator. In case of failure of the two
arbitrators appointed by the Parties to reach upon a consensus within a period of
thirty (30) days from the appointment of the arbitrator appointed subsequently,
the Presiding Arbitrator shall be appointed by the Indian Council of
Arbitration/President of the Institution of Engineer (India)/The International
Centre for Alternative Dispute Resolution (India).

10.1.2 If one of the Parties fails to appoint its arbitrator in pursuance of sub-Clause
10.1.1 above within 30 days after receipt of the notice of the appointment of its
arbitrator by the other Party, then the Indian Council of Arbitration/President of
the Institution of Engineer (India)/The International Centre for Alternative
Dispute Resolution (India), shall appoint the arbitrator. A certified copy of the
order of the Indian Council of Arbitration /President of the Institution of
Engineer in Charges (India)/The International Centre for Alternative Disputes
Resolution (India), making such an appointment shall be furnished to each of
the Parties.

10.1.3 Arbitration proceedings shall be at Jaipur, Rajasthan, India, and the language of
the arbitration proceedings and that of all documents and communications
between the Parties shall be English.

10.1.4 The decision of the majority of arbitrators shall be final and binding upon both
Parties. The cost and expenses of Arbitration proceedings will be paid as
determined by the arbitral tribunal. However, the expenses incurred by each
Party in connection with the preparation, presentation, etc. of its proceedings as
also the fees and expenses paid to the arbitrator appointed by such Party or on
its behalf shall be borne by each Party itself.

10.1.5 Without prejudice to the above provision, Where the amount in dispute is Rs.50
lacs and below, the disputes or differences arising shall be referred to the Sole
Arbitrator. To be nominated by employer. The arbitration will take placein
accordance with the Indian Arbitration and Conciliation Act 1996. The
Arbitration shall be at Jaipur. Arbitration may be commenced prior to or after
completion of the contract provided that the obligation of the employer and the
contractor shall not be altered by reason of the arbitration being conducted during the progress of the contract.

10.1.6 Performance under the Contract shall continue during the arbitration proceedings and subject to the satisfactory performance of the Contractor, payments due to the Contractor by the Employers shall not be withheld, unless they are the subject matter of the arbitration proceedings.
B. TIME CONTROL

11 Avoidance Of Delay

11.1 It is paramount that the Contractor shall constantly plan his work so as to most efficiently utilize all or any available part or parts of the Site, any completed part or parts of another Contractor’s works which is to be integrated into the Contract Works (if any), the available drawings and all others matters as are available to him, as well as his own resources in order to avoid or reduce any standstill and down time.

11.2 In the event that the Contractor cannot commence or proceed with a particular part of the Contract Works as per the programme furnished to the Employer in accordance with Clause 12.1, for any reason whether attributed to the Contractor or not, the Contractor shall be obliged to reschedule and proceed with other parts of the Contract Works at no costs to the Employer to ensure that the completion date of the Contract Works will be met.

11.3 Should the Contractor fall behind any program submitted in accordance with Clause 12.2, due to any act, default, neglect or omission of the Contractor and requires over-time, night work or shift work and/or an increase of man power and/or construction plant to regain the scheduled progress (whether or not instructed by the Employer), the cost of such measures shall be borne by the Contractor.

11.4 Within the time stated in the Contract Data, the Contractor shall submit to the Engineer in Charge for approval a Construction Program including Environmental Management Plan.

11.5 The Engineer in Charge's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Engineer in Charge again at any time. A revised Program is to show the effect of Variations.

12 Extension of the Intended Completion Date

12.1 Time shall be of the essence with respect to the commencement and completion as per the key Contractual dates as mentioned in the Contract Data as Milestones for the execution and completion of the Contract Works as stated.

12.2 The Contractor acknowledges that a high rate of working is required to achieve the Dates for Completion of the Contract Works and Contractor shall be deemed to have allowed for shift working, sufficient plant, labour, floodlighting and any or all other measures to achieve the same.

12.3 The Dates of Completion of the Contract Works may be extended by the Employer subject to compliance by the Contractor with Clause 11 (Avoidance of Delay), by such period which reasonably reflects any delay in completion of the Contract Works which, notwithstanding due diligence and taking of all reasonable steps by the Contractor to avoid or reduce the delay as provided for in Clause 11, is caused:-
a) By the occurrence of an event of Force Majeure;
b) By a delay in handing over of the Site or part of the Site by the Employer after the Dates for Commencement of the Contract Works;
c) Any variations requested by the Employer;
d) By other Contractors carrying out works not forming part of the works to be carried out under the Contract, and employed by the Employer;
e) By an instruction to suspend the Contract Works issued by the Employer pursuant to this Contract provided that such suspension is not due to the default of the Contractor;

and which affects the Contract Works PROVIDED that such delays are not due to the Contractor. PROVIDED FURTHER THAT if, while the Contractor is continuing works during the period when liquidated and ascertained damages are being deducted, the Employer gives instruction or matters occur which would entitle the Contractor to an extension of time then the Employer shall assess and give the Contractor an extension of time and so notify the Contractor accordingly.

12.4 It shall be a condition precedent that the Contractor shall notify the Employer in writing of any factors and the relevant Contract provision (if any) which entitles Contractor to an extension of time together with a statement of:

a.) the reason why the delay in completion of the Contract Works is likely to result or has resulted;
b.) an estimate of the period by which the Contract Works are likely to be or had been delayed; and
c.) details of steps that the Contractor proposes to take to avoid or reduce the delay;

within seven (07) days of the commencement or occurrence of any such factor or such extension of this seven (07) days period as the Employer may allow.

12.5 The Contractor shall notify The Employer within fourteen (14) days of the cessation of the factors notified to The Employer under Sub-Clause 12.4; to enable any provisions, that the Contractor may require to the proposed extended Date for Completion to be made as quickly as possible and such other particulars as shall be reasonably necessary to enable The Employer to properly consider the revision.

12.6 Without prejudice to any other grounds which do not entitle the Contractor to an extension of time, the Contractor shall not be entitled to extensions of time for delays resulting from weather conditions, or discrepancy in the Contract Documents, whether such events affect the Contract Works or not.

12.7 Notwithstanding the foregoing, the Employer shall not be obliged to take into account any circumstances that are not notified to The Employer in accordance with the periods referred to in Sub-Clause 12.3 and 12.4.

12.8 The Employer shall as soon as is reasonably practical after receipt of the Contractor’s notification furnished in accordance with the sub-Clause 11.3 determine and notify the Contractor in writing of any extension of time to which the Employer considers the Contractor is entitled under Sub-Clause 12.4.
12.9 The Contractor had agreed NOT TO CLAIM for all costs, loss and/or expense suffered or incurred by reason of any extension of time granted by the Employer in accordance to Sub-Clause 12.4 herein.

13 Force Majeure

13.1 Force Majeure” shall mean any event beyond the reasonable control of the Employer or of the Contractor, as the case may be, and which is unavoidable notwithstanding the reasonable care of the Party affected, and shall include the following:

13.1.1 War, hostilities or warlike operations (whether a state of war be declared or not), invasion, act of foreign enemy and civil war, rebellion, revolution, insurrection, mutiny, usurpation of civil or military government, riot, civil commotion and terrorist acts, confiscation, nationalization, mobilization, commandeering or requisition by or under the order of any government authority or act of any local state or national government authority

13.1.2 Strike (other than strike by employees/staff/labour of Contractor or Sub-Contractor), sabotage, embargo, import restriction, epidemics, quarantine and plague.

13.1.3 Earthquake, volcanic activity, fire, flood or inundation, tidal wave, typhoon or cyclone, hurricane, storm, lightning, or nuclear or other natural disaster

14 Delays Ordered by the Engineer in Charge

14.1 The Engineer in Charge may instruct the Contractor to delay the start or progress of any activity within the Works.

C. QUALITY CONTROL

15 Identifying Defects

15.1 The Engineer in Charge/Architect shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer in Charge may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer in Charge considers may have a Defect.

15.2 The Contractor shall permit the Employer's technical auditor to check the Contractor’s work and notify the Engineer in Charge and Contractor of any defects that are found.

16 Correction of Defects

16.1 The Engineer in Charge shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. Once the defects are notified to the contractor the Defects Liability Period shall extend automatically for as long as Defects remain to be corrected.

16.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Engineer in Charge’s notice.
17 Uncorrected Defects

17.1 If the Contractor has not corrected a Defect within the time specified in the Engineer in Charge’s notice, the Engineer in Charge will have the right to engage third party to the defects rectified at risk & cost of the contractor along with overheads. Such amount will be recovered from the Contractor.

D. COST CONTROL

18 Bill of Quantities

18.1 The Bill of Quantities shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.

18.2 The Bill of Quantity is used to calculate the Contract Price. The Contractor Shall be paid for the actual quantities executed & inspected & duly approved and accepted by the Engineer in Charge and the Contract Price shall be adjusted based on approved actual quantities of the Contract works as described in Bill Of Quantity for each item.

18.3 The rates set out in the Bill of Quantity (BOQ) are fixed, firm and shall be inclusive of all costs and expenses as under. No escalation in rate is permitted during the tenure of contract and shall not be subject to variation on any account what so ever also inclusive of dewatering of rain water / water spillage at site due to construction activities during the progress of work.

18.3.1 Preliminaries works / costs such as site measurement, supervision, setting out, insurances, water, electricity/power, security/ watch & ward protection of public, working around and in connection with underground services, cables, pipes, etc. working/liaison with consultant engineers, Government and other Relevant Authorities etc.

18.3.2 All associated temporary and false works.

18.3.3 Preparation and maintenance of access and / or haul road, etc.

18.3.4 All tests, sampling, inspection, reports, opening up of works and related works (including testing on materials supply by Employer).

18.3.5 Material, labour, plant, equipment, machinery, tools and all related costs.

18.3.6 Shifts works, night works, overtime works, incentives, bonus, related labour employment costs etc.

18.3.7 Working with site constraints and conditions.

18.3.8 Liaison, including dealing and compliances with requirements, restrictions, etc. of all Relevant Authorities.

18.3.9 Overhead cost, profits, etc.

18.3.10 Protection and maintaining all Contract works and any thing affected by the Contract works until completion and handing over.

18.3.11 Coordination with Development Commissioner Office located within the SEZ for verification etc. for availing benefits of exemptions for works within SEZ.
18.3.12 Any other costs and / or expenses deemed necessary for the due execution and completion of the works.

18.4 This Project is an SEZ. As per Special Economic Zone Act 2005, WCT & EXCISE DUTY (except income tax on the work done of the Contractor) are exempted; hence, the quoted rates shall be exclusive of all taxes, duties, royalties, levies, service tax etc. Any tax component, considered shall be indicated separately and shall be admissible only if applicable, proof of payment of such taxes will be required for acceptance of claim in there respect. The Contractor shall put his best efforts to forward the exemptions and benefits granted by the Government he gets from time to time. Employer shall deduct Tax Deduction at Source (TDS) for such taxes at the rates fixed and revised by Relevant Authorities from each payment/bill due to Contractor. Employer shall issue TDS certificate in favour of Contractor for the TDS so recovered. In case employer is not able to avail any tax benefit due to negligence or non compliance of SEZ rule and regulation by contractor then the same will be recovered from contractor.

18.4.1 The rates as contained in the BOQ shall include all E PF( Mandatory), and all other payment as per the statutory requirements. The Contractor shall produce proof of compliance of such requirement to the Employer and upon submission of such proof only, the Employer shall release periodic payments to the Contractor

18.4.2 19 Alterations, Additions and Omissions

19.1 Variations

The Engineer in Charge shall make any variation of the form, quality or quantity of the Works or any part thereof that may have been approved by the Employer and he shall have power to order the Contractor to do and the Contractor shall do any of the following:

(a) increase or decrease the quantity of any work included in the Contract,
(b) omit any such work,
(c) change the character or quality or kind of any such work,
(d) change the levels, lines position and dimensions of any part of the Works, and
(e) execute additional work of any kind necessary for the completion of the Works.

(f) Contractor shall not refuse and execute all additional civil work designated by engineer in charge relating to Civil work in the Vicinity in MTP area on existing BOQ rates, the items for which BOQ rates are not available, will be derived based on explanation given in clause 19.3 below.

and no such variation in any way vitiate or invalidate the Contract, but the Value, if any, of all such variations shall be taken into account in ascertaining the amount of the Contract Price.

19.2 Orders for Variations

No such variations shall be made by the Contractor without an order in writing of the Engineer in Charge. However, provided for under Clause 19.1 no order in
writing shall be required for an increase not exceeding twenty five per cent (25%) in the total amount of the works where such increase is not the result of an order given under this Clause, but is the result of variation of quantities exceeding or being less than those stated in the Bill of Quantities and additional work. However the contractor shall seek prior written approval before executing quantities exceeding the bill of quantities.

19.3 Valuation of Variations

All extra or additional work done or work omitted by order of the Engineer in Charge shall be valued at the rates and prices set out in the Contract, if, in the opinion of the Engineer in Charge, the same shall be applicable. If the Contract does not contain any rates or prices applicable to the extra or additional work then suitable rates or prices shall be derived from similar items in the contract or based on actual market rates with 15% over head & profits as decided by the Engineer-in-charge.

19.4 Power of Engineer in Charge to Fix Rates

The rate mentioned in BOQ shall be firm during the pendency of contract for all the quantities executed at site irrespective of any variation(addition or omission).

19.5 Variations

There are no limit of variation for individual item, However If, on certified completion of the whole of the Works it shall be found that a reduction or increase of the Contract value shall be regularised through an amendment i/c all deviations and additional scope.( Extra items shall be based on approval of rate analysis by competent authority.)

Contract value shall be subject to amendment by such sum as may be agreed between Contractor and the Engineer in Charge.

20 Tax

20.1 The rates quoted by the Contractor shall be deemed to be exclusive of taxes which are exempted under SEZ Act 2005 and separate disclosure of all taxes which are not exempted alongwith basic rate in the bid. In case, any tax is levied inspite of Employer giving all requisite documents to the Contractor and Contractor’s best efforts, same shall be paid extra to the Contractor upon Contractor submitting proof of such payments.

20.2 INCOME TAX: Deduction of income tax at source will be made by the Employer at the applicable rates which is obligatory as per the provisions of Income Tax Act. It shall be the responsibility of Contractor to arrange and produce a “No Deduction Certificate” from the Income Tax Authorities, if the payment of their invoices are to be made without deduction of Income Tax at source.

20.3 If any tax exemptions, concessions, reductions, allowances or privileges may be available to the Employer, the Contractor shall use its best endeavours to enable the Employer to benefit from any such tax savings to the maximum allowable extent.

BASE DATE : Base date for reimbursement of any new enactment in taxes, duties and levies by central or state govt. or any other statutory authorities as applicable to the Contract, shall be seven (7) days prior to the date on which the price bid or revised price bids were stipulated to be received.
21 Retention

21.1 Retention Money at the rate of 5% of the value of work done for each running bill will be deducted until the actual completion of work, up to a maximum of 5% of Contract Price.

21.2 Retention money shall be refunded within 30 days after discharge of defect liability period of 12 months.

21.3 No retention sum shall be deducted from interim progress payment subject to the submission of an unconditional bank guarantee from a scheduled bank in the Employer’s format equivalent to 5% of the Contract Price which would valid up to the Completion of Defect Liability period with 180 days extra claim period.

22 SUPPLY OF MATERIAL (Cement and R/f Steel)

22.1 The Employer shall supply following material for incorporation into permanent works on reconciliation basis, free of cost. Wastage at a rate of 3% will be permitted for reinforcement steel only. For quantity of consumption in excess of allowed values, deduction will be effected from the Contractor’s bill at current market price or Employer’s average purchase price plus 100% whichever is higher.

22.2 The Contractor’s rates shall include for receiving the materials, unloading from transport trucks, storing, wastages and transporting to the place of work.

22.3 For reinforcement steel, the Contractor’s rates will include for cutting, bending, binding wires, and placing in position at all heights as per the BOQ. Wastages up to 3% on consumption of steel will be considered. Actual Rolling Margin will be recorded for every consignment and affected accordingly.

22.4 Blank

22.5 Wastage on any materials (Except steel reinforcement) will be to the Contractor’s account.

22.6 The Contractor shall provide the requirement of the materials well in advance, at least by 30 days, and no delay due to non-availability of materials on time will be accepted.

22.7 Damage to materials:

Any item damaged by the Contractor, after taking delivery will be made good by the Contractor at his own cost (Same make and size), or the Employer will deduct 2 times the cost of such material.

22.8 The Employer reserves the right to supply any other material / materials also and the Contractor acknowledges that such supply of material shall affect his rates quoted in Bills of Quantities.

The Contractor accepts that in the event of supply of any material from Employers side pursuant to Clause 22 (Supply Of Material). The Item rate quoted by the Contractor shall be re-calculated and the Contractor will not make any claim whatsoever in account of material part of the rates (including all profits, overheads,
taxes etc. all) quoted by him in the Bills of Quantity. The coefficient of the materials shall be determined based on CPWD.

22.9 The material provided/supplied by the Employer shall continue to rest with the Contractor till the works are handed over to the Employer. The Contractor shall not utilize such supplied material or deal with them in any manner whatsoever except for use in execution of permanent works under this Contract.

22.10 The Contractor shall submit his material requirement schedule to the Employer minimum four (04) weeks in advance or as advised at the time of commencement of works. The Contractor shall submit bar bending schedule and quantity calculation to Employer prior to the supply of material along with the material requisition.

22.11 All material supplied to the Contractor shall be unloaded and safely and properly stored by the Contractor at his own cost and risk. The Employer in any event shall not be responsible for any loss, damage, theft, pilferage etc.

22.12 The Contractor shall maintain a proper account of all such material and shall submit returns and documents of consumption. The Contractor shall submit a statement with each running bill to Employer reconciling the quantity of material drawn from Employer and quantities consumed.

22.13 In case of steel of cut lengths of bars below the following size shall be ranked as wastage. Cut bars higher lengths shall be treated as prime steel:

i) bars of 16 mm dia and above dia – 4 m long
ii) bars of below 16 mm dia – 2 m long

Rolling margin shall be established for every lot of steel and for every diameter between the Engineer in Charge and the Contractor.

22.14 The free issue steel shall be used in the works as per the Scope Of Works pursuant to Clause 2 of Special Conditions Of Contract. 3% wastage in the form of scrap steel shall be allowed to the Contractor. The scrap steel shall be employer’s property. Contractor will not be permitted to utilize/dispose the same either within the SEZ or out side the SEZ.

22.15 For reconciliation purpose, the consumption of any material (supplied by the Employer) shall be calculated based on CPWD consumption co-efficient, however for mix design materials coefficient derived from the approved mix design shall be taken into account.

23 Liquidated Damages

23.1 If the contractor fails to complete the works by the date of completion as stated in the Tender or within extended time as per agreed project baseline schedule, the Owner shall withhold a sum calculated at the rate of 0.5 % of the total contract value per week (or part thereof) of delay as liquidated damages for the period during which the said work shall so remain or have remained in-complete. The owner may deduct such damages from any money's otherwise payable to the contractor under this contract, up to a maximum of 5.0 % of the total contract value after which Owner will have right to terminate the contract and claim for compensation from contractor for the
financial losses on account of delay of project. The contractor admits that the loss shall always be caused if there is failure on its part.

23.2 The delay shall be assessed based on milestones mentioned hereafter. The LD clause shall be implemented based on the milestones set for the progress of work. Reconciliation statement for Project Tracking giving detail of delay, duly verified by Engineer-in-Charge / project manager shall be submitted along with monthly running bills.

23.3 The Liquidated Damages imposed for not achieving intermediate milestone shall be subjected to refund/adjustment in case of Contractor achieve the final Milestone with the period as stipulated in the Contract.

23.4 Time shall be of the essence with respect to the commencement and completion as per the key Contractual dates for the execution and completion of the Contract Works as stated in Contract Data, and payment or deduction of liquidated damages shall not relieve the Contractor from his obligation to complete the work as per agreed construction program and milestones or from any other of the Contractor’s obligations and liabilities under the Contract.

24 Bonus

24.1 For early completion of Contract before the stipulated date of completion or such later date as authorized by the Employer, incentive shall be paid to the Contractor at 0.025% of the Contract price per week of early completion, subject to a maximum of 2.5% of Contract price. This incentive shall be applicable in cases where completion of work before scheduled dates lead to tangible benefits.

25 Advance Payment

25.1 Mobilization Advance: No interest bearing mobilization advance equivalent to 10% (5% after award of work and on mobilization at site & 5% on mobilization of T&P, shuttering & scaffolding material etc) of the contract value against irrevocable bank guarantee for each stage, from the scheduled bank, in the approved format, may be paid to the Contractor. The Mobilization advance shall be proportionately recovered from the contractor’s running bills in such manner that full recovery of amount is affected on completion of 80% value of work done. The mobilization advance will be paid in two equal installments, 1st on signing of the contract agreement and submission of Bank Guarantee and Performance Guarantee of full amount and Mobilization of Major Equipment.

The value of bank guarantee for mobilization advance may be reduced to the extent of such advances recovered by the Employer subject to the condition that the value of bank guarantee amount at any time, remain same or more than the recoverable outstanding amount. The bank guarantee shall be released as and when the corresponding advance amount is deducted from the bills of the Contractor.

The Contractor is to use the advance payment only to pay for Equipment, Plant and Mobilization expenses required specifically for execution of the Works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other relevant documents to the Engineer in Charge.

The advance payment shall be recovered by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the
advance (mobilization and equipment only) payment or its repayment in assessing valuations of work done, Variations, price adjustments or Liquidated Damages.

26 **Performance Security**

The Performance Security in the form of unconditional bank guarantee shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount equal to 5% of Contract Price from a Nationalised or Scheduled bank in the Employer’s prescribed format the Performance Security shall be valid until a date 180 days from the date of expiry of Actual Date of Completion.

27 **Defect Liability and Cost of Repairs**

27.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Actual Date of Completion and the end of the Defects Liability Periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions. The Contractor shall be responsible to make good at his own expense any defect which may develop within the period mentioned as Defect Liability Period in the Contract Data. The Employer shall give the Contractor a notice in writing about the defects and the Contractor shall repair the defect within maximum of seven (07) days or fourteen (14) days depending upon whether the defect is minor or major. If the Contractor fails to repair/ remove the defect, the Employer may get the work execute from others at Contractor’s risk & cost . The Employer shall have the right to appropriate all or part of the Retention Money towards the expense in repairing the defects.

**E. FINISHING THE CONTRACT**

28 **Completion**

28.1 After completion of the work, the Contractor will serve a written notice to the Engineer in Charge to this effect. The Engineer in Charge upon receipt of this notice shall conduct a complete joint survey of the work within seven (07) days and prepare a defects list jointly. The defects pointed out by the Engineer in Charge or his nominee would be rectified by the Contractor within fourteen (14) days and thereafter acceptance report be signed jointly by the Contractor, Engineer in Charge and the Employer. And a ‘Completion Certificate’ shall be issued to Contractor by Employer.

29 **Taking Over**

29.1 The Employer shall take over the Site and the Works within seven days of the Engineer in Charge issuing a certificate of Completion.

30 **As Built Drawings**

30.1 The Contractor shall supply “As Built” Drawings 3 sets (hard copy) and soft copies in CAD format in CD alongwith Operation & Maintenance Manuals, SOPs and Guarantees by the dates stated in the Contract Data.

30.2 Contactor’s rates include the As-built drawings and associated manuals. If the Contractor does not supply the As Built drawings by the dates stated in the Contract Data, or they
do not receive the Engineer in Charge’s approval, the Engineer in Charge shall withhold the amount stated in the Contract Data from payments due to the Contractor. Rs. 1.00 Lac shall be on hold from pre-final bill till submission of built up drawings.

31 Termination Of Contract

31.1 Due to any default by the Contractor, the Employer shall be entitled to terminate the Contractor’s employment under the Contract by giving one (01) week advanced notice in writing by stating the reason. The date after seven (07) days from the date of issuance of the Termination Notice shall hence be defined as "Date of Termination". The Contractor will be paid for all works duly and properly completed up to the Date of Termination but shall not be entitled to anticipated profit or any consequential or indirect loss or damage and shall hold harmless and indemnify the Employer against Contractor's Contractors/suppliers or third parties arising from termination under this Clause.

31.2 The Contractor had agreed in the event of delay in progress or non-achievement of the Milestone Dates, The Employer shall reserve the sole discretion right in deploying its own plant and machinery or engaging third party to speed up the Contractor’s works and the Contractor’s Contract shall be terminated with written notice at any point of time without any compensation or claims to be paid to the Contractor. All additional / extra cost incurred by The Employer shall be charged to the Contractor due to such event.

32 Payment upon Termination

32.1 Full payment to Contractor’s workers, Contractors, suppliers and third parties engaged by the Contractor for any portion of the Contract works shall be paid in full by the Contractor and thereafter must be removed from site on or before the Date of Termination. If the Contractor failed to make full payment to these workers, Sub Contractors, suppliers and third parties and/or remove them from site on the Date of Termination, then the Employer will carry out such duties on behalf of the Contractor. The Employer will recover all cost incurred due to the performing of such duties on behalf of the Contractor by making deduction from amount/s due to the Contractor or by any other process.

33 Breach Of Contract

The following events shall be fundamental breach of Contract:

33.1 The Contractor has contravened any Clause / sub-Clause of the Conditions of Contract.

33.2 The Contractor does not adhere to the agreed construction program and agreed environmental management plan and also fails to take satisfactory remedial action as per Agreements.

The Contractor shall carry out all instruction of the Engineer in Charge which comply with the applicable laws where the Site is located if the Contractor fails to carry out the instructions of Engineer in Charge within a reasonable time determined by the Engineer in Charge in accordance with General Condition of Contract Clause 11.
Special Conditions of Contract

1. General

The Contractor is advised to note that the following Special Conditions are part of the Contract and he will not have any right to claim at any time for delays or for expenditure incurred by him in fulfilling the following special conditions.

2. Scope of Works

The Contract Works shall comprise of but not be limited to:

The scope of work is for the construction of Mahindra Technology Park Building civil and structure works as defined in BOQ.

The work to be carried out under the contract shall include all the items given in the Bill of Quantities and such other item as may be instructed by the Employer time to time and shall expect as otherwise specified in these conditions include all labour, materials including wastage, tools plant equipment and transport, hoisting, setting and fitting in position and other infrastructural facilities etc. which may be required in preparation and completion of the works.

All the above shall be as per issued relevant drawings, Specifications of IS and other relevant National and International Standard Specifications and good engineering practices, safety measures as required all as per agreed construction methodology in consultation and coordination with and under the inspection of the Employer’s personnel / design consultants.

All the Contract Works shall be executed in full compliance with the Specifications of the Contract and all requirements and always to the satisfaction of the Employer.

The Contractor acknowledge that he understands the Special Economic Zone (SEZ) rules and regulation as per SEZ Act 2005 and he further acknowledge that he will abide all the rules and regulations of SEZ Act, laws related to custom duties, notified area and all other related things affecting the Contract works directly or indirectly and shall keep the employer harless from any violation of the provisions of SEZ Act 2005.

The Contractor shall resolve local constraints and problems, liaise, seek, and obtain any consent, permit, license, approval, etc. from all Relevant Authorities including paying all fees, charges, levies, etc all at his own cost.

Clearing all debris and disposing to location approved by Municipal authorities during progress of Contract works and before and after the dates of Completion.

All temporary works, haul/access roads that are necessary for the proper and due completion of the Contract Works.

3. Milestone dates:

Milestone date shall be as negotiated and agreed at the time of award of contract with the following milestones;
<table>
<thead>
<tr>
<th>S.No</th>
<th>Activity to be completed</th>
<th>Milestone from date of commencement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RCC Slab at Ground floor Level/Plinth level.</td>
<td>90 Days</td>
</tr>
<tr>
<td>2</td>
<td>RCC Slab at First floor Level.</td>
<td>112 Days</td>
</tr>
<tr>
<td>3</td>
<td>RCC Slab at Second floor Level i/c Masonry work in Basement.</td>
<td>134 Days</td>
</tr>
<tr>
<td>4</td>
<td>RCC Slab at Third floor Level i/c Masonry work at Ground Floor.</td>
<td>156 Days</td>
</tr>
<tr>
<td>5</td>
<td>RCC Slab at Fourth floor Level i/c Masonry work at First Floor.</td>
<td>178 Days</td>
</tr>
<tr>
<td>6</td>
<td>RCC Slab at Terrace floor Level i/c Masonry work at Second Floor</td>
<td>200 Days</td>
</tr>
<tr>
<td>7</td>
<td>Parapet walls, Mumty and M/C Room and water tank i/c Masonry work at Third &amp; Fourth Floor</td>
<td>230 Days</td>
</tr>
<tr>
<td>8</td>
<td>External Plaster</td>
<td>240 Days</td>
</tr>
<tr>
<td>9</td>
<td>External Texture painting</td>
<td>265 Days</td>
</tr>
<tr>
<td>10</td>
<td>External Stone Cladding</td>
<td>280 Days</td>
</tr>
</tbody>
</table>

4. **Schedule of Works**

The Contractor shall submit a work schedule including the commencement date, to reflect the ground realities and indicating the milestones.

5. **Measurements**

The payable quantity (ies) against the executed work shall be determined on the basis of quantity certified, wherein certification conducted jointly by the Contractor and the Engineer-in-Charge. Work accepted, approved and certified by the Contract Dept. / PM, will only be paid for as specified in Bills of Quantities and payments shall be at the same rates.

6. **Method of Measurements**

The mode of measurement will be as per IS 1200 (Part I & II). Unless specified: The Contractor may from time to time intimate to the Engineer in Charge that he required the works to be measured, and the Engineer in Charge shall within a reasonable period of time take such measurements and calculations and to furnish all particulars or to give full assistance required by any of them. Such measurements shall be taken in accordance with the Mode of measurements detailed in the specifications; a copy of such measurements shall be given to the Contractor for preparation of his bills. However, the Contractor shall be responsible for preparation and submission of his bills.
All authorized extra works, omissions and all variations made without the Employer’s knowledge, if subsequently sanctioned by him in writing shall be included in such measurements.

7. **Running Account Bills**

The Contractor has to prepare and submit the Running Account Bills in triplicate once in a month along with details measurements in serially machine numbered register, abstract sheets, deviation statement and any specific instructions which may be given in this regard by the Engineer In-Charge shall also be attached to by the contractor

**Running Bill Certification:**

The Contractor shall prepare and submit running bill to the Engineer In-Charge once a month throughout the construction period considering that No payment shall be made for works estimated to cost less than rupees 1 (One) Lac.

All Running Bills shall be accompanied with the detailed material reconciliation statement for cement, steel and other Owner Supplied Materials.

Retention Money and Mobilization Advance shall be applied to interim billings as mentioned elsewhere in the conditions of contract.

Cost of materials if any issued by the Employer shall be recovered from the running bills at rates specified in the Contract, any shortage of material will be recovered with 100% penalty.

Within 5 days of the receipt of Contractor’s running bill for payment, the Engineer In-Charge / Employer’s representative shall check and point out corrections, if any to be made in the bill. The Contractor shall correct the bill and resubmit the same to the Engineer In-charge.

Within 10 days of receipt of the corrected bill from the Contractor, the Engineer In-charge/ Employer representative shall check the bill and forward the same to Manger Contract for verification for certification, who will certify the amount due to Contractor and recommend payment of the amount by the accounts department to the Contractor.

Within 6 days of receipt of the bill from Engineer In-Charge, account dept will release the payment along with certificate showing details pertaining to works done, total recoveries and statutory deductions.

Any running / interim Certificate of Payment given by the Infra / Account Dept. relating to work done or the materials delivered shall be adhoc in nature and may be modified or corrected by any subsequent interim Certificate or the Final Certificate of payment.

An interim payment not exceeding 60% of the provisional bill amount restricted to BOQ items may be certified by the Engineer-in-charge. Balance payment shall be made once Engineer-in-charge certifies quantity and item rate and amendment to service PO. Interim payment can be made within 7 days of engineer-in-charge certificate.

**Final Bill payment**
The Final Bill shall be submitted by the Contractor within two month of the date of Completion of the Work or if the work is completed earlier, within one month of such completion. The contractor shall give to the employer a detailed account of the total amount which he consider payable to him under the contract..

The final bill will be checked in terms actual measurement at site, quality of works and material supplied / used, approved extra items, by the Engineer In-Charge within 30 days from the date of the bill is received by the Engineer In-Charge, provided the contractor has complied with all formalities as described in various clauses of the Contract and thereafter the same would be forwarded to the next concerned dept.

The payment of the final bill shall be made to the Contractor by the Employer within 15 days from the receipt of the Engineer in-charge approval certificate for payment.

No further claim shall be made by the Contractor in respect thereof even after submission of the final bill and the same shall be deemed to have been fully waived and absolutely extinguished.

The final billing shall be accompanied by all substantiating documents as required for running bills with the addition of the following items that shall be supplied by the contractor:

All written guarantees / warrantees and spares required by the Contract documents.
Operation and manuals and instructions for equipment and apparatus.
Re producible and blue prints of all requisite As Built drawings along with the soft copy thereof on latest version of AutoCad software.

**Certificate for payment format : (may be finalized later with the Engineer In-Charge)**

<table>
<thead>
<tr>
<th>Add (+)</th>
<th>Deductions :</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value of Work done for Interim Certificate As per Contract</td>
<td>(a)</td>
</tr>
<tr>
<td>Additional Work , Extra Items Duly sanctioned by the Engineer In-Charge</td>
<td>(b)</td>
</tr>
<tr>
<td><strong>Total - Work Done (a+b)</strong></td>
<td>(1)</td>
</tr>
<tr>
<td>Less (-)</td>
<td></td>
</tr>
<tr>
<td>Retention 5% on '1' subject to a maximum of 5% on Contract Value</td>
<td>©</td>
</tr>
<tr>
<td>Value of Material issued by the Employer (Actually used by the Contractor in the work competed up to this bill)</td>
<td>(d)</td>
</tr>
<tr>
<td>Mobilization advance recovered (on pro rate basis from Running Bills in such manner that full advance can be recovered by when 80% work done)</td>
<td>(e)</td>
</tr>
</tbody>
</table>
8. **Subcontract or Subletting of Works**

**Sub-Letting:**

No part of the Contract shall be sublet without the written permission of the Employer nor shall transfers be made by the 'Power of Attorney' authorizing others to carryout the work or receive payment on behalf of the Contractor.

**Sub-Contract:**

7.2.1 The Contractor is not permitted to subcontract any part of his works in this Contract without prior approval in writing from the Employer. It may be made clear that under ordinary circumstances, no subcontract shall be permitted.

7.2.2 In any case, whether any part of the works is subcontracted or not; the principal liabilities of the works shall lie with the Contractor.

9. **Contract Drawings**

The Engineer in Charge shall issue free of charge Two sets of Contract Drawings, approved for construction, to the Contractor. Additional copies as and when required shall be supplied by the Engineer in Charge and costs shall be reimbursed by the Contractor.

The Engineer in Charge may from time to time during the course of the Contract issue the Contractor with revised Contract drawings and the Contractor shall ensure that all superseded drawings are removed from site and replaced by revised Contract Drawings.

The Contractor shall ensure that a complete up to-date list of drawing is maintained at site. All Contract Drawings shall be properly filed and indexed for ready reference.

The Contractor shall ensure that only the valid up to-date Contract Drawings are used for preparation of Working Drawings, setting out, construction, etc. shall be carried out as per valid Contract Drawings.

The privilege of the authorship and Employership of drawing and designs of the building remains with Engineer in Charge. Drawings and design prepared by their Consultants shall be used only for the purpose specified in the Contract and all drawings issued shall be returned To Engineer in Charge after completion of works.
9.6 The Contractor shall submit shop and fabrication drawings as required by the Engineer-in-Charge.

9.7 Contractor is not authorize to disclose drawings or any part of drawing and photographs of site without written approval from the Employer.

10 Additional Work
Any additional works, instructed during the Contract Period and within the Contract Amount, will be paid as per Bill of Quantity rates and it shall not be considered as a cause for the Contractor to claim for delay, incurred overhead, mobilization etc.

11 Protection of the Works during Contract Period
It is clearly understood that any damage occurring to the Works (completed or under execution) is the Contractors responsibility and no claims will be entertained by the Employer since the matter shall be covered by the relevant Insurances.

12 Discrepancies in alignment
Discrepancies in alignment and levels etc. noticed during construction and/or on completion shall be rectified (including affected works executed by other Contractors) by the Contractor at his own cost and risk, Engineer in Charge’s approval does not relieve the Contractor of his responsibilities.

13 Temporary Power and Water Supply
All costs, both for power supply and temporary installations and Power and Water required for construction and labour shall be borne by the Contractor.

14 Site Offices of the Contractor
The successful Bidder is to provide and maintain a site office at a location approved by the Engineer in Charge, within 15 days from the date of issue of Notice to Proceed.

15 Site Laboratory of the Contractor for Tests
The successful Bidder is to provide and maintain a well equipped site laboratory at a location approved by the Engineer in Charge, within 15 days from the date of issue of Notice to Proceed.

If the Engineer in Charge instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect all such test/tests shall be carried out by the Contractor at his own cost and shall be deemed to be included in the rates given by Contractor

16 Safety on Site
The Contractor shall ensure full compliance of Safety Code. All measures to ensure safety of workers and plant at site shall be taken by the Contractor. The cost of all safety equipments and the cost of full compliance of provisions given in safety code at site would be deemed to be included in various Items of the Bill of Quantities and Rates.

17 As Built Drawings
The Contractor shall prepare As Built Drawings both in hard copy and in digital format. The drawings shall be prepared for any given section of the work as soon as the work for that particular section is completed. Preparation of As Built Drawings shall keep
pace with the work and shall not be left over towards the end of the project. Three (03) hard copies and one soft copy of all drawings shall be submitted.

No separate payment will be made for the preparation of As-Built Drawings; Cost of preparation of As Built Drawing is deemed to be included in all other priced bill items.

18 Labour

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

The Contractor shall, if required by the Engineer in Charge, deliver to the Engineer in Charge a return in detail, in such form and at such intervals as the Engineer in Charge may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer in Charge may require.

The contractor shall make his/their arrangements for the engagement of all labour, skilled and unskilled. No Contractor shall employ any person who is under the age of 18 years.

The Contractor shall, in respect of labour employed by him, comply with or cause to be complied with the provision of various labour laws and rules as applicable to them from time to time in regard to all matters provided therein and shall indemnify the Employer in respect of all claims that may be made against the Employer for non-compliance thereof by the Contractor.

19 Contractor’s Other Obligations

19.6 All safety training and skill development of Contractor’s workers and operators shall be carried out by the Contractor and all costs related to such training shall be borne by the Contractor as required under statutory law.

19.7 The Contractor shall obtain all necessary approvals/permission from the Relevant Authorities including where necessary securing the presence of the Relevant Authorities or their representative to inspect and supervise the operations in connection with the Contract Works. The Contractor shall bear all costs, fees, charges etc so imposed for the attendance of the Relevant Authorities or their representatives.

19.8 The Contractor shall be responsible for any damage caused by any work carried out by Contractor to the existing services and utilities whether shown or not shown in the drawings from whatsoever cause arising thereof and shall make good to its original condition at his own costs and expense to the satisfaction of the Employer.

19.9 Upon completion of the Contract Works the Contractor shall remove and clear all debris, waste and/or any excess materials, construction plant, and temporary works from the site and shall do all things to clear up the site which shall include any cleaning where instructed by the Employer to other areas affected by the Contract Works. During the Contract period the Contractor shall ensure that the site is kept clean and in proper order and free from rubbish, waste or debris and Contractor shall do all things necessary to prevent any damage to or pollution or the creation of any health or environmental hazard at or around or adjacent to the Site.

19.10 The Contractor shall defend (if requested to), save harmless and indemnify the Employer against all claims, demands, interest, penalties, proceedings, damages,
loss, costs, charges and expenses arising out of or in connection with any failure, neglect or omission, by the Contractor to perform his obligations under the Contract or any damage to property (including the Contract Works) or injury to person (whether resulting in death or not) caused or contributed by the Contractor and/or his servants or agents or independent Contractors appointed by the Employer to carry out works on behalf of Contractor (whether or not such claims, losses and/or damages have been insured by the Employer). In addition, this indemnity shall include all legal costs incurred by the Employer as a consequence of such claim, demand or proceeding being made.

19.11 The Contractor shall, subject to this Contract and other obligations imposed by law, execute the Contract Works and provide all labour, materials, construction equipment and all things necessary and incidental for the Contract Works to the satisfaction of the Employer and/or the Relevant Authorities.

19.12 The contractor shall abide by labour laws. It will get itself registered under the provision of contract labours (Registration and abolition) Act’1970 and it will obtain a separate EPF code number for payment of EPF contribution to Fund. The contractor shall take all necessary precaution against the pollution of drinking water, underground water and for the protection of the environment, tree and vegetation etc.

19.13 The Contractor shall bear all payments and other related costs on his own in connection with the execution and completion of additional, rectification, etc, works due to or caused by any act, default, neglect or omission by the Contractor. This shall also include the employment of consulting Engineer in Charges, professional experts and such other personnel as may be necessary for such works.

19.14 The Contractor acknowledges that he will not have any objection in re-structuring the Contract with respect to material and labour in order to realize the exemptions and benefits granted by the Government whenever required, and he will pass on such benefits to the Employer.

19.15 The Contractor shall indemnify the Employer against all claims in respect of patent rights and any or all other intellectual property rights, and shall defend all actions arising from such claims, and shall himself pay all royalties, license fees, damages, cost of charges of all and every sort that may be legally incurred in respect thereof.

19.16 The Contractor shall never disclose, share, publish, and/or make copies of any drawing, specification, methodology or any other information in any manner given to the Contractor during the Contract or after the completion of the Contract without the written permission of Employer.
G. SAFETY MANUAL

CHAPTER 01

1.0. THE MAIN CONTRACTOR.

1.1. RELATIONSHIP WITH THE CLIENT.

A close relationship and continuous interaction must be maintained with the client by the Construction Manager of the main or managing contractor. The client does have specific safety and health requirements to be observed and co-operation with his contractor, throughout the contract is essential. The prospective main contractors are given information on which to base their tenders and at the Tender Stage; the prospective contractors are expected to understand fully the Scope and Design Intent of these provisions.

1.2. Selection of sub contractors.

Management contractors should select sub or works contractors, using the same criteria of practical safety policy. Again, it must be ensured that the terms of contracts include adequate provision for safe working and for specified safety and health items.

1.3. Planning.

Detailed planning should take the following matters into account

- Know hazardous operations, e.g., use of cranes and site transport, steel erection, excavation and false work, scaffolding, roof work, demolition, asbestos removal, etc.
- Requirement for plant and equipment to ensure safe working, or ease of handling.
- The sequence of work and its phasing between contractors, to minimise the possibility of one contractor placing another contractor’s men at risk. Where appropriate, the segregation of contractors should be considered.
- The need to provide information, instruction and appropriate training, both on general site safety and on hazards specific in the site. The latter could range from restricted zones, permit-to-work systems and lifting operation, to the wearing of safety helmets.
- The need for fire precautions and emergency procedures.
- The need for environmental monitoring and health surveillance.
- Site security and foreseeable risks to the public, including the need for directional and warning signs
- Safe access across the site for persons, vehicles and plant. Thought should be given to arrangements for keeping the site tidy, accommodation for site staff, welfare, first aid and other facilities
- The provision of safe places of work at different stages of the job, including the provision of scaffolding for a number of sub or works contractors.

1.4. Control.

Sub and works contractors should be briefed about the safety policy and site rules of the main contractor at an initial safety meeting. Decisions on all other matters affecting safety and health should be laid down so that the responsibilities of all parties are made clear before contractors start work. Such matters should include:

- Appropriate precautions and work methods for identified hazards or hazardous work.
- Necessary plant and equipment and arrangements for its provision, maintenance use and inspection.
- The question of trade union or other workforce safety representation and the need for a joint safety committee.
- Arrangements for some form of induction training for new-starters on site.
- Arrangements for any specialist training.
- Arrangements for promulgating safety and health information, e.g. on site notice boards.
It is important that such safety and health arrangements are reviewed at the first project meeting, where the site management can set the tone for the conduct of work by resolving, at an early stage, any difficulties which may arise.

1.5 Co-ordination.

The Construction Manager, appointed by the main contractor, must be totally responsible for compliance with health and safety code. He must appoint a Chief Safety Officer and form a Safety Committee along with operatives from sub vendors. This Safety Committee will be Chaired by the Client’s representative and sit twice a week and report to the Project Controller. The Construction Manager must take suitable arrangements to ensure the effective co-ordination of the work of all contractors on site. He should ensure that he is kept informed on a day to day basis, of progress and problems which arise. Clear lines of communication should be set up between each contractor and the Safety Officer of the Main Contractor. Operatives must also know whom to contact over safety and health matters requiring action or a decision. Such effective co-ordination will be enhanced by ensuring that ‘safety and health’ figures prominently on the agenda of regular project meetings. Safety Committee’s weekly report must be submitted to the Project Controller in every Project Meeting.

1.6 Monitoring.

Arrangements must be made for safety and health monitoring of the site on a regular basis. This will include, not only ensuring the safety of such items as scaffolding excavations and plant but also environmental matter such as hazardous dust fume noise etc. In all cases, the Construction Manager should ensure that daily site inspections are carried out, by Safety Officer, more in depth inspections being done periodically by visiting safety advisers. It may be necessary for arrangements to be made for specialist occupational health and hygiene advice. The Check List for daily inspection is given in the following Chapters.

1.7 Records.

The main contractor should ensure that all statutory notifications, examinations and inspections are carried out. Except for plant used exclusively by individual contractors, all records should be kept by the Construction Manager.

1.8 Standards.

The following standards shall be followed, unless more onerous provisions have been specified in the Safety Provisions given in this Code.

IS: 3696 (Part I) - 1966 Safety code for scaffolds and ladders: Part I Scaffolds
IS: 3696 (Part II) - 1966 Safety code for scaffolds and ladders: Part II Ladders
IS: 3764-1966- Safety code for excavation work.
IS: 4082-1977- Recommendations on stacking and storage of construction materials at site (first revision)
IS: 4130-1976- Safety code for demolition of buildings (first revision)
IS: 4912-1978 -Safety requirements for floor and wall openings, railings and toe boards (first revision)
IS: 5121-1969- Safety code for piling and other deep foundations
IS: 7205-1974- Safety code for erection of structural steel work.

1.9 Non Compliance of Safety and Health Provisions:

The Compliance of the Safety and Health provisions are of utmost important to the Client. The prospective contractors must note that the client will take a serious view of any non compliance report of Safety Committee. Based on Safety Committee’s report, the Client has a right to order stoppage of work till rectification is carried out to the satisfaction of the Safety Committee and all stoppages on this account will be at the entire risk, costs and consequences of the Contractor.
## CHAPTER 2.0

### 2.0 CONTRACTOR’S SAFETY INSPECTION CHECKS LIST.

Contractor______________________ Contract No._____________________

Project_________________________________________________________________

Location_______________________________________________________________

Type of Work_____________________________________________________

Date_______________ Checked By _________________________________________

<table>
<thead>
<tr>
<th>Sr</th>
<th>ITEM</th>
<th>STATUS</th>
<th>REMARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>ACCIDENT PREVENTION ORGANISATION.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>Trained First Aid Person</td>
<td></td>
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</tr>
<tr>
<td>3.2</td>
<td>First Aid Kit.</td>
<td></td>
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<tr>
<td>3.3</td>
<td>Safety Material Posted.</td>
<td></td>
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<tr>
<td>3.4</td>
<td>Emergency Phone # Posted.</td>
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<tr>
<td>4.0</td>
<td>HOUSEKEEPING &amp; SANITATION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>General neatness of working areas.</td>
<td></td>
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</tr>
<tr>
<td>4.2</td>
<td>Regular disposal of waste and trash.</td>
<td></td>
<td></td>
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<tr>
<td>4.3</td>
<td>Passageways and walkways clear.</td>
<td></td>
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<tr>
<td>4.4</td>
<td>Adequate lighting</td>
<td></td>
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<tr>
<td>4.5</td>
<td>Projecting nails removed.</td>
<td></td>
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<tr>
<td>4.6</td>
<td>Oil and grease removed.</td>
<td></td>
<td></td>
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<tr>
<td>4.7</td>
<td>Waste containers provided and used.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8</td>
<td>Sanitary facilities adequate and clean.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.9</td>
<td>Drinking water tested and approved.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.10</td>
<td>Adequate supply of water.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.11</td>
<td>Drinking cups, Clean Dispensers.</td>
<td></td>
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<td>5.0</td>
<td>FIRE PREVENTION.</td>
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<tr>
<td>5.1</td>
<td>Fire extinguishers identified, checked, lighted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>Hydrants clear access to public thoroughfare open.</td>
<td></td>
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</tr>
<tr>
<td>5.3</td>
<td>Good housekeeping.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.4</td>
<td>NO SMOKING posted and enforced where needed.</td>
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</tr>
<tr>
<td>6.0</td>
<td>PERSONAL PROTECTION.</td>
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</tr>
<tr>
<td>6.1</td>
<td>Hard-hats</td>
<td></td>
<td></td>
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<tr>
<td>6.2</td>
<td>Noise Level Exposure.</td>
<td></td>
<td></td>
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<td>6.3</td>
<td>Eye Protection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.4</td>
<td>Safety Lines &amp; Belts.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5</td>
<td>Life Jackets.</td>
<td></td>
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<td>7.0</td>
<td>ELECTRICAL INSTALLATION.</td>
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<tr>
<td>7.1</td>
<td>Adequate well insulated wiring.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Fuses &amp; GFI provided.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Fire hazards checked.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>Electrical dangers posted.</td>
<td></td>
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<tr>
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<td>ITEM</td>
<td>STATUS</td>
<td>REMARKS</td>
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<td>8.0</td>
<td><strong>HAND &amp; POWER TOOLS</strong></td>
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<tr>
<td>8.1</td>
<td>Tools and cords in good condition.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td>Proper grounding.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.3</td>
<td>All mechanical safeguards in use.</td>
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<td></td>
</tr>
<tr>
<td>8.4</td>
<td>Tools neatly stored when not in use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.5</td>
<td>Right tool being used for the job at hand.</td>
<td></td>
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<tr>
<td>8.6</td>
<td>Wiring properly installed.</td>
<td></td>
<td></td>
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<tr>
<td>8.7</td>
<td>Enough men used to handle material.</td>
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<td>9.0</td>
<td><strong>LADDERS.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Stock ladders in good condition.</td>
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<td></td>
</tr>
<tr>
<td>9.2</td>
<td>Stock ladders not spliced.</td>
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<td></td>
</tr>
<tr>
<td>9.3</td>
<td>Properly secured, top and bottom.</td>
<td></td>
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</tr>
<tr>
<td>9.4</td>
<td>Side rails on fixed ladders extend above top landing.</td>
<td></td>
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<tr>
<td>9.5</td>
<td>Built-up ladders constructed of sound materials.</td>
<td></td>
<td></td>
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<tr>
<td>9.6</td>
<td>Rungs not over 12 inches on centre.</td>
<td></td>
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<tr>
<td>9.7</td>
<td>Step ladders fully open when in use.</td>
<td></td>
<td></td>
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<tr>
<td>9.8</td>
<td>Metal ladders not used around electrical hazards.</td>
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</tr>
<tr>
<td>9.9</td>
<td>Proper maintenance and storage.</td>
<td></td>
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<tr>
<td>10.0</td>
<td><strong>SCAFFOLDING.</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.1</td>
<td>All structural members adequate for use.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.2</td>
<td>All connections adequate</td>
<td></td>
<td></td>
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<tr>
<td>10.3</td>
<td>Safe tie-in to structure.</td>
<td></td>
<td></td>
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<tr>
<td>10.4</td>
<td>Ladders and working areas free of debris, snow, ice, grease.</td>
<td></td>
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<tr>
<td>10.5</td>
<td>Proper footings provided.</td>
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<tr>
<td>10.6</td>
<td>Passerby protected from falling objects.</td>
<td></td>
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<tr>
<td>10.7</td>
<td>Supports plumb, adequate cross bracing provided.</td>
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<tr>
<td>10.8</td>
<td>Guard rails and toe boards in place.</td>
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<tr>
<td>10.9</td>
<td>Scaffold machines in working order.</td>
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<td></td>
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<tr>
<td>10.10</td>
<td>Ropes and cables in good condition.</td>
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<td>11.0</td>
<td><strong>HOISTS, CRANES &amp; DERRICKS.</strong></td>
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<tr>
<td>11.1</td>
<td>Inspect cables and sheaves.</td>
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<tr>
<td>11.2</td>
<td>Check slings and chains, hooks and eyes.</td>
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<tr>
<td>11.3</td>
<td>Equipment firmly supported.</td>
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<tr>
<td>11.4</td>
<td>Outriggers used if needed.</td>
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<td></td>
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<tr>
<td>11.5</td>
<td>Power lines inactivated, removed, or at safe distance.</td>
<td></td>
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<tr>
<td>11.6</td>
<td>Proper loading for capacity at lifting radius.</td>
<td></td>
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</tr>
<tr>
<td>11.7</td>
<td>All equipment properly lubricated and maintained.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.8</td>
<td>Signalmen where needed.</td>
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<tr>
<td>12.0</td>
<td><strong>MOTOR VEHICLES.</strong></td>
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<tr>
<td>12.1</td>
<td>Brakes, lights, warning devices operative.</td>
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<tr>
<td>12.2</td>
<td>Weight limits and load sizes controlled.</td>
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<tr>
<td>12.3</td>
<td>Personnel carried in safe manner.</td>
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<tr>
<td>13.0</td>
<td><strong>BARRICADES.</strong></td>
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<tr>
<td>13.1</td>
<td>Floor openings planked over or barricaded.</td>
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<tr>
<td>13.2</td>
<td>Roadways and sidewalks effectively protected.</td>
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<tr>
<td>13.3</td>
<td>Adequate lighting provided.</td>
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<tr>
<td>13.4</td>
<td>Traffic controlled.</td>
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<tr>
<td>Sr.</td>
<td>ITEM</td>
<td>STATUS</td>
<td>REMARKS</td>
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<td>-----------------------------------------------</td>
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<tr>
<td>14.0</td>
<td>HANDLING &amp; STORAGE OF MATERIALS.</td>
<td></td>
<td></td>
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<tr>
<td>14.1</td>
<td>Neat storage area, clear passageway.</td>
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<tr>
<td>14.2</td>
<td>Stacks on firm footings, not too high.</td>
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<tr>
<td>14.3</td>
<td>Men picking up loads, correctly.</td>
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<tr>
<td>14.4</td>
<td>Materials protected from heat and moisture.</td>
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<tr>
<td>14.5</td>
<td>Protection against falling into hoppers and bins.</td>
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<tr>
<td>14.6</td>
<td>Dust protection observed.</td>
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<tr>
<td>15.0</td>
<td>EXCAVATION &amp; SHORING.</td>
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</tr>
<tr>
<td>15.1</td>
<td>Shoring of adjacent structures</td>
<td></td>
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</tr>
<tr>
<td>15.2</td>
<td>Shoring and sheathing as needed for soil and depth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.3</td>
<td>Public roads and sidewalks supported and protected.</td>
<td></td>
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<tr>
<td>15.4</td>
<td>Materials not too close to the edge of excavation.</td>
<td></td>
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</tr>
<tr>
<td>15.5</td>
<td>Lighting at night.</td>
<td></td>
<td></td>
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<tr>
<td>15.6</td>
<td>Water controlled.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.7</td>
<td>Equipment at safe distance from edge.</td>
<td></td>
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</tr>
<tr>
<td>16.0</td>
<td>CONCRETE CONSTRUCTION.</td>
<td></td>
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</tr>
<tr>
<td>16.1</td>
<td>Forms properly installed and braced.</td>
<td></td>
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</tr>
<tr>
<td>16.2</td>
<td>Adequate shoring, plumbed and cross braced.</td>
<td></td>
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</tr>
<tr>
<td>16.3</td>
<td>Shoring remains in place until strength is attained.</td>
<td></td>
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</tr>
<tr>
<td>16.4</td>
<td>Proper curing period and procedures.</td>
<td></td>
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<td>16.5</td>
<td>Check heating devices.</td>
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<tr>
<td>16.6</td>
<td>Adequate runways.</td>
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<td></td>
</tr>
<tr>
<td>16.7</td>
<td>Protection from cement dust.</td>
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</tr>
<tr>
<td>16.8</td>
<td>Hard-hats, safety shoes, shirts covering skin.</td>
<td></td>
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</tr>
<tr>
<td>16.9</td>
<td>Nails and stripped form material removed from area.</td>
<td></td>
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<tr>
<td>17.0</td>
<td>MASONRY.</td>
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<tr>
<td>17.1</td>
<td>Proper scaffolding.</td>
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<tr>
<td>17.2</td>
<td>Masonry saws properly equipped, dust protection provided.</td>
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</tr>
<tr>
<td>17.3</td>
<td>Safe hoisting equipment.</td>
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</tbody>
</table>
CHAPTER 3.0

3.0 ACCIDENT PREVENTION ORGANISATION.

3.1 Trained First Aid Person

A contractor shall provide, or ensure that there is provided, such number of suitable persons as is adequate and appropriate in the circumstances for rendering first aid to his employees if they are injured or become ill at work: and for this purpose a person shall not be suitable unless he has undergone -

a) Such training and has such qualifications as the Health and Safety Executive may approve for the time being in respect of that case of the class of case, and

b) Such additional training, if any, as may be appropriate in the circumstances of that case.

In practice, (a) refers to a trained first aider and (b) to an occupational first aider. In addition, a person who holds a current first aid certificate issued by registered medical association or Indian Red Cross Society will be classed as a “Suitable Person” for the purposes of Regulation.

For most sites, the contractor should ensure that at least one first aider is normally present when the number of employees at work is between 50 and 150, there should be at least one additional first aider for every 150 or so should ensure that sufficient first aiders are appointed to provide adequate coverage for each shift. Provisions for medical care must be made available by the contractor for every employee covered by the regulations. In the absence of infirmaries, clinics, or hospitals in proximity to the work site, properly trained and certified first aid personnel must be available, and first aid supplies must be provided by the contractor. Appropriate equipment for transportation of injured personnel to a physician or hospital must be provided for.

3.2 First Aid Kit

Regardless of the number of employees there must be at least one first-aid box on site. Every first aider and occupational first aider should have easy access to first-aid equipment, and provision should be made for every employee to have reasonably rapid access to first aid. Each box should be placed in a clearly identified and readily accessible location, and contain a sufficient quantity of suitable first-aid materials and nothing else. Boxes and kits should be checked frequently to ensure they are fully stocked and all items are in a usable condition. Sufficient quantities of each item should always be available in every first aid box or cabinet.

<table>
<thead>
<tr>
<th>Sr.No</th>
<th>Item</th>
<th>Numbers of Employees</th>
</tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td>1</td>
<td>Guidance Card individually wrapped.</td>
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<tr>
<td>2</td>
<td>Sterile adhesive dressings.</td>
<td>10</td>
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<tr>
<td>3</td>
<td>Sterile eye pads with attachment.</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td>Triangular bandages</td>
<td>1</td>
</tr>
<tr>
<td>5</td>
<td>Sterile coverings for serious wounds (where applicable)</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Safety pins.</td>
<td>6</td>
</tr>
<tr>
<td>7</td>
<td>Medium sized sterile un medicated dressings.</td>
<td>3</td>
</tr>
<tr>
<td>Sr.No</td>
<td>Item</td>
<td>Numbers of Employees.</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------</td>
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</tr>
<tr>
<td>8</td>
<td>Large sterile un medicated dressings</td>
<td>1 2 4 6 10</td>
</tr>
<tr>
<td>9</td>
<td>Extra Large sterile un medicated dressings.</td>
<td>1 2 4 6 8</td>
</tr>
<tr>
<td>10</td>
<td>Sterile water or saline in 300 ml disposable containers, where tap water is unavailable.</td>
<td>1 1 3 6 6</td>
</tr>
</tbody>
</table>

The first-aid box or cupboard should protect the contents from dampness and dust and be clearly marked with a white cross on green background.

### 3.2.1 First-Aid Rooms.

Where there is 250 or more person at work on site, a suitably staffed and equipped first-aid room should be provided. In addition, where there is a large (over 150) number of employees divided into several dispersed working groups, or the location of the site makes access to places of treatment outside it difficult, the contractor should consider whether a centralised first-aid room may be needed.

A first aid room should:

a) Be under the charge of an occupational first aider in most circumstances; names and locations of all first aiders should be displayed.

b) Be readily available and used only for the rendering of first aid

c) Be clearly identified and of sufficient size to allow access for a stretcher, wheelchair, etc. and to hold a couch with space for people to work around it

d) Contain in addition to the previously mentioned first aid materials: a sink with hot and cold running water, drinking water, paper towels, impermeable work surfaces, clean garments for use by first aiders and occupational first aider’s clinical thermometer a couch with pillow and blankets frequently cleaned

e) Be heated, lighted, ventilated and cleaned regularly

f) Be designed so that immediate contact can be made with the person on call, e.g. radio, siren, and a telephone link if feasible. It should be stressed that a sufficient number of first-aid boxes must be provided for any work area which is not within easy reach of the first-aid room.

### 3.3 Emergency Phone # Posted.

The following are the business telephone numbers where project key personnel can be reached at all times. In addition, the emergency telephone numbers of other vital agencies are listed:

<table>
<thead>
<tr>
<th>BUSINESS</th>
<th>RESIDENCE</th>
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</thead>
<tbody>
<tr>
<td>CLIENTS PROJECT CONTROLLER</td>
<td></td>
</tr>
<tr>
<td>CHIEF CONSTRUCTION MANAGER</td>
<td></td>
</tr>
<tr>
<td>SAFETY OFFICER (CONTRACTOR)</td>
<td></td>
</tr>
<tr>
<td>OTHER EMERGENCY TELEPHONE NUMBERS</td>
<td></td>
</tr>
<tr>
<td>FIRE</td>
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</tr>
<tr>
<td>AMBULANCE</td>
<td></td>
</tr>
<tr>
<td>DOCTOR</td>
<td></td>
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<tr>
<td>HOSPITAL</td>
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<tr>
<td>POLICE</td>
<td></td>
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<tr>
<td>GAS COMPANY</td>
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<tr>
<td>ELECTRIC COMPANY</td>
<td></td>
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<tr>
<td>WATER COMPANY</td>
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<tr>
<td>TELEPHONE COMPANY</td>
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<tr>
<td>INSURANCE CARRIER</td>
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</table>
CHAPTER 4.0

4.0 HOUSEKEEPING & SANITATION

At the work site, an adequate supply of potable water must be provided, as well as clean drinking water dispensers. Potable water for cleanup must be provided. Where non potable water is used for industrial or fire fighting purposes it must be identified by appropriate signs.
CHAPTER 5.0

5.0 FIRE PREVENTION.

Electrical wiring equipment for heating, light, or power purposes must be installed in compliance with the requirements. Internal combustion engine-powered equipment must be located with exhausts well away from combustible materials. Smoking is to be prohibited in the vicinity of fire hazards, and such areas must be conspicuously posted. Care shall be taken properly to ground nozzles, hoses, or steam lines used in hazardous tankage or vessels.

In location of temporary buildings and yard storage, appropriate care shall be taken for proper separation to preclude an accumulation of fire potential. The contractor is responsible for maintaining the entire area, but particularly storage areas, free from accumulation of unnecessary combustible materials.

Site Fire Check List

1. Are safe ashtrays provided where smoking is permitted?
2. Are heaters properly guarded?
3. Are wet clothes kept clear of heaters?
4. Are portable heaters secure from being knocked over?
5. Is all temporary wiring well supported and protected?
6. Are any circuit’s overloads?
7. Are all flammable liquids, gas cylinders and flammable materials separately and properly stored?
8. Are all gas appliances fitted with control taps?
9. Is rubbish being “burned in proper fashion”?
10. Is all flame cutting and welding taking place with proper precautions?
11. Are all blowlamps and blowtorches being used correctly?
12. Do all night watchmen and security patrols know the fire routines?

Preventing the spread of fire

1. Is waste accumulating in hoist shafts, under buts, in odd corners?
2. Are separate metal waste containers supplied for each of the following: oily rags, paint rags, paint scrapings, waste flammable liquids, wood shavings and off cuts?
3. Is all waste regularly cleared?
4. Are all huts safely sited?

Means of escape

1. Are all gangways, stairs and platforms free from obstruction?
2. Does everyone know what to do in emergency?
3. Is fire drill practised, and is there a system to ensure that all persons have evacuated the area?

Fire Fighting

1. Have all extinguishers been checked and / or recharged?
   Are they clearly identified and easily accessible? Are operatives trained in their use
CHAPTER 6.0

6.0 PERSONAL PROTECTION.

Workers are often reluctant to use protection equipment. Such items should not only be suitable for their purpose but also be as comfortable as possible and acceptable to the workers concerned. Only then can efforts to ensure that equipment is worn or used prove successful.

All necessary personal safety equipment as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use; and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.

a) Workers employed on mixing asphaltic materials, cement and lime mortars / concrete shall be provided with protective footwear and protective gloves.

b) Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.

c) Those engaged in welding works shall be provided with welder’s protective eye-shields.

d) Stone workers are employed in sewers and manholes, which are in use, the contractor shall ensure that man-holes cover are opened and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.

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

   i) No paint containing lead or lead products shall be used except in the form of paste or ready.
   ii) Suitable face masks shall be supplied for use by 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 workmen and adequate facilities shall be provided to enable working painters to wash during and on cessation of work.
CHAPTER 7.0

7.0 ELECTRICAL INSTALLATION.

Contact of plant with un insulated overhead electric cables (over 200 volts) or electrical
discharge due to plant coming into close proximity.
Electrical short circuit or overload causing explosion or fire resulting in stoppage of plant
involved for more than 24 hours and which might have caused injury.

General Guidelines Electrical

1. Provide earth leakage protection (ELCB of 20mA) on every socket outlet and lighting circuits.
2. Use separate 15 A socket outlets also multi sockets are not to be used.
3. All socket outlets shall be shuttered type.
4. All wiring shall be properly colour coded.
   - Phase - Red / Yellow / Blue
   - Neutral - Black
   - Earth - Green.
5. Wiring shall be done only in rigid metal conduits. PVC and metal flexible are not to be used.
6. Fuses are not to be used. Only circuit breakers to be used.
7. Lighting protection as per IS: 2309 to be provided.
CHAPTER 8.0

8.0 HAND & POWER TOOLS

Hand and power tools must be maintained in a safe condition, whether furnished by the contractor or by the employee. When power-operated tools are designed to accommodate guards, they must be equipped with appropriate guards when in use. Belts, gears, shafts, pulleys, sprockets, spindles, drums, flywheels, chains and other moving parts of equipment must be guarded if the parts are exposed to contact by employees.

All hand-held power tools must be equipped with a constant pressure switch that shuts off when the pressure is released. Electric power-operated tools shall be of the approved double insulated type, or grounded in accordance with good electrical practice. Pneumatic power tools must be secured to the hose or whip by positive means. Safety clips or retainers must be maintained on pneumatic impact (percussion) tools to prevent attachments from being accidentally expelled.

Pneumatically driven nails, staplers, and similar equipment provided with automatic fastener feed that operate at more than 100 psi pressure at the tool must have safety devices on the muzzle to prevent the tool from ejecting fasteners, unless the muzzle is in direct contact with the work surface.

Hoses shall not be used for hoisting or lowering tools, and hoses exceeding ½-in inside diameter must have a safety shutoff at the source of supply to reduce pressure in case of a hose failure.

All fuel-powered tools must be stopped while being refuelled, serviced, or maintained.

Only trained employees may be allowed to operate a powder-actuated tool. Such tools must be tested each day before loading to see that the safety devices are in proper working condition, in accordance with manufacturer’s recommended test procedure. Tools shall not be loaded until just prior to the intended firing time. Neither loaded nor empty tools are to be pointed at any employee, and hands shall be kept clear of the open barrelled end. Fasteners shall not be driven into very hard or brittle materials such as cast iron, glass block, face brick, hardened steel, or hollow tile. For driving into materials that are easily penetrated, appropriate backing must be available to prevent the pin fastener from passing completely through.

All employees using abrasive wheels must use eye protection, and other tools must be operated using appropriate personal safety equipment.
CHAPTER 9.0

9.0 LADDERS

Use of Ladders and Folding Step-Ladders.

- This regulation applies to all ladders and pairs of steps but not roof ladders and crawling boards.
- Ladders must:
  a) Be fixed near the top if practicable, or near the bottom if not; if suspended they must be secure,
  b) Be placed (except when suspended) on a firm level base; they must not stand on loose packing (e.g. bricks),
  c) Be intermediately secured, where necessary, to prevent swaying and sagging, and
  d) Be supported, or suspended, equally on each stile.
- If a ladder, standing on the ground, cannot be fixed to prevent slipping, then someone must hold it at the base when it is being used.
- A ladder which is not more than 3 m in length, need not be fixed or footed, provided it is securely placed so as to prevent it from slipping or falling. This exemption does not apply to ladders which are used as a means of communication between one working place and another, or to suspended ladders.
- Ladder must:
  a) Extend at least 1.05 m above any landing place beyond the highest rung from which a person may be working, or have a nearby handhold of equivalent height.
  b) Be placed so that there is space behind each rung for proper foothold (e.g. no rung should coincide with a scaffold tube).
CHAPTER 10.0

10.0 SCAFFOLDING

Collapse of any scaffold or part of a substantial part of the scaffold falling or overturning; also collapse or part collapse of the suspension arrangements of a slung or suspended scaffold, causing the platform or cradle to fall more than 5m.

10.1. Provision of Scaffolds, ETC.

Scaffolds must be provided for all work which cannot be safely done from the ground or part of the building.

Ladders, properly secured, can be used - but only for light work which can be done with one hand.

10.2. Supervision of Work and Inspection of Material.

Scaffolds must be erected, altered, or dismantled only under competent supervision and, as far as possible, by experienced persons. All scaffolding materials must be inspected before use to check that they are up to standard.

10.3. Construction and Material.

Sufficient sound material must be provided for a scaffold to be strong enough and stable enough for the job.

Wherever timber is used for any kind of scaffolding purpose, it must be of the right type for the job, be free from back and must not be painted so that any defects are hidden.

Scaffold tubes and fittings must not be bent, distorted or unduly rusty.

10.4. Defective Material

- Scaffold tubes, couplers or fittings that are bent unduly rusty or distorted should be rejected.

Timber with dangerous splits and knots should always be rejected.

- Ropes and lashings showing signs of chafing through wear, or of being corroded, should be rejected.

- All scaffold components must be properly stored when not in use and kept separately from all other building materials.

10.5. Maintenance of Scaffolds.

Scaffolding must be kept in good order and every effort made to prevent the accidental displacement of any part.

10.6. Partly Erected or Dismantled Scaffolds.

In any scaffold is either partly erected (or partly dismantled), but nevertheless is still capable of being used to some extent, it must have a bold warning notice fixed, or all access blocked off or barred, at the point beyond which it cannot be safely used.
10.7. Standards or Uprights, Ledgers and Putlogs.

- Scaffold standards should be vertical and spaced closely enough for the intended use of the scaffold.
- Base plates must be used. Timber sole plates should also be used to distribute the load from the standard over a wider area, as well as to offset possible local subsidence.
- Ledgers must be level and fixed to standards with right-angle couplers.
- Putlogs and transoms must be firmly fixed to ledgers or standards.

The flattened end of the putlog must be pushed right into the wall to provide maximum support.

- Putlogs and transoms should be spaced according to the expected load and the thickness of the boards to be used in the platform.

In normal use, putlogs and transoms should be spaced so that the spans of scaffold boards should not be greater than:

- 32 mm boards: 1 m
- 38 mm boards: 1.50 m
- 50 mm boards: 4.60 m

10.8. Ladders used in Scaffolds

- Ladders used as uprights must be:
  a) Strong enough for the load,
  b) Equally supported on each stile, and
  c) Secured to prevent slipping.

- Ladders are only to be used to support a scaffold platform when the work is light, e.g. painting.

10.9. Stability of Scaffolds

- All scaffolds must be:
  a) On a solid, even base; or suspended from a sound structure.
  b) Braced to prevent failure, and
  c) Tied to the building or structure unless specially designed to be completely independent.

- Any building or structure which supports a scaffold must be strong enough to carry the scaffold and its load.
- Mobile scaffolds must:
  a) Be stable, weighted at the base if necessary.
  b) Be used only on a flat, level surface.
  c) Have the wheels locked to prevent movement whilst being used for work, and
  d) Be pushed, or pulled only at the base when being moved.

- Scaffolds must not be built on loose bricks, drain pipes, chimney pots, etc. Bricks or blocks can be used to support a platform no higher than 600 mm from the ground or floor.

10.10. Slung Scaffolds

- a) Be strong enough,
- b) Be properly secured to be overhead anchor-ages and to be platform frame,
- c) Be spaced so as to keep the platform stable,
- d) Be vertical, and
- e) Be kept taut.
No rope other than wire rope may be used for suspension.
· Packing must be used to prevent damage to suspension ropes or chains at any point where sharp or rough - edged protrusions could cause chafing.
· The platform must be secured to prevent swaying whilst in use.

10.11. Cantilever, Jib, Figure and Bracket Scaffolds.

Cantilever or jib scaffolds must be anchored to a structure which is strong enough to carry the total load. Outriggers must be long enough and strong enough and the scaffold must be braced to ensure stability.

Figure or bracket scaffolds supported by dogs or spikes must not be used if there is any danger of these pulling out of the brickwork or stone-work.

10.12. Support for Scaffolds, etc.

No part of the building may be used to support scaffolding unless it is strong enough to do so. Unless gutters have been designed as walkways and are strong enough to bear the weight, they must not be used to support scaffolding or ladders.

10.13. Suspended Scaffolds (Not Power Operated)

· The ropes, winches, blocks and tackle must be strong enough and correctly rigged. A safe anchorage for the suspension must be provided.
· Winches or similar lifting devices must :
  a) Have brakes which apply when the operating lever is released, and
  b) Be protected from the weather, falling dirt, etc.
· Outriggers must :
  a) Be long enough and strong enough,
  b) Be horizontal (light cradles are excepted),
  c) Have stops at their outer ends (light cradles excepted)
  d) Be tied down or properly counterweighted at the tail, and
  e) Be close enough together to support the rails and scaffolds properly.
· Counterweights Must :
  a) Be bolted or securely attached to the outriggers, and
  b) Be at least three times the overturning moment or load.
· Platforms must be hung clear of the building or face of the structure.
· Runways must :
  a) Be strong enough and in good condition,
  b) Have stops at each, and
  c) Be bolted or tied securely to their supports.
· Suspension ropes or chains must :
  a) Be properly secured, both overhead and to the frame of the platform, and
  b) Be kept taut.
· Winches must :
  a) Have at least two full turns of rope on the drum when the platform is in its lowest position, and
b) Be marked with the length of rope on the drum.

- Suspended scaffolds and associated equipment must be maintained in good condition. Platforms must be prevented from tipping or swaying whilst in use.
- Steel wire rope must be used for the suspension of all platforms other than lightweight cradles.

Lightweight cradles may be suspended by fibre ropes and pulley blocks which should not be more than 3.20 m apart. (only ropes recommended by manufacturers for this purpose should be used).

- Platforms of suspended scaffold must:
  a) Be close boarded,
  b) Be at least 430 mm wide on lightweight cradles.
  be at least 600 mm wide on all other types, if used only for workmen, or
  be at least 800 mm wide, if used for workmen and materials, and
  c) Never be used to carry another higher platform.

Platforms should be as close as possible to the face of the building, but where persons sit on the edge of the platform to carry out their work, then the distance between platform and building can be up to 300 mm.

10.14. Boatswain’s Chairs Cages, Skips etc. (Not Power Operated)

- Hand-operated boatswain’s chairs, skips etc. must:
  a) Be well constructed, strong enough, and properly maintained.
  b) Have outriggers strong enough and firmly anchored,
  c) Have chains, ropes and lifting gear firmly secured to the outriggers above and to the chair, skip etc. The construction (lifting operations) regulations apply to the lifting gear,
  d) Be designed so that the occupant cannot fall out,
  e) Carry no loose materials which could interfere with the safety of the occupant,
  f) Have means of preventing spinning and tipping (a swivel connection at the suspension point is strongly advised),
  g) In the case of skips, be at least 910 mm deep, and
  h) Be under the supervision of a competent person during installation and use.

- A boatswain’s chair may only be used as a workplace when the work would not take long enough to make the use of a suspended (or standard) scaffold reasonably practicable.
CHAPTER 11.0

11.0 HOISTS, CRANES & DERRICKS

Safety of Hoist ways, Platforms and Cages.

- Hoist ways must be enclosed wherever access is provided or wherever persons could be struck by the platform or other moving parts. Gates must be fitted in the enclosure at all landing places and must normally be at least 2m high, but gates 910 mm high are acceptable where persons are not at risk of falling down the hoist-way or coming into contact with moving parts. Gates must be kept closed except for the movement of persons and materials; it is the duty of all persons to see that this is done.
- Hoist platforms and cages must be fitted with a device capable of supporting them, fully loaded, should hoists, ropes or driving gear fail.
- Hoists must be fitted with ver-run stops at the top.

Operation of Hoists.

- Hoists must only be capable of being operated from one position at a time, whether by rope, lever or switch. Hoists must not be operated from the cage.
- Where the hoist driver cannot see the platform or cage during its movement, a signalling system, which covers all landing places, must be used.

Safe working Load and Marking of Hoists.

- A) The platform of materials or goods hoists must carry a notice stating (I) the safe working load and (ii) that passengers must not ride on the platform.
- B) The safe working load must not be exceeded except for test purposes.
- B) Cages for passenger’s hoists must carry a notice stating (i) the safe working load and (ii) the number of passengers permitted.

- No greater number of passengers may be carried and the safe working load must not be exceeded except for test purposes.

Cranes & Derricks

Manufacture’s recommendations on operating conditions shall be followed by the contractor. Rated load capacities and recommended operating speeds and special hazard warnings or instructions must be conspicuously posted on all equipment visible to the operator while he is at his control station.

A boom angle indicator and a load-indicating device in good working order must be provided for cranes and derricks. Hand signals to crane and derrick operators shall be those prescribed by the applicable ANSI standards for the type of crane in use. Accessible areas within the swing radius of the rear of the rotating superstructure of a crane must be barricaded to prevent an employee from being struck or crushed by the crane.

In operating boom equipment, careful clearance shall be given to electrical distribution and transmission lines. For lines rated 50 kV or below, minimum clearance is 10 ft, whereas for loads rated over 50 kV, minimum clearance shall be 10 ft + 0.4 in per each kV over 50 - or use twice the length of the line insulator, but never less than 10 ft.
For hammerhead tower cranes, adequate clearance must be maintained between the moving and rotating structures and fixed objects to allow the passage of employees without harm. Employees required to perform duties on the horizontal booms of hammerhead tower cranes must be protected against falling by guard rails or by safety belts and lanyards. Overhead and gantry cranes must have the rated load of the crane plainly marked on each side, and if the crane has more than one hoisting unit, each must have its rated load marked on the load block in marking clearly legible from the ground or floor. All operation must be prescribed in ANSI B30.2, “Safety code for Overhead and Gantry Cranes”

Derricks in use must meet the applicable requirements for design, construction, installation, inspection, testing, maintenance, and operation prescribed in ANSI B30.6, “Safety code for Derricks”
CHAPTER 12.0

12.0 MOTOR VEHICLES

Motor equipment left unattended at night near areas where work is in progress must have appropriate lights, reflectors, or barricades to identify the location of the equipment. A safety tire rack, cage, or equivalent protection must be used when a worker is inflating, mounting, tires installed on split rims or rims equipped with locking rings. Heavy machinery that is suspended or held aloft by the use of slings, hoists, or jacks must be blocked or cribbed to prevent falling or shifting before employees are permitted to work under them. Bulldozer and scraper blades and similar equipment shall be either fully lowered or blocked when being repaired or when not in use. All controls must be in the neutral position and the motor stopped and brakes set, unless work being performed requires otherwise. Parked equipment must be checked and parking brakes set. All cab glass shall be safety glass. All vehicles must have a service brake system, an emergency brake system, and a parking brake system. Vehicles that require additional light shall have at least two headlights, as well as brake lights.

Other standard vehicles equipment such as seat belts, rear-view mirrors, and safety latches on operating levers shall be in accordance with standard vehicle codes, and state-inspected where appropriate.
CHAPTER 13.0

13.0 BARRICADES

i) Contractor shall erect and maintain barricades required in connection with his operation to guard or protect.
   a) Hoisting Areas.
   b) Areas adjudged hazardous by contractor or Client.
   c) Owner’s existing property subject to damage by Contractor’s operations.

ii) Contractor’s employees and those of his subcontractors shall become acquainted with Project Managers barricading practice and shall respect the provisions thereof.

13.1 Guarding of Floor Openings and Floor Holes.

13.1.1 Every temporary floor opening shall have railings, or shall be constantly attended by someone. Every floor hole into which persons can accidentally fall shall be guarded by either:

   a) A railing with toe board on all exposed sides, or
   b) A floor hole cover of adequate strength and it should be hinged in place. When the cover is not in place, the floor hole shall be constantly attended by some one or shall be protected by a removable railing.

13.2 Every stairway floor opening shall be guarded by a railing on all exposed sides, except at entrance to stairway. Every ladder way floor opening or platform shall be guarded by a guard railing with toe board on all exposed sides (except at entrance to opening), with the passage through the railing either provided with a swinging gate or so offset that a person can not walk directly into the opening.

13.3 Guarding of Open-Side Floors and Platform.

Every open-sided floor or platform 120 cm or more above adjacent floor or ground level shall be guarded by a railing (or the equivalent) or all open sides, except where there is entrance to ramp, stair-way, or fixed ladder. The railing shall be provided with a toe board beneath the open sides wherever.

   a) Persons may pass;
   b) There is moving machinery ; or
   c) There is equipment with which falling materials could create a hazard.
CHAPTER 14.0

14.0 HANDLING & STORAGE OF MATERIALS

The contractor shall responsible to receive free issue material and maintain adequate storage space with proper stacking to safeguard against any damage to material. Contractor shall submit weekly receipt/issue to other agency from his stock without any cost to MWCJ/consumed at site with day to day record. Proper reconciliation.

14.1 Cement.

a) Storage and Stacking - Cement shall be stored at the work site in a building or a shed which is dry, leak proof and as moisture-proof as possible. The building or shed for storage should have minimum number of windows and close fitting doors and these should be kept closed as far as possible.

Cement received in bags shall be kept in such a way that the bags are kept free from the possibility of any dampness or moisture coming in contact with them. Cement bags shall be stacked off the floor on wooden planks in such a way as to keep them 150 to 200 mm clear from the floor and space of 450 mm minimum shall be left all-round between the exterior walls and the stacks. In the stacks the cement bags shall be kept close together to reduce circulation of air as much as possible. Owing to pressure on bottom layer of bags sometimes ‘warehouse pack’ is developed in these bags. This can be removed easily by rolling the bags when cement is taken out for use.

The height of stack shall not be more than 15 bags to prevent the possibility of lumping up under pressure. The width of the stack shall be not more than four bags length or 3 metres. In stacks more than 8 bags high, the cement bags shall be arranged alternately lengthwise and crosswise so as to tie the stacks together and minimise the danger of toppling over.

For extra safety during monsoon, or when it is expected to store for an unusually long period, the stack shall be completely enclosed by a waterproofing membrane such as polyethylene, which shall close on the top of the stack. Care shall be taken to see that the waterproofing membrane is not damaged any time during the use.

Drums or other heavy containers of cement shall not be stacked more than two layers high.

The manner of storage shall facilitate the requirement that lots of cement received are removed and used more or less in the order in which they are received.

b) HANDLING - Hooks shall not be used for handling cement bags unless specifically permitted by the engineer-in-charge.

14.2 Polyethylene Pipes.

a) Storage & Stacking - Black polyethylene pipes may be stored either under cover or in the open. Natural polyethylene pipes, however, should be stored under cover and protected from direct sunlight.

Coils may be stored either on edge or stacked flat one on top of the other, but in either case they should not be allowed to come into contact with hot water or steam pipes and should be kept away from hot surface.

Straight lengths should be stored on horizontal racks giving continuous support to prevent the pipe taking on a permanent set.

Storage of pipes in heated areas exceeding 27°C should be avoided.
b) Handling - Removal of pipe from a pile shall be accomplished by working from the ends of the pipe.

14.3. **Pipes of Conducting Materials.**

a) Storage and Stacking - Pipes shall be stacked on solid level sills and contained in a manner to prevent spreading or rolling of the pipe. Where quantity storage is necessary, suitable packing shall be placed between succeeding layers to reduce the pressure and resulting spreading of the pile.

In stacking and handling of pipes and other conducting materials, the following minimum safety distances shall be ensured from the overhead power lines:

- 11 kV and below: 40m
- Above 11 and below 33 kV: 60 m
- Above 33 and below 132 kV: 70 m
- Above 132 and below 275 kV: 70 m
- Above 275 and below 400 kV: 50 m

b) Handling - Removal of pipes from a pile shall be accomplished by working from the ends of the pipe. During transportation, the pipes shall be so secured as to insure against displacement.

14.4 **Paints Varnishes and Thinners.**

a) Storage and Stacking - Paints, varnishes, lacquers, thinners and other flammable materials shall be kept in properly sealed or closed containers. The containers shall be kept in a well ventilated location, free from excessive heat, smoke, sparks or flame. The floor of the paint stores shall be made up of 10 cm thick loose sand.

Paint materials in quantities other than required for daily use shall be kept stocked under regular storage place.

Where the paint is likely to deteriorate with age, the manner of storage shall facilitate removal and use of lots in the same order in which they are received.

Temporary electrical wiring / fittings shall not be installed in the paint store. When electric lights, switches or electrical equipment are necessary, they shall be of explosion proof design.

b) Handling - Ventilation shall be adequate to prevent the accumulation of flammable vapours to hazardous levels of concentration shall be provided in all areas where painting is done.

When painting is done in confined spaces where flammable or explosive vapours may develop, any necessary heat shall be provided through duct work remote from the source of flame.

Sources of ignition, such as open flame and exposed heating elements, shall not be permitted in area or rooms where spray painting is done nor shall smoking be allowed there.

Care should be taken not to use any naked flame inside the paint store. Buckets containing sand shall be kept ready for use in case of fire. Fire extinguishers when required shall be of foam type conforming to accepted standards.

Each workman handling lead based paints shall be issued 1/2 litre milk per day for his personal consumption.
14.5. Bitumen, Road Tar, Asphalt, etc.

a) Storage and Stacking - Drums or containers containing all types of bitumen, road tar, asphalt, etc. shall be stacked vertically on their bottoms in up to 3 tiers. Leaky drums shall be segregated. Empty drums shall be stored in pyramidal midal stacks neatly in rows.

b) Handling Bitumen / Tar - Bitumen / tar shall not be heated beyond the temperature recommended by the manufacturer of the product. While discharging heated binder from the boiler, workers shall not stand opposite to the jet so as to avoid the possibility of hot binder falling on them. The container shall be handled only after closing the control valve. While handling hot bitumen / tar, workers shall exercise scrupulous care to prevent accidental spillage thereof. The buckets and cans in which the hot material is carried from boiler shall be checked before use to ensure that they are intact and safe. Mops and other applicators contaminated with bituminous materials shall not be stored inside buildings.


a) Storage and Stacking - Bituminous roofing felts shall be stored away from other combustible flammable materials. For long storage it shall be kept under shade.

b) Handling - Bituminous roofing felts should be handled in a manner to prevent cracking and other damages.

14.7. Flammable Materials.

a) Storage and Stacking - In addition the following provisions shall also apply:

1) Outdoor storage of drums requires some care to avoid contamination because moisture and dirt in hydraulic brake and transmission fluid, gasoline, or lubricants may cause malfunction of failure of equipment, with possible danger to personnel. The storage area should be free of accumulations of spilled products, debris and other hazards.

2) Compressed gases and petroleum products shall not be stored in the same building or close to each other.

b) Handling - Petroleum products delivered to the job site and stored there in drums shall be protected during handling to prevent loss of identification through damage to drum markings, tags, etc. Unidentifiable petroleum products may result in improper use, with possible fire hazard, damage to equipment or operating failure.

Workmen shall be required to guard carefully against any part of their clothing becoming contaminated with flammable fluids. They shall not be allowed to continue work when their clothing becomes so contaminated.
CHAPTER 15.0

15.0 EXCAVATION & SHORING

Excavation and Trenching: All trenches, 1.5 meters or more in depth, shall at all times be supplied with at least one ladder for each 30 meters in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 meter above surface of the ground. Sides of a trench which is 1.5 meters 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. Excavated material shall not be placed within 1.5 meters of edge of trench or half of depth of trench, whichever is more cutting undermining or undercutting be done.
CHAPTER 16.0

16.0 CONCRETE CONSTRUCTION

16.1. Handling of Plant.

16.1.1. Mixers - All gears, chains and rollers of mixers shall be properly guarded. If the mixer has a charging skip the operator shall ensure that the workmen are out of danger before the skip is lowered. Railings shall be provided on the ground to prevent anyone walking under the skip while it is being lowered.

16.1.2. All cables, clamps, hooks, wire ropes, gears and clutches, etc, of the mixer, shall be checked and cleaned, oiled and greased, and serviced once a week. A trial run of the mixer shall be made and defects shall be removed before operating a mixer.

16.1.3. When workmen are cleaning the inside of the drums, and operating power of the mixer shall be locked in the off position and all fuses shall be removed and a suitable notice hung at the place.

16.2. Trucks.

When trucks are being used on the site, traffic problems shall be taken care of. A reasonably smooth traffic surface shall be provided. If practicable, a loop road shall be provided to permit continuous operation of vehicles and to eliminate their backing. If a continuous loop is not possible, a turnout shall be provided. Backing operations shall be controlled by a signalman positioned so as to have a clear view of the area behind the truck and to be clearly visible to the truck driver. Movement of workmen and plant shall be routed to avoid crossing, as much as possible, the truck lanes.

16.3. Formwork.

16.3.1. Formwork shall be designed after taking into consideration spans, setting temperature of concrete, dead load and working load to be supported and safety factor for the materials used for formwork.

16.3.2. All timber formwork shall be carefully inspected before use and members having cracks and excessive knots shall be discarded.

16.3.3. The vertical supports shall be adequately braced or otherwise secured in position that these do not fall when the load gets released or the supports are accidentally hit.

16.3.4. Tubular steel centering shall be used in accordance with the manufacturer’s instructions. When tubular steel and timber centering is to be used in combination necessary precautions shall be taken to avoid any unequal settlement under load.

16.3.5. All centering shall be finally, inspected to ensure that:

a) Footings or sills under every post of the centering are sound.

b) All lower adjustment screws or wedges are snug against the legs of the panels.

c) All upper adjustment screws or heads of jacks are in full contact with the formwork.

d) Panels are plumb in both directions.

e) All cross braces are in place and locking devices are in closed and secure position.

f) In case of CHHAJAS and balconies, the props shall be adequate to transfer the load to the supporting point.

16.4. Ramps and Gangways.

16.4.1. Ramps and gangways shall be of adequate strength and evenly supported. They shall either have a sufficiently flat slope or shall have cleats fixed to the surface to prevent slipping of workmen.
Ramps and gangways shall be kept free from grease, mud, snow or other slipping hazards or other obstructions leading to tripping and accidental fall of a workman.

16.4.2. Ramps and gangways meant for transporting materials shall have even surface and be of sufficient width and provided with skirt boards on open sides.

16.5. **Prestressed Concrete.**

16.5.1. In pre-stressing operations, operating, maintenance and replacement instructions of the supplier of the equipment shall be strictly adhered to.

16.5.2. Necessary shields should be put up immediately behind the prestressing jacks during stressing operations.

16.5.3. Wedges and other temporary anchoring devices shall be inspected before use.

16.5.4. The prestressing jacks shall be periodically examined for wear and tear.

16.6. **Erection of Prefabricated Members.**

16.6.1. A spreader beam shall be used wherever possible so that the cable can be as perpendicular to the members being lifted as practical. The angle between the cable and the members to be lifted shall not be less than 60°.

16.6.2. Methods of assembly and erection specified by the designer shall be strictly adhered to at site. Immediately on erecting any unit in position, temporary connections or supports as specified shall be provided before releasing the lifting equipment. The permanent structural connections shall be established at the earliest opportunity.

16.7. **Heated Concrete.**

When heaters are being used to heat aggregates and other materials and to maintain proper curing temperatures, the heaters shall be frequently checked for functioning and precautions shall be taken to avoid hazards in using coal, liquid, gas or any other fuel.
CHAPTER 17.0

17.0 MASONRY

17.1. Walls.

17.1.1. General - Depending on the type of wall to be constructed the height of construction per day shall be restricted to ensure that the newly constructed wall does not come down due to lack of strength in the lower layers. Similarly, in long walls adequate expansion / crumple joints shall be provided to ensure safety.

17.2. Opening in Walls - Whenever making of an opening in the existing wall is contemplated, adequate supports against the collapse or cracking of the wall portion above or roof or adjoining walls shall be provided.

17.2.1. Guarding of Wall Openings and Holes - Wall opening barriers and screens shall be of such construction and mounting that they are capable of withstanding the intended loads safely. For detailed information reference may be made to good practice. Every wall opening from which there is a drop of more than 120 mm shall be guarded by one of the following:

a) Rail, Roller, Picket Fence, Half Door or Equivalent Barrier - The guard may be removable but should preferably be hinged or otherwise mounted so as to be conveniently replaceable. Where there is danger to persons working or passing below on account of the falling materials, a removable toe board or the equivalent shall also be provided. When the opening is not in use for handling materials, the guards shall be kept in position regardless of a door on the opening. In addition, a grab handle shall be provided on each side of the opening. The opening should have a sill that projects above the floor level at least 2.5 cm.

b) Extension platform into which materials may be hoisted for handling shall be of full length of the opening and shall have side rails or equivalent guards.

17.2.2. Every chute wall opening from which there is a drop of more than 120 mm shall be guarded by one or more of the barriers specified in 17.2.1. or as required by the conditions.
CHAPTER 18.0

18.0 HEALTH STANDARDS

18.1 DRINKING WATER

a) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

b) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

c) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or any other source of pollution.

18.2 WASHING FACILITIES

a) In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.

b) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

c) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

18.3 LATRINES AND URINALS

a) Latrines shall be provided in every work place on the following scale namely:-

i) Where female are employed there shall be at least one latrine for every 25 females.

ii) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be upto first 100, and one for every 50 thereafter.

b) Every latrine shall be under cover and so partitioned off as to secure privacy and shall have proper door and fastenings.

c) Construction of latrines: The inside walls shall be constructed of masonry or some suitable heat-resisting non-absorbent materials and shall be cement washed inside and outside at least once a year, latrines shall not be of standard lower than borehole system.

d) i) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women only" as the case may be.

ii) The notice shall also bear the figure of man or woman, as the case may be.

e) There shall be at least one urinal for male workers upto 50 and for female workers upto 50 employed at a time, provided that where the number of male or female workers, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females upto the first 500 and one for every 100 or part thereafter.

f) i) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

ii) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of Public Health Authorities.

g) Water shall be provided by means of tap or otherwise so as to conveniently accessible in or near the latrines and urinals.

h) Disposal of excreta: Unless otherwise arranged by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn to manure).
i) The contractor shall at his own expense, carry out all instructions issued to him by the Engineer-in-charge to effect proper disposal of night soil and other conservancy work in respect of the contractor’s workmen or employees of the site. The contractor shall be responsible for payment of any charges which may be levied by the municipal or cantonment authority for execution of such on behalf.

18.4 PROVISION OF SHELTER DURING REST

At every place there shall be provided, free of cost, four suitable sheds, two for meals and other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3m from the floor level to the lowest part of the shed roof. These shall be kept clean and the space provided shall be on the basis of 0.6sq.m per head.

Provided that the Engineer-in-charge may permit subject to his satisfaction, a portion of building under construction or other alternative accommodation to be used for the purpose.

18.5 CRÊCHES

I) At every work place, at which 20 or more women workers are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under at the age of six years. One room shall be used as a play room for the children and the other as their bedroom.

ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.

iii) The contractor shall supply adequate number of toys and games in playroom and sufficient number of cots and bedding in the bed room.

iv) The contractor shall provide one aya to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceeds 50.

v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

18.6 CANTEENS

I) In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering 100 or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such labour.

ii) The canteen shall be maintained by the contractor in an efficient manner.

iii) The canteen shall consist of at least a dining hall, kitchen, storeroom, pantry and washing places separately for workers and utensils.

iv) The canteen shall be sufficiently at all times when any person has access to it.

v) The floor shall be made of smooth and impervious materials and inside walls shall be lime washed or colour washed at least once a year. The inside walls of the kitchen shall be lime washed every four months.

vi) The premises of the canteen shall be maintained in a clean and sanitary condition.

vii) Suitable arrangements shall be made for the collection of disposal of garbage.

viii) Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause nuisance.

ix) The dining hall shall accommodate at a time 30 percent of the contract labour working at a time.

x) The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one sq.m per diner to be accommodated as prescribed in sub-rule (ix).

xi) a) 1. There shall be provided and maintained sufficient utensils crockery, furniture and any other equipment necessary for efficient running of canteen.

2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.

b) 1. Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.
2. A service counter, if provided, shall have top of smooth and impervious material.
3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment.

xii) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number.

xiii) Sufficient tables stools or benches shall be available for the number of diners to be accommodated as prescribed in sub rule (ix).

xiv) The food stuff and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.

xv) The charges for food stuffs, beverages and other items served in the canteen shall be based on “No profit No loss” and shall be conspicuously displayed in the canteen.

xvi) In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely:
   a) The rent of land and building.
   b) The depreciation and maintenance charges for the building and equipment provided for the canteen.
   c) The purchase, repairs and replacement of equipment including furniture, crockery, cutlery and utensils.
   d) The water charges and other charges incurred for lighting and ventilation.
   e) The interest and amounts spent on the provision and maintenance of equipment provided for the canteen.

xvii) The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

18.7 ANTI-MALARIAL PRECAUTIONS

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by Engineer-in-charge including the filling up of any borrow pits which may have been dug by him.
CHAPTER 19.0

19.0 RECORD OF FIRST AID TREATMENT.

Project Data:______________________________________________________________

Project:
Location:

Injured Data:

Name:
Employer:
Employer’s Supervisor:

Injury Data:

Date:
Time:
Description of Injury:

First Aid Treatment:

Treatment administered by:
Type of treatment administered:
Referred for Medical Treatment:

_______No

_______Yes.

Doctor_____________________________
Hospital ___________________________

Report Prepared By: Date: 

Treatment Received By: Date:
CHAPTER 20.0

20.0 DAMAGE REPORT FORM

Contract_______________________________________________________________

Plant and equipment affected.____________________________________________

Serial numbers or identifying marks ________________________

Owner of plant or equipment ____________________________________________

Place, date and time of incident __________________________________________

Circumstances of incident ______________________________________________

_____________________________________________________________________

_____________________________________________________________________

_____________________________________________________________________

Details of damage ____________________________

_____________________________________________________________________

Names of operators involved (if not Company employers, also give details of such contractors concerned)__________________________________________________

___________________________________________________________________

Were normal working methods used ? _____________________________________

Contributory causes of incident __________________________________________

_____________________________________________________________________

Names of witness ______________________________________________________

(attach statements)______________________________________________________

Preventative action proposed or taken _________________________________

Signature of Site Agent or Manager ________________________________

Date _______________________.
CHAPTER 21.0

21.0 PERSONNEL ACCIDENT REPORT FORM.

Division / Dept (if applicable) ________________________________
Contractor ________________________________
Full name and address of injured person (IP) ________________________________

______________________________
Occupation of IP ________________________________Age of IP _______________
Employed (state if self - employed or under training) ________________________________
Trade of sub contractor (where applicable) ________________________________

Particulars of accident:
Date and time of accident _________________________________________________
Exact place where accident happened. ________________________________________________
What was IP doing at time of accident? ________________________________________________
Did IP cease work? ________________________________________________
First air or hospital treatment. ________________________________________________
Time lost (state of IP is still off work) ________________________________________________
Brief description of accident, giving dimensions where applicable ________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
____________________________________________________________________
Details of tools, equipment plant or machinery. ________________________________________________
What protective clothing / equipment was being worn / used by IP? ________________________________
Nature of injury and part of the body injured. e.g. punctured foot, hand, broken leg. ______
____________________________________________________________________
Contributory factors:
Unsafe system of work YES/NO ________________________________________________
Lack of training, supervision etc. YES/NO ________________________________
Environmental Conditions (wind, rain, ice, etc.) YES/NO ________________________________
State of equipment (faulty brakes, damaged lifting gear, etc.) YES/NO ____________
Housekeeping (untidy access, nails in timber, etc) YES/NO ______________________
Other __________________________________________________________________
Delete as appropriate and give details.
______________________________________________________________________

Names and address of witness ____________________________________________
______________________________________________________________________
If reportable:
Date and time Safety Officer informed by Telephone _________________________
Preventative action taken or proposed________________________________________
Signature of Site Agent or Manager _________________________________________

Date ______________
SECTION 4:
FORMS OF SECURITIES
Forms of Securities

Acceptable forms of securities are annexed. Bidders should not complete the Performance and Advance Payment Security forms at this time. Only the successful Bidder will be required to provide Performance and Advance Payment Securities in accordance with one of the forms, or in a similar form acceptable to the Employer.

Annex A: Performance Bank Guarantee
Annex B: Bank Guarantee for Advance Payment
ANNEXURE –A

PERFORMANCE GUARANTEE

This Guarantee of guarantee (hereinafter referred to as “Guarantee”) made this date ...................... by Bank (Bank Name).........................................................., a scheduled bank with its head office at (address)................................., (hereinafter referred to as the “Bank”) of the first part in favour of M/s. Mahindra World City (Jaipur) Limited, a company incorporated under Companies Act, 1956 and having its office at 411, Neelkanth Towers, BS Road, C-Scheme, Jaipur. (hereinafter referred to as “Employer” which expression shall, unless repugnant to the meaning and context here to, include its affiliates, successors and assigns) of the other part.

WHEREAS:
A. M/s. Mahindra World City (Jaipur) Limited is developing a special economic zone at Jaipur called “Mahindra World City, Jaipur” (hereinafter referred to as “SEZ”);
B. On the assurance of M/s ----------------------- having its office at ------ (hereinafter referred to “Contractor”) that they are having the necessary infrastructure and capacity to undertake construction of -------------- package at the SEZ to the quality, specifications and time frame as per the terms and conditions stipulated by MWCJ, MWCJ and Contractor have entered into a contract ref: MWCJL/IT ITES/____________________ dated ___ day ___ Month ___ Year (hereinafter referred to as “Contract” which expression shall include any agreed amendments or modifications thereto) to execute the work within the SEZ in accordance with the terms and conditions of such Contract;
C. Contractor has, by its acceptance to enter into the Contract with MWCJ has agreed to furnish a bank guarantee to MWCJ to ensure timely and satisfactory performance and completion of the work as per terms of the Contract;
D. The Bank has, at the request of the Contractor, agreed to grant in favour of MWCJ, a guarantee to secure performance by Contractor of its obligations under the said works contract.

NOW THIS GUARANTEE WITNESSES AS FOLLOWS:

1. The Bank hereby unconditionally, unequivocally and irrevocably guarantee to MWCJ and agrees and undertakes that if in the sole and unfettered opinion of MWCJ, Contractor has failed to perform its obligations under the said Contract and any amendments or modifications thereto, the Bank shall upon demand of MWCJ forthwith pay to MWCJ, without demur, contestation or dispute, without reference to Contractor, the amount set forth in certificate by MWCJ as the amount of loss / claim / damage / cost / expense arising or likely to arise out of breach or non fulfilment of the said Contract. Any such certificate or demand by MWCJ on the Bank, shall be conclusive as regards the amount due and payable by the Bank to MWCJ under this Guarantee, notwithstanding any dispute between Contractor and MWCJ as to the liability for or quantum of loss / damage / claim / costs / expenses and notwithstanding any notice by Contractor to the Bank withhold or not to pay any amount to MWCJ against this Guarantee either before or after invoking of this Guarantee by MWCJ Provided always the total liability of the Bank hereunder shall be limited to Rs. (............................) (Rupees..............................................................).
2. This Guarantee of the Bank shall be effective immediately from the date hereof and shall be in force for till a certificate is issued by MWCJ to the Bank in accordance with Clause 4 of this Guarantee or the claim expiry date of this guarantee whichever is earlier. If a demand is served, before the claim expiry date, this Guarantee shall continue in full force and effect (notwithstanding the validity date) in respect of the amount so demanded until the obligation of the Bank in respect hereof is finally determined and the payment made to MWCJ.

3. The Bank agrees that MWCJ has the fullest liberty, without affecting in any manner the Bank’s obligations hereunder, to vary any of the terms and conditions of the said Contract, to extend the time of performance by the Contractor from time to time and to forbear from enforcing any of the terms of the said Contract without any notice to or the consent of the Bank and the Bank shall not be released from its liability under this Guarantee by reason of any such variation or extension or forbearance being granted to Contractor. The Bank agrees that MWCJ has no obligation whatsoever to exercise its rights against collateral, if any, of Contractor but may immediately call on this Guarantee.

4. This Guarantee herein contained shall remain in valid and effect till MWCJ certify that the terms and conditions of the said Contract have been fully and properly carried out and that the Contractor has fulfilled all its obligations under the Contract and that MWCJ has no claim against the Contractor on any account against the said Contract or the expiry date whichever is earlier.

5. Only neglect or forbearance, on the part of MWCJ, in the enforcement of the payment of any money, the payment whereof is intended to be hereby secured or the giving of the time for the payment hereto shall in no way relieve the Bank of their liability under this Guarantee.

6. The Bank shall not revoke this Guarantee during its currency except with the previous consent in writing of MWCJ.

7. Any notice or communication under this Guarantee shall be in writing and shall be served on the Bank at its address first hereinbefore mentioned and to MWCJ at its address first hereinbefore mentioned. Either party may notify to the other in writing any change in such address for service of notice upon it. The notices shall be served personally against acknowledgement or by Registered Post.

8. This Guarantee shall not be affected by any change in the constitution of the Bank or of Contractor or of MWCJ.

9. This Guarantee shall be governed by the applicable laws of India.

10. The expression “The Bank” and the Contractor hereinbefore used shall include their respective successors and permitted assigns.

Notwithstanding anything contained hereinabove in the Bank Guarantee.

1- Our liability under this Bank Guarantee shall not exceed Rs. __________/-

2- This Bank Guarantee shall be valid up to __________

3- We shall be liable to pay any amount under this Bank Guarantee or part thereof only if we received (if your serve upon us) a written claim or demand under this Guarantee up to __________ at ________ Bank Ltd., _________(Address)
ANNEXURE – XXXX

DRAFT FOR ADVANCE BANK GUARANTEE

Bank Guarantee Bond (RE: Mobilization Advance)

This Bond (hereinafter referred to as “Guarantee”) made this (date)...................... by Bank (Bank Name).......................................................... a scheduled bank with its head office at (address)........................................... (hereinafter referred to as the “Guarantor”) of the first part in favour of M/s. Mahindra World City (Jaipur) Limited, a company incorporated under Companies Act, 1956 and having its office at 411, Neelkanth Towers, 1, Bhawani Singh Marg, C-Scheme, Jaipur. (hereinafter referred to as “Employer” which expression shall, unless repugnant to the meaning and context here to, include its affiliates, successors and assigns) of the other part.

WHEREAS:

A. M/s. Mahindra World City (Jaipur) Limited is developing a special economic zone at Jaipur called “Mahindra World City, Jaipur” (hereinafter referred to as “SEZ”);

B. On the assurance of M/s ........................................ having its registered office at ------- (hereinafter referred to “Contractor”) that they are having the necessary infrastructure and capacity to undertake construction of ---------------- package at the SEZ to the quality, specifications and time frame as per the terms and conditions stipulated by EMPLOYER, EMPLOYER and Contractor have entered into a contract Ref. No. __________________ dated __________ (hereinafter referred to as “Contract” which expression shall include any agreed amendments or modifications thereto) to execute the work__________________ (work specification) within the SEZ in accordance with the terms and conditions of such Contract;

C. And whereas Employer has agreed to pay the said Contractor a sum of Rs._______ (Rupees ______________________) as Mobilisation Advance as per terms and conditions of the above said Contract, which is to be recovered from each running bill amount payable to the contractor so that the advance is recovered by the time 80% of the work is completed by the contractor upon the condition that the said Contractor shall submit in favour of your company and an unconditional and irrevocable Bank Guarantee for an equal amount valid till completion period i.e __________.(Date)

D. The said Contractor has agreed to refund to the Company the balance un-recovered sum in the event of the said Contract Agreement being terminated or coming to an end for whatsoever reason,

E. We the Guarantor, at the request of the Contractor, agreed to Guarantee in favour of EMPLOYER, a guarantee to advance payment made by EMPLOYER to the Contractor.

NOW THIS GUARANTEE WITNESSES AS FOLLOWS:

1. The Bank hereby unconditionally, unequivocally and irrevocably guarantee to EMPLOYER and agrees and undertakes that if in the sole and unfettered opinion of
EMPLOYER, Contractor has failed to pay the amount equivalent to Rs. _______—given as advance by EMPLOYER to the Contractor (hereinafter referred to as “Advance”) with in the time stipulated in the Contract, the Bank shall upon demand of EMPLOYER forthwith pay to EMPLOYER, without demur, contestation or dispute, without reference to Contractor, amount equivalent to Advance. Any such certificate or demand by EMPLOYER on the Bank, shall be conclusive as regards the amount due and payable by the Bank to EMPLOYER under this Guarantee, notwithstanding any dispute between Contractor and EMPLOYER as to the liability for or quantum of loss / damage / claim / costs / expenses and notwithstanding any notice by Contractor to the Bank withhold or not to pay any amount to EMPLOYER against this Guarantee either before or after invoking of this Guarantee by EMPLOYER. Provided always the total liability of the Bank hereunder shall be limited to Rs. (________________________) (Rupees..........................................................).

2. This Guarantee of the Bank shall be effective immediately from the date hereof and shall be in force for till a certificate is issued by EMPLOYER to the Bank in accordance with Clause 5 of this Guarantee unless a claim or demand in writing is served upon the Bank by EMPLOYER. If a demand is so served, this Guarantee shall continue in full force and effect (notwithstanding the expiration date) in respect of the amount so demanded until the obligation of the Bank in respect hereof is finally determined and the payment made to EMPLOYER.

3. The Bank agrees that EMPLOYER has the fullest liberty, without affecting in any manner the Bank’s obligations hereunder, to vary any of the terms and conditions of the said Contract, to extend the time of performance by the Contractor from time to time and to forbear from enforcing any of the terms of the said Contract without any notice to or the consent of the Bank and the Bank shall not be released from its liability under this Guarantee by reason of any such variation or extension or forbearance being granted to Contractor. The Bank agrees that EMPLOYER has no obligation whatsoever to exercise its rights against collateral, if any, of Contractor but may immediately call on this Guarantee.

4. The Bank agrees that EMPLOYER has the fullest liberty, without affecting in any manner the Bank’s obligation hereunder, to assign this guarantee in favour of any EMPLOYER affiliate company in India without the consent of but with prior intimation to, the Bank, and the Bank shall not be released from its liability under this Guarantee by reason of any such assignment. The Bank shall forthwith, on receipt of such intimation; undertake necessary endorsements or amendments hereto to incorporate the assignment in favour of such EMPLOYER affiliate assignee.

5. This Guarantee herein contained shall remain in force and effect till EMPLOYER certify that the Contractor has dully paid the Advance back to EMPLOYER. The Bank shall be released of its liabilities and obligations under this Guarantee only after such a certificate as aforesaid is issued by EMPLOYER to the Bank.

i) The Bank shall not revoke this Guarantee during its currency except with the previous consent in writing of EMPLOYER.

ii) Only neglect or forbearance, on the part of EMPLOYER, in the enforcement of the payment of any money, the payment whereof is intended to be hereby secured or the giving of the time for the payment hereto shall in no way relieve the Bank of their liability under this Guarantee.
6. Any notice or communication under this Guarantee shall be in writing and shall be served on the Bank at its address first hereinbefore mentioned and to EMPLOYER at its address first hereinbefore mentioned. Either party may notify to the other in writing any change in such address for service of notice upon it. The notices shall be served personally against acknowledgement or by Registered Post / Fax / Telex.

7. The Bank hereby agrees that their liability hereunder shall not be discharged or released or altered or impaired in any manner by any change in the constitution, structure or our Bank or by merger or amalgamation by our Bank with any other Bank, Company, Corporation or Body.

8. The Bank hereby agrees that their liability hereunder shall not be discharged or released or altered or impaired in any manner by any change in the constitution, structure or powers of the said, Contractor or of the Employer.

9. This Guarantee shall be governed by the applicable laws of India.

10. The expression “The Bank” and the Contractor hereinbefore used shall include their respective successors and permitted assigns.

Notwithstanding anything contained herein

We the Bank ___________ (Name) ___________________________ (Address) ___________ hereby irrevocably and unconditionally undertake to pay your company, by Banker’s Cheque / Demand Draft favouring Mahindra World City (Jaipur) Ltd., payable at Jaipur on First Demand without protest or demur or proof or condition any and all amount demanded by your Company in writing, with reference to the guarantee and that the liability of the __________ (Bank Name) under this guarantee is restricted to Rs. _____________ (amount in figures) ______________ (Amount in words). Our guarantee shall remain in force until _______ (date) Unless a claim in writing is presented to us during the validity period of this Guarantee and / or during a further grace period of ________ (extended period) thereafter upon expiry of the said validity.

11. IN WITNESS WHEREOF………………………………………. FOR AND ON BEHALF OF THE BANK HAS SIGNED THIS GUARANTEE ON THE DAY AND THE YEAR FIRST ABOVE WRITTEN.

12. ( )

13. WITNESSES :

1- 

2-
MAHINDRA TECH PARKS
AT
MAHINDRA WORLDCITY, JAIPUR
FOR
MAHINDRA WORLDCITY JAIPUR LTD

TENDER
FOR
CIVIL AND STRUCTURAL WORKS
(BLOCK B2)

VOLUME - II

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# TECHNICAL SPECIFICATIONS FOR CIVIL WORK

1. General 
2. Earth Work 
3. Anti-Termite Treatment 
4. Plain and Reinforced Cement Concrete 
5. Brick Masonry 
6. Water Proofing 
7. Finishing Works 
8. Flooring Work 
9. Steel Works
1.0 GENERAL REQUIREMENTS

1.1 GENERAL

The General conditions of contract shall form an integral part of these General requirements.

The Contractor shall notify all sub-contractors (if any) of the provisions of the General Conditions of contract and the General Requirements of these Specifications.

The arrangement and divisions of these Specifications are not to be construed as establishing the limits of responsibility of sub trades. The Contractor is responsible for delineating the scope of sub trade and for coordinating all the Works.

Throughout the Contract documents abbreviations have been used where necessary. In general the abbreviations used are those normally understood and acceptable in construction documentation. Any explanation to any abbreviation or symbol if required, should be obtained from the Consultant.

1.2 CODES AND STANDARDS

In general, Indian Codes of practice and Standards have been used. In the absence of other standards being regulated by the Contract Documents, all work shall meet the requirements of these Standards.

1.3 UNITS OF MEASUREMENT

The International System of Units (SI) shall be used throughout the project.

1.4 PLANT, EQUIPMENT AND TOOLS

The Contractor shall provide at his cost modern plant equipment and tools adequate and fitting to the magnitude and size of the Works in strict compliance with the requirements of General Conditions of Contract.

1.5 STORAGE & HANDLING FACILITIES

The Employer will not be responsible for providing the Contractor with any space for the storage of plants, equipment and materials and for temporary offices of the Contractor, during the execution of the Contract. It shall be the Contractor's responsibility to arrange at his cost temporary facilities for storage of plants, equipment and all materials including temporary Contractor's offices, if such facilities cannot be accommodated on the Work site.

On no account shall the temporary installation conflict with any of the permanent installation.

The handling and storage of all plants, equipment and material at site shall be at the risk of the Contractor and without responsibility of the Employer.

The Contractor shall protect all material against mechanical damage or deterioration during storage and erection at site. The protection methods shall be subject to the approval of the Project Engineer.
The Tenderer shall provide along with his tender details of his proposals in respect of stores, lay down areas, and other such facilities and shall include all cost connected with these provisions in his tender.

**1.6 TEST LABORATORY & TESTING**

The Contractor shall supply and maintain complete testing equipment, apparatus, tools, gauges, instruments, etc. sufficient for all tests to be carried out as specified in these specifications.

Testing, except as otherwise specified herein shall be performed by an approved testing agency as proposed by the Contractor and at no extra cost to the Employer. The Project Engineer may require all testing to be carried out under his supervision only.

**1.7 CHECKING AT SITE**

The Tenderers shall provide along with their Tender a list of the main construction equipment they propose to use on site.

The submittal of proposal for temporary & permanent and other arrangements, and the approval thereof by the Project Engineer, shall not relieve the Contractor of his responsibilities and duties under the contract.

The Contractor shall appoint his authorised representative as in charge of the works, after seeking the Consultant’s approval for such appointment. The Contractor's representative is to be given full responsibility & authority to enter into negotiations regarding points arising from the execution of the work.

All work included in the contract is to be supervised by Contractor’s representative assisted by sufficient number of qualified staff of Contractor. Full facilities and assistance are to be afforded by the Contractor for the Employer or his Representative to check the execution of the work.

Contractor’s representative on site shall liaise with and take necessary instructions from the Consultant on all matters related to work. In situations of non-compliance, irregularity or disobedience the Consultant reserves the right to ask the Contractor to replace his representative.

The Employer reserves the right to inspect all part of the works but may at its discretion waive inspection on certain items, but this shall in no way absolve the Contractor from his responsibilities.

If the Employer or his Representative shall see that the works will not be completed in the time specified, then he shall order the Contractor to work over-time or in more shifts and the Contractor shall obey those orders free from additional payments and without any objections or request for compensation.

In the event of work to be carried at night, the Contractor shall provide sufficient lighting arrangements to the satisfaction of Project Engineer and shall supply necessary labour for continuation of work at required efficiency.
1.8 AS-BUILT DRAWINGS

The Contractor shall, at all times, keep on the site one copy of all drawings and relevant standards applicable to the works.

In addition the Contractor shall, at all times, keep on site a separate set of prints on which progress of work & all significant changes/ deviations shall be noted neatly, accurately and promptly.

Upon completion of works, the Contractor and his sub-contractors shall revise these prints neatly and legibly, so as to show clearly the way in which the work was actually carried out. The Contractor shall provide in the same format as the original drawings, any additional sheets required to record the work. The Contractor shall at his expense, supply the Consultants a complete and updated set of reproducible prints showing record of as-built changes to help them prepare as-built drawings.

1.9 PROTECTION OF THE WORKS

The Contractor shall, whenever necessary, cover up and protect the works from weather and damage by his own or other workmen performing subsequent operations. He shall provide & maintain all necessary warning signs, warning lamps, barricades and guard rails and clear away the same at completion.

1.10 RESTORATION AND CLEARING

On completion of the works the Contractor shall restore all items covered by the contract to the satisfaction of the Project Engineer and the inspection committee.

The Contractor shall allow for regular cleaning and clearing away all rubbish and excess materials that may accumulate from time to time. Upon completion of the works he shall obliterate all signs of temporary construction facilities such as work areas, foundations of temporary structures, stockpiles or waste materials, or any other elements of obstruction, as directed by the Project Engineer. The area shall be cleared, and the works and site shall be left in a clean and satisfactory state for immediate use and occupation.

1.11 TEMPORARY FACILITIES

The Contractor shall provide/ erect or install/ maintain and alter as necessary and remove on completion or when directed by the Project Engineer all temporary facilities and services including access roads as described herein after and/or in the Contract document and/or instructed and approved by the Project Engineer.

1.12 TEMPORARY ROADS

The Contractor shall prepare and maintain such temporary roads as may be necessary from the site to the nearest road and also within the plot. Such roads shall be positioned strictly in accordance with the Project Engineer's instructions and the Contractor shall reduce or control any dust nuisance by spraying with water as directed. The Contractor shall satisfy himself as to the locations and nature of the proposed access routes to the site, and shall be responsible for preventing any damage whatsoever to adjacent property and vegetation and keeping the access road free from debris at all times.
1.13 TEMPORARY SERVICES

1.13.1 Temporary Water Supply

The Contractor shall supply in sufficient quantity all necessary potable and other water for construction purposes at a point within a reasonable distance from the site.

He shall make arrangements and pay charges for water service installation, maintenance and removal thereof, and pay the costs of Water.

At completion of the work the temporary water services equipment and piping shall be removed by the Contractor at his own expense.

1.13.2 Temporary Electricity

The Contractor shall make all the necessary arrangements for temporary electricity services, pay all expense in connection with the installation, operation and removal thereof and pay the costs of electricity consumed by all trades.

Temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of Governing codes.

Temporary wiring shall be maintained in a safe manner and utilised so as not to constitute a hazard to persons or property.

At completion of the work, temporary electricity services shall be removed by the Contractor at his own expense.

1.13.3 Waste Disposal

The Contractor shall make such temporary provisions as may be required in order to dispose of any chemicals, fuels, oils, grease, waste and soil waste and the like without causing pollution to either the site or the environment. Disposal of any materials, wastes, effluents, garbage, oil, grease, chemicals and the like shall be in areas specified by the concerned local authority and subject to the approval of the Project Engineer. If any waste material is dumped in unauthorized areas the Contractor shall remove material and restore the area to the condition of the adjacent undisturbed area. If necessary, contaminated ground shall be excavated, disposed of as directed by the Project Engineer and replaced with suitable fill material compacted and finished with topsoil, all at the expense of the Contractor.

1.13.4 Fire Protection

The Contractor shall provide and maintain adequate fire protection in the form of barrels of water with bucket tanks, fire extinguishers, or other effective means of extinguishing fire, ready for instant use. The Contractor shall follow the instructions and specifications of the concerned local authorities.

1.13.5 Telephone

The Contractor shall immediately after receiving the letter of acceptance take necessary steps to obtain a telephone on site and it shall be installed within one month from the date of letter of acceptance.
The Contractor shall be responsible for all installation charges and periodic telephone accounts. The telephone shall be made available to the Project Engineer for due performance of his duties at all times and free of charge.

1.14 **NIGHT WORK**

When work is done at night the Contractor shall maintain from sunset to sunrise such lights on or about his work and plant as the Project Engineer may deem necessary for proper observations of work.

1.15 **WEATHER**

No work is to be undertaken when, in the opinion of the Project Engineer, the weather is so unsuitable that proper protection of the work cannot be ensured.

1.16 **ACCIDENT PREVENTION, PROTECTIVE EQUIPMENT**

The Contractor shall comply and enforce compliance by all his Sub-Contractors, the highest standards of safety and accident prevention in accordance with International standards and in compliance with all applicable laws, ordinances, and regulations.

All requisite barriers, fence, warning signs, lights and other safety precautions as required for the protection of persons and property on or adjacent to the site shall be provided at the Contractor's cost.

All warning signs shall be in Hindi and English and shall remain prominently displayed at potential accident hazard locations. These signs shall be maintained to remain in a clean and legible condition at all times, to the satisfaction of the Project Engineer.

1.17 **SURVEY INSTRUMENTS**

The Contractor shall maintain on site the following surveying instruments in perfect working conditions to enable the Project Engineer or his representative to check levels and lines of the work at all times.

- One theodolite, 10 sec. reading, complete with tripod and other accessories.
- One automatic level, 10mm reading, complete with tripod and other accessories.
- Three leveling staves, 3m long, centre hinged.
- Two survey Umbrellas.
- Ten ranging poles, 2m long.
- Two measuring steel tapes calibrated, 50m long.
- Two measuring steel tapes, 20m long.
- Five insulated water carriers 5 liter capacity minimum.

1.18 **SETTING OUT**

Setting out shall be in accordance with General Conditions of Contract.

The Project Engineer will establish bench marks and/or reference lines as shown on the drawings. All other work shall be laid out from these marks and/or lines.
Temporary poles and other marks used in setting out shall be removed after completion of the required work.

1.19 ENVIRONMENTAL CONSIDERATIONS

The Contractor shall be concerned with the impact of his work upon the environment. This applies to the effect upon the residential community, adjacent industrial facilities and upon the area outside the site boundary. Areas of concern will include but are not limited to:

- Use of clean fuels to minimize air polluting emissions.
- Control of other air pollutants.
- Recovery and recycling of usable materials.
- Control of vehicle noise.
- Control of noise from power facilities.
- Limitation of Vibrations.
- Preservation of natural land to the extent possible.
- Preservation of archaeological features.

1.20 PAYMENT OF WORK

No payment shall be made for the works involved within the scope of this division of specification unless otherwise specifically stated in the bill of quantities or herein. The cost thereof shall be deemed to have been included in the rates for other items of the bill of quantities.

1.21 CONTRACTOR's CAMP

Scope of work under this head consists of construction, erection, installation and maintenance of the Contractor's camp to house the Labour.

Location of the camp, including all utilities and facilities shall be subject to approval of the Project Engineer.

Such temporary camp facilities shall be dismantled after actual Completion Date of the project. However, if directed by the Project Engineer or the Employer, the Contractor shall continue maintaining such facilities to the extent required by the Contractor's personnel during the period of maintenance. No compensation shall be paid for the continued operation and maintenance of the Contractor camps during the period of maintenance.

Upon completion of the works, or at such time within the period of maintenance as directed by the Project Engineer, the Contractor shall remove all buildings/ utilities and other facilities from the vicinity of the site and restore all camp areas to a neat and clean condition.

The Employer shall not be responsible to provide any space to the Contractor for building his construction and labour camps and any other facilities in this respect. The Contractor shall make his own arrangements for space for his construction and labour camp at his own risk and cost. The Construction operation and maintenance of all camps of the Contractor shall comply with all applicable provisions of current labour camp rules.
The Contractor shall furnish, make arrangements for and carry out proper and adequate maintenance of the Contractor's camp areas at each camp to provide a neat, well-kept camp in all respects with pleasant and healthy surroundings and conditions for all occupants of their camp. The Contractor's camps shall be kept clean, well guarded, free from undergrowth and adequately drained. Roads and streets shall be kept in good condition.

Adequately equipped and properly staffed portable first aid stations or dispensaries shall be provided by the Contractor at strategic locations to administer first aid treatment at any time required and free of charge to all person on the site, including employees of the Consultant and the Employer.

1.22 CLEARING AND GRUBBING

The clearing and grubbing shall consist of clearing the designated area of all trees, down timber snags, bush, other vegetation, rubbish and all other objectionable material, and shall include grubbing stumps, roots, and matted roots, and disposal of all material resulting from the clearing and grubbing. It shall also include the removal and disposal of structures that protrude/encroach upon, or otherwise obstruct the work, except when otherwise provided for on the drawings or directed by the Project Engineer to be saved.

The scope of this section of specifications is as follows.

1.22.1 Location of works

The Project Engineer will define the limits of areas where clearing and grubbing is to be done. Normally it will include all land within the right of way and all other construction area including ditches, detours, minor road crossings and other areas shown on the plans or as specified or as directed by the Project Engineer. The Project Engineer will designate the fences, structures and debris and trees and bushes to be cleared where grubbing is not required. It shall not include clearing and grubbing of borrow or other pit areas from which material is secured. It shall include the leveling or removal of blown sand dune or mounds within the site of works unless otherwise directed by the Project Engineer.

1.22.2 Grubbing and Cutting

All roots and stumps within the limits of the site shall be grubbed and excavated unless otherwise specified or approved by the Project Engineer.

1.22.3 Disposal

All wood and bush shall be burned or otherwise disposed off within 15 days after cutting or felling unless otherwise approved. No tree trunks, stumps or other debris shall be fallen, side cast or placed outside the limits of the site.

No debris shall be left within the site unless approved in writing by the Project Engineer. The location areas shall be within or outside the limits of the project or as approved in writing by the Project Engineer and shall be acquired by the Contractor at his own expense. Any usable material shall remain the property of the Employer.
1.22.4 Protection and Restoration

The Contractor shall prevent all damage to pipes, conduits, wires, cables or structures above or below ground. No land monuments, property markers, or official datum points shall be damaged or removed until the Engineer has witnessed or otherwise referred their location and approved their removal. The Contractor shall so control his operations as to prevent damage to trees and shrubs which are to be preserved. Protection may include fences and boards lashed to trees to prevent damage from machine operations. The existing covered or open bench marks should be located as directed by the Project Engineer. In the event that anything specified herein to be saved and protected is damaged by the Contractor such damages shall immediately be repaired or replaced by him at his own cost to the satisfaction of the Project Engineer. All areas cleared and grubbed must be approved before start of clearing operations.

1.23 STAKE-OUT SURVEY

Under this item the Contractor shall make the stake-out survey for construction purposes with competent & qualified men, consistent with the current practices. The work shall proceed immediately upon the award of the contract and shall be expeditiously progressed to completion in a manner and at a rate satisfactory to the Consultant. The Contractor shall keep the Project Engineer fully informed as to the progress of the Stake-out survey. The scope of this section of specifications is covered by detailed specifications as laid down herein.

1.23.1 MATERIAL

All instruments, equipment, stakes and other material necessary to perform all work shall be provided by the Contractor. These instruments and equipment shall be available to the Project Engineer at all times for the purpose of checking the work.

1.23.2 EXECUTION

The Contractor shall trim trees, bushes and other interfering objects, not consistent with the plans, from survey lines in advance of all survey work to permit accurate and unimpeded work by his stake-out survey crew and the Engineer's survey crew. The exact position of all work shall be established from control points which are shown on the plans or modified by the Project Engineer. Any error, apparent discrepancy or absence in or of data shown or required for accurately accomplishing the stake-out survey shall be referred to the Project Engineer for interpretation.

The Contractor shall be responsible for the accuracy of his work and shall maintain all reference points, stakes, etc. Existing or new control points that will be or are destroyed during construction shall be re-established. All stake-out survey work shall be referenced to the centre lines shown on the plans. All computations necessary to establish the exact position of the work from control points shall be made of this responsibility for the accuracy or completeness of his work.

Reference points, base lines, stake and bench marks for borrow pits shall be established by the Contractor after approval of the Project Engineer.

All required right-of-way and easement limits shall be established, staked and referenced by the Contractor concurrent with the construction stake-out survey.
The Contractor shall place at least two offset stakes or references at each centre line station and at such intermediate stations as the Project Engineer may direct. From computations and measurements made by the Contractor, these stakes shall be clearly marked with the correct center line, station number, offset and cut or fill so as to permit the establishment of the true centre line location during construction. The Contractor shall locate and place all cut, fill, slope, line grade or other stakes and points as the Project Engineer may direct to be necessary for proper progress of the work.

1.24 DEWATERING

The works covered by this section of the specifications consist of furnishing all plant, labour, equipment appliances and materials and in performing all operations in connection with earthworks of all underground supplies and services and for all structural units, stock piling of suitable excavated materials, disposal of unsuitable and surplus excavated material, in accordance with this section of specifications and applicable drawings and subject to terms and conditions of the contract.

The Contractor shall acquaint himself of the nature of the ground, existing structures, foundations and subsoil which might he encountered during excavation of earthworks. The Employer does not guarantee or warrant in any way that the material to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the Report, Drawings or in any other Contract Documents or to material obtained from boring or trial pits. The Contractor shall be deemed to have made local and independent inquiries towards the nature of the ground, subsoil conditions or material to be excavated or penetrated. The Contractor shall not be entitled to receive any extra or additional payment on account of any variations.

All excavations, cuttings, and fills shall be carried out to the lines, levels and gradients specified with necessary allowance for consolidation, settlement and drainage. Any approval from Consultant shall not relieve the Contractor of any of his duties under the Contract.

The dewatering system shall consist of the basic dewatering system, a standby dewatering system, standby power system, monitoring devices, ditches, sumps, pumps and all associated equipment as specified herein. The basic dewatering system shall be the minimum dewatering system required to achieve the specified result.

The standby dewatering system shall be that system, which may be required to achieve the specified results, should part or all of the basic dewatering system becomes ineffective for maintenance or any reasons, other than a failure of power supply.

The standby power system shall be that independent generating system which may be required to keep the dewatering system fully operational in the event of a power failure.

1.24.1 DESIGN OF DEWATERING SYSTEM

The Contractor shall arrange to have the entire dewatering system designed in detail, installed, maintained and operated by qualified and experienced personnel throughout the course of the work.

If the Contractor wishes to appoint some properly qualified dewatering sub-contractor, then his name, qualifications, record of previous jobs of a similar nature, personnel to be
employed on the work, and other pertinent information shall be submitted to the Project Engineer for approval.

Two weeks prior to commencement of installation of the dewatering system, Contractor shall submit to the Project Engineer for his technical approval, complete final plans, details and description of the dewatering system.

Approval of the dewatering system by the Consultant shall in no way relieve the Contractor from his responsibility of satisfying the entire dewatering requirements as specified herein.

1.24.2 DEWATERING THE EXCAVATIONS

The Contractor shall install, maintain and operate a system of wells, trenches and pumps as required performing the excavations for the areas and subsequent construction of the structures and placement of backfill, in dry condition.

Dewatering of the excavation shall be accomplished in a manner that will prevent seepage, boils, loss of fines, corrosion, softening of the strata, and that will maintain the stability of the bottom and slopes of excavation. In case any damage is caused to the work, in the opinion of the Project Engineer, due to inadequacy or failure of the dewatering system, in part or in whole, then the supply of all labour, materials and plant, and the performance of all work necessary to carry out additional or remedial work resulting from such damage shall be undertaken by the Contractor at his own cost. The cost of any damage caused to the structures or other equipment due to the failure of the dewatering system shall be borne by the Contractor and shall be covered by proper insurance to be provided by the Contractor, in accordance with insurance clauses of the "General Conditions of Contract".

The dewatering system shall be designed to operate on a continuous basis in such a manner that during excavation, the water level as observed in all piezometers installed near the periphery of the excavation with their tips located below the prevailing excavation level, is at least one meter below the prevailing excavation level. If the water level observed in any or all of the piezometers is higher than that specified, the excavation shall be halted until remedial measures to the dewatering system have been effected and the specified water levels in the piezometers attained or until the Contractor demonstrates to the satisfaction of the Project Engineer that it is safe to proceed with the excavation. Piezometers tips shall be installed near the bottom of the hole drilled for that purpose.

During construction of structures and subsequent backfill placement and associated work operations, the dewatering system shall operate on a continuous basis in such a manner that the water level, as observed in the piezometers located below the level of construction and backfill placement is at least one meter below the lowest point of construction and backfill placement and the water level in the piezometers is maintained at such level till the concrete if any, has sufficiently hardened and until in the opinion of the Project Engineer, it is safe to allow the water level to rise upto a predetermined level.

The Dewatering System shall be maintained in operating condition so as to achieve the specified results until the construction of the structures and the backfill placement at all points, and installation of machinery and other associated equipment and embedded parts has reached a stage when , in the opinion of the Project Engineer Dewatering system can be cut off in stages as directed by the Project Engineer.
The Contractor shall not permit the accumulation of surface water within the confines of the excavation areas. The Contractor shall control, remove and divert surface water run-off, and water discharging from the dewatering system away from the excavations, to a point outside the working area as required by the Project Engineer.

The Contractor shall perform all work including, but not limited to, the construction and maintenance of ditches and sumps and provide, install, maintain and operate pumps and pipelines of adequate capacity as are necessary for the effective control of surface run-off and ground water not required to be intercepted by the dewatering system.

The Contractor shall supply, install, maintain and operate as required, the generators for power supply which shall be of sufficient capacity to maintain all pumps and equipment for both the Basic and Standby systems, operating on a continuous basis.

The Contractor shall supply, install and maintain an alarm system which will alert responsible personnel at the time of power failure and at the same time will automatically activate the standby units.

The dewatering system shall be designed in such a manner that all or parts of the standby system may be directly connected to the basic system.

The standby dewatering systems shall be operated for a period of at least 3 hours duration each week to demonstrate its complete effectiveness. For such demonstrations, the Contractor shall not be entitled to any payment/compensation.

1.24.3 OBSERVATIONS

Contractor's dewatering system shall include the supply, installation, data recording and maintenance of piezometers as may be required to demonstrate the satisfactory performance of the dewatering system.

In order to ascertain the continuous effectiveness of the dewatering system, Contractor shall supply all equipment and perform all work necessary to obtain and correlate records of the water elevation in each of the piezometric observation wells and records of the discharges from the dewatering system. These data shall be obtained on a continuous basis and shall be properly compiled and copies of the compiled data shall be submitted to the Project Engineer daily, or as required. The Contractor shall also keep the Project Engineer advised on a daily or as required basis on the equipment being utilized to effect the required results during the entire period when the dewatering system is in operation.

1.24.4 MEASUREMENT AND PAYMENT

The payment for the item dewatering shall be made as per tender. This payment will include but not limited to all costs incurred in connection with provision, installation, operation and maintenance etc. of the complete dewatering system consisting of basic dewatering system, standby dewatering system together with standby power arrangements. The item also includes the transportation of all plant, equipment, supply and personnel to the site and making all the necessary arrangements for satisfactory performance of the dewatering system as specified and directed by the Project Engineer. The provision of safety measures required for excavation of the work and any insurance, premium paid to cover the life and property shall also be considered as part of
this item for the purpose of payment. All the cost incurred on designing of the dewatering system will be deemed included under this item for payment.

Any payment against this item shall be made only against prior submission of a Bank Guarantee, to be supplied by the Contractor for the full amount of the price of dewatering, as per BOQ item, in the name of the Employer. The Bank Guarantee will be released only after the Project Engineer has issued a certificate that the item of dewatering has been completed in all respects and that dewatering is no longer required.

Interim payments for dewatering may be made in lump sum in accordance with the following provisions:

The first payment equal to 25% of the lump sum amount of dewatering item will be made after the Contractor has brought on the site all the material and dewatering equipment in accordance with his approved scheme of dewatering and after the Contractor has submitted a Bank Guarantee for the full amount of the dewatering item.

The second payment equal to 25% of the dewatering item will be made after the dewatering system has been installed and the Contractor has demonstrated its performance to the satisfaction of the Project Engineer.

The remaining amount shall be paid to the Contractor in equal monthly installments divided over the total period of the dewatering system. This period shall be determined by the Project Engineer based on proposed Construction Schedule.

If at any time the Project Engineer is dissatisfied with the performance of dewatering system installed and operated by the Contractor, and if in his opinion it is necessary to make substantial changes in the dewatering system to achieve the desired results, the Employer will be entitled to encash the Bank Guarantee to the extent of all amounts already paid to the Contractor.
2.0 EARTHWORK

2.1 SCOPE OF WORK

The works covered by this section of the specifications consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with earthworks of all underground supplies and services and for all structural units, stock piling, of specifications and applicable drawings, and subject to terms and conditions of the contract. The scope of this section of specifications is also covered with detailed specifications as laid down herein.

2.2 GENERAL

2.2.1 The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil which might be encountered during excavation of earthworks. The Employer does not guarantee or warrant in any way that the material to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the report, drawings or in any other contract documents or to material obtained from boring or trail holes. The contractor shall be deemed to have made local and independent inquiries and shall take the whole risk of the nature of the ground subsoil or material to be excavated or penetrated and the Contractor shall not be entitled to receive any extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground subsoil or material.

2.2.2 All excavations, cutting, and fills shall be constructed to the lines, levels and gradients specified with any necessary allowance for consolidation, settlement and drainage so that at the end of the period of maintenance the ground shall be at the required lines, levels and gradients. During the course of the Contract and during the period of maintenance any damage or defects in cuttings and fills, structures and other works, caused by slips, falls or basins or any other ground movement due to the Contractor's negligence shall be made good by the Contractor at this own cost.

2.3 SITE PREPARATION

2.3.1 The Contractor shall set out the works and shall be responsible for true and perfect setting out of the same and for correctness of the positions, levels, dimensions and alignments of all parts thereof. If at any time any error in this respect shall appear during the progress of the works, the Contractor shall at his own expense rectify such error, to the satisfaction of the Project Engineer.

The Contractor shall construct and maintain accurate bench marks so that the lines and levels can be easily checked by the Project Engineer.

2.3.3 The Contractor shall Construct and maintain such ditches, in addition to those shown on the plans, as will adequately drain areas under construction.

2.3.4 The Contractor shall perform a joint survey with the Project Engineer's representative of the area where earthwork is required, plot the ground levels on the drawings and obtain approval from him before starting the earthwork.
2.4 EXCAVATIONS

2.4.1 Excavation shall include the removal of all material of every name and nature. Excavations shall be carried out in accordance with excavation plans and sections shown on the Drawings and as directed by the Project Engineer.

2.4.2 The major portion of excavations shall be carried out by mechanical excavators and excavated materials disposed off to stock on spoil as per drawings or as directed by the Project Engineer. The excavation which can not be done by mechanical means including levelling, trimming and finishing to the required levels and dimensions shall be done manually. The material suitable for fill and back fill shall be stock piled within the free haulage limit of the 200m of the works.

2.4.3 The Contractor shall give reasonable notice that he intends to commence any excavation and he shall submit to the Project Engineer full details of his proposals. The Project Engineer may require modifications to be made if he considers the Contractor's proposals to be unsatisfactory and the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.

2.4.4 For major excavations, the Contractor shall submit for the prior approval of the Project Engineer full details and drawings showing the proposed method of supporting and strutting etc. The design, provisions construction, maintenance, and removal of such works shall be the responsibility of the Contractor and all cost in these respects shall be included in the unit rates for the permanent work.

2.4.5 The Contractor's attention is drawn particularly to his obligations under the general conditions in respect of those works which are in close proximity to existing buildings.

2.4.6 The Contractor shall preserve the complete excavation from damage from slips and earth movements, ingress of water from any source what so ever and deterioration by exposure to the sun and the effects of the weather.

2.4.7 All excavation of every description, in whatever material encountered shall be performed to the elevations and dimensions shown on the drawings in such a manner as to avoid interruption to work in other parts of the site. The Contractor shall be responsible for injury to the permanent works caused by excavation on other parts of the works.

2.4.8 Excavation shall extend to sufficient distance from walls and footing to allow for placing and removal of forms, installations of services and for inspection, except where the concrete for walls and footings is authorised to be deposited directly against excavated surfaces. Undercutting will not be permitted. The additional excavation for placing and removal of forms, installation of services, for inspection and generally for working area on slopes for stability shall not be measured for payment and shall be deemed to be included in the rates for excavation as measured net.

2.4.9 All excavations in foundations shall be taken to 150mm and shall be trimmed carefully to a smooth and level surface, immediately after trimming to the final elevation a layer of building concrete shall be placed to the thickness shown on the drawings. All excavations for foundations which have been trimmed and disturbed shall be compacted and covered by concrete by the end of the day. It is specifically brought to the notice of the Contractor that any excavation taken down to the trimmed elevation which is left overnight or for any length of time thereafter, uncovered by the blinding concrete, shall
be required to be trimmed to such lower elevation as directed by the Project Engineer and any extra work or any consequent increase in the quantities caused thereby shall not be paid to the Contractor.

2.4.10 No excavation shall be refilled nor any permanent work commenced until the foundation has been inspected by the Project Engineer and his permission to proceed given.

2.4.11 If excavation for sub-structures are carried below the required level, as shown in the drawings or as directed by the Project Engineer, the surplus depth shall be filled in with concrete of same grade as of blinding concrete at the sole cost of the Contractor.

2.4.12 All excavation shall be performed in the dry. The placing of blinding concrete, placing of reinforcement and casting of the permanent works in the excavation shall be carried out in the dry and the Contractor shall have sufficient equipment for this purpose. Adequate precautions shall be taken to prevent any corrosion due to undercutting from underneath the previously constructed adjoining foundations.

2.4.13 Shoring, where required during excavation, shall be installed to protect the bank, adjacent paving, structures and utilities. The term shoring shall also be deemed to cover whatever methods the Contractor elects to adopt, with prior approval of the Project Engineer, for upholding the sides of excavation and also for planking and strutting to excavation against the side of roadways and adjoining properties in existing hardcore of any other material. The Contractor will be held responsible for upholding the sides of all excavations and no claim for additional excavation, concrete or other material will be considered in this respect.

2.4.14 Existing utility lines that are shown on the drawings or the locations of which are made known to the Contractor prior to excavation and that are to be retained, as well as utility lines constructed during excavation and backfilling, and if damaged, shall be required to be repaired by the Contractor at his expense. Any existing utility lines which are not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor and adjustment in payment will be made as approved by the Project Engineer. When utility lines which are to be removed, are encountered within the area of operations the Contractor shall notify the Project Engineer in ample time for necessary measures to be taken to prevent interruption of the service.

2.4.15 Excavated material suitable for use as filling material shall be stock piled within the free haulage limit 200m of works as directed by the Project Engineer. This stock piled material shall be transported back to places requiring fill or backfill. Surplus or material unsuitable for use as filling shall be disposed of by the Contractor at locations approved by the Project Engineer within specified free haulage limit.

2.4.16 The excavation work shall include excavation in above water table and excavations below water table. The Contractor shall submit the proposal for dewatering from the areas of excavation for the approval of Engineer and shall provide all plant, equipment, pumps, sheeting, well points as required to keep the water table below 1.0m from the deepest foundation as shown on the drawings till the completion of foundation works.

2.4.17 The Contractor shall make independent enquiries and perform and make independent observations to ascertain the water table in the areas of excavations during the period when the construction works are in progress. The Contractor shall take whole risk of any nature for fluctuation of the water table from his own findings. The Employer is not
bound in any way and shall not be responsible for any information given by him or any information, observations or values obtained from his reports, drawings and documents.

2.4.18 Excavation for pits, cable trenches and equipment foundation and other structures shall be taken out to the levels and dimensions as the Project Engineer may direct.

2.4.19 Before starting the excavations, the Contractor shall ensure the correct alignment of the pipe line on the ground, the depth and width of excavation of the trench, all in accordance with the drawings and instructions of the Project Engineer. The Contractor shall make profiles with cement concrete pillars.

2.4.20 Excavation shall be carried out true to line, grade, width as shown on the drawings or as directed by the Project Engineer ensuring proper laying of the pipe line, the bedding fill, construction of chambers for appurtenant and any other structures. The trench bottom shall be graded to provide even and substantial bearing over the specified bedding and of the structure.

2.4.21 The Contractor at his cost shall provide to the satisfaction of the Project Engineer all timbering, approved supports and shores and bracings to the sides of the excavated trench and foundations in such a manner to secure the sides of the trench and excavations from falling or adverse movement. All responsibility connected with such shoring shall rest with the Contractor. Adequate clearance / working space on both sides of the structure/pipe line shall be provided for which no payment shall be made.

2.4.22 Without the written permission of the Project Engineer no more than 200.0m the trench shall be opened in advance of the completed pipe line.

2.4.23 The bottom of all excavations shall be carefully levelled. Any pockets of soft or loose material in the bottom of the pits and trenches shall be removed and the cavities so formed filled with lean concrete at the Contractor’s expense.

2.4.24 The Project Engineer may require the Contractor to excavate below the elevations shown on the drawings or he may order him to step above the elevations shown depending upon the suitable foundation material encountered.

2.4.25 If for any reasons, the levels grades or profiles of the excavations are changed adversely, the Contractor shall at his own cost be liable to bring the excavations to the required levels and profiles as shown on the drawings or as directed by the Project Engineer.

2.5 EXCAVATION TOLERANCES

Excavation shall be performed within the tolerances for excavation limits indicated on the drawings. Where no tolerance limits are indicated excavation shall be performed to tolerances established by the Project Engineer as accepted for the design and type of work involved.

2.6 BACK FILLING

2.6.1 After completion of foundation footing, foundation, walls, and other construction below the elevation of the final grades and prior to backfilling, forms shall be removed and the excavation shall be cleaned of trash and debris.
2.6.2 The backfilling shall include filling under the floors, around the foundations, trenches, pipes, conduits, ducts and channels and bedding for pipes.

2.6.3 The backfilling work shall include loading, unloading, transporting, placing, stocking, spreading of earth, watering, rolling, ramming and compacting complete as specified herein.

2.6.4 Filling shall be approved selected material from excavation or other predominantly granular material and free from slurry, mud, organic or other unsuitable matter and capable for compaction by ordinary means.

2.6.5 The excavated material if found suitable shall be stock piled within the free haulage limit of the site of the works. This material shall be used for backfilling if approved by the Project Engineer and shall be transported by the Contractor any where required for the purpose of backfilling work in this contract.

2.6.6 The Contractor shall provide the approved quality fill and backfilling material as required to complete the fill/backfilling work.

2.6.7 Filling in trenches and foundation shall be placed in 200 mm layers and compacted at optimum moisture content by mechanical means or other means as approved by the Project Engineer.

2.6.8 Fill in around pipes and cables shall be carefully placed with fine material to cover the pipe or cable completely before the normal infilling is done.

2.6.9 Material for back filling shall be as approved by the Project Engineer and shall be placed in layers of 150 mm measured as compacted material and saturated with sufficient water and compacted to produce in-situ density not less than 95% of the maximum density at optimum moisture content, achieved in Test No.15 of BS 1377:1975 or similar clause of relevant IS Code.

2.6.10 All filled areas shall be left neat, smooth and well compacted with the top surface consisting of the normal site surface soil unless otherwise directed.

2.6.11 Depending on the depth of fill the Project Engineer may instruct increased thickness of successive layer to be placed.

2.6.12 Fill shall not be placed against foundation walls prior to approval by the Project Engineer. Fill shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.

2.6.13 In case the Contractor is instructed to arrange for the fill material the quality of the fill material will be subject to the approval of the Project Engineer. The Project Engineer shall require the Contractor to carry out various tests of the fill material. All such tests shall be made at an approved laboratory at the cost of the Contractor. Once a material from a specific source has been approved, the material for the same quality and from that source only shall be used. Any fill material from borrow pits which has not been approved or the quality of which differs from the approved material shall be rejected out rightly. The Project Engineer reserves the right to order removal of any such materials brought to the site of works at his discretion at Contractor's expense. In order to ensure satisfactory compaction, it will be necessary to carry out, depending upon the type of
material, particle size distribution tests, determination of organic content tests, maximum and minimum density tests and determination of optimum moisture content for the filling material.

2.6.14 The method of compaction, namely type of compactor, type of roller, weight of roller and number of passes proposed by the Contractor for any particular fill material shall be subject to the approval of the Project Engineer after completion of satisfactory field tests, subsequent to the laboratory analyses, using the materials and equipment proposed to be used for the earth work in conditions similar to those likely to be encountered during construction. The final selection of the soil moisture content, the thickness of layers, the type of compaction equipment and the number of passes shall be decided after these tests, which shall be conducted at Contractor's expense.

2.6.15 Having established the method of compaction to be used, no departure from this approved method shall be permitted without the prior approval of the Project Engineer. Adequate control of the fill and compacting operations shall be ensured by in-situ density tests and in order to obtain significant results, not less than two measurements shall be carried out per one hundred square meters of area compacted. The frequency of tests shall be determined on site and may be varied at the discretion of the Project Engineer. Compaction shall not be less than 95% in-situ density with respect to the maximum density, at optimum moisture content.

2.6.16 The exact thickness of layers and the method of placing and compacting the fill shall be determined by the field tests, as stated above, but not withstanding the results of these trails, fill shall not be placed in layers exceeding 200mm in thickness. In order to maintain control of the thickness of layers, timber profiles shall be used wherever feasible. The travelers of such profiles for each layer of fill shall be checked by the supervisory staff of the Project Engineer. The Contractor shall provide adequate supply of water and sufficient capacity of mechanical water carriers to ensure uniform and uninterrupted operation of compaction. The Project Engineer may forbid the Contractor to proceed with placing and/or compaction of fill and/or order removal and re-compaction of such fill when he finds that the Contractor has insufficient or defective equipment or that the fill has been improperly laid and/or compacted.

2.6.17 If it is found necessary to alter the moisture content of the fill material in any way, then very strict control shall be exercised over the wetting and/or the drying process and frequent moisture content tests.

2.6.18 The fill material should be well graded non-cohesive and nearly silt-free (silt content between 5 to 10 percent) salt free and free of organic materials (less than 2%). It should also be free of stones larger than 100 mm. maximum dimension.

It should be of such nature and characteristics that it can be compacted to the specified densities in reasonable length of time. It shall be free of plastic clays, of all materials subject to decay, decomposition or dissolution and or cinder or other material which corrode piping and other metals.

2.7 TOLERANCES

The stabilization of compacted backfill/fill surfaces shall be smooth and even and shall not vary more than 100mm in 3 meters from true profile and shall not be more than 12.5mm from true elevation.
2.8 DISPOSAL OF SURPLUS MATERIAL

2.8.1 The rejected unsuitable material and surplus excavated material shall be disposed of within 200 m free haulage limit measured from boundary of the works to places or as directed by the Project Engineer.

2.8.2 The disposal of surplus excavated material shall include loading, unloading, transporting, stacking, spreading as directed by the Project Engineer.

2.9 MEASUREMENT AND PAYMENT

2.9.1 GENERAL

Except otherwise specified herein or elsewhere in the Contract documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the bill of quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the bill of quantities.

2.9.1.1 Dewatering, where required, to keep the foundation trenches dry during construction of works.

2.9.1.2 Timber shoring, planking, strutting and providing slope for up-holding the sides of excavations.

2.9.1.3 Any fill with approved material necessitated by over excavation due to fault or negligence of the Contractor.

2.9.1.4 Stock piling of the excavated material at approved locations with free haulage limit of 200m and transporting back suitable material to places requiring fill or backfill.

2.9.1.5 Specified foundation bed preparation.

2.9.1.6 Excavation involved in providing sufficient working space around sides of foundation and service line trenches.

2.9.1.7 Providing approved quality fill/backfill material from outside sources. Royalty for borrow areas and haulage of material shall not be paid for separately.

2.9.1.8 Rolling, levelling, watering and compacting the fill and backfill to required density.

2.9.1.9 All laboratory and field tests stipulated in these specifications.

2.9.1.10 Disposal of rejected unsuitable and surplus excavated material within 200m free haulage limit measured from the fence boundary of site of works following the shortest route as directed by the Project Engineer.

2.9.2 EXCAVATION.

2.9.2.1 MEASUREMENT

Quantities of excavation shall be calculated / measured from the pre-work levels of natural ground taken jointly by the Contractor and the Project Engineer before Commencement of the work.
The quantities set out for excavation and its subsequent disposal shall be deemed to be the bulk before excavating and no allowance shall be made for any subsequent variations in bulk or for any extra excavation unless otherwise shown on the drawings. Quantities of excavation shall be measured on the basis of vertical excavations required for the nominal concrete dimensions of the structural members of foundations. Lean concrete shall not be construed as structural concrete.

Quantities of excavation for service line trenches shall be measured for payment on the basis of vertical excavation faces for the specified width as shown on the drawings. Measurement for acceptably completed excavation works shall be made on the basis of number of cubic meters of material excavated for foundation and service trenches as shown on the drawings or as directed by the Consultant’s Project Engineer.

2.9.2.2 PAYMENT.

Payment will be made for acceptable measured quantity of excavation on the basis of unit rate per cubic ft./cu.m. quoted in the bill of quantities and shall constitute full compensation for all the works related to the item.

2.9.3 BACKFILL / FILLS.

2.9.3.1 MEASUREMENT.

Measurement for acceptable completed backfill/ fill works shall be made on the basis of number of cubic meter of compacted backfill/ fill in position, or as shown on the drawings or as directed by the Project Engineer.

2.9.3.2 PAYMENT.

Payment will be made for acceptable measured quantity of backfill/ fill on the basis of unit rate per cu.meter quoted in the bill of quantities and shall constitute full compensation for all the works related to the item.
3.0 ANTI-TERMITE TREATMENT

3.1 GENERAL

Prevention of termite from reaching the superstructure can be achieved by creating a chemical barrier between the ground of the chemical. To have proper check for uniform, spraying of chemical, graduated containers shall be used. Proper check should be kept that the specified quantity of chemical is used for the required area during the operation.

3.2 TIME OF APPLICATION

Soil treatment shall start when foundation trenches and pits are ready to take mass concrete in foundations. Laying of mass concrete shall start when the chemical emulsion has been absorbed by the soil and the surface is quite dry. Treatment should not be carried out when it is raining or when soil is wet with rain or sub-soil water. The foregoing applies also in the case of treatment to the filled earth surface within the plinth before laying the sub grade for the floor.

3.3 DISTURBANCE

The treated soil barriers shall not be disturbed after they are formed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

3.4 TREATMENT OF COLUMN-PITS, WALL-TRENCHES AND BASEMENT-TANKS EXCAVATION.

3.4.1 The bottom surface and the sides (upto a height of above 300 mm) of the excavation made for column pits, wall trenches and basements shall be treated with the chemical at the rate specified in IS 6313 (1981) Part II of 1981.

3.4.2 After the column foundations and the retaining wall of the basement come up, the backfill in immediate contact with the foundation structure shall be treated at the rate specified in IS 6313 of the vertical surface of the sub-structure for each side. If water is used for ramming the earth fill, the chemical treatment shall be carried out after the ramming operation is done by rodding the earth at 150mm centers close to the wall surface and spraying the chemical with the above dose. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the concrete or masonry surfaces of the columns and walls so that the earth in contact with these surface is well treated with the chemicals.

3.4.3 In the case of R.C.C. framed structures with columns and plinth beams and R.C.C. basements/ tanks with concrete mixes rich and dense (being 1:2:4 or richer), it is unnecessary to start the treatment from the bottom of excavation for columns and plinth beams. The treatment shall start at the depth of 500mm below ground level. From this depth the back-fill around the columns, beams and R.C.C basement wall shall be treated at the rate as per IS 6113 Part II. The other details of treatment shall be as laid down in the clause 3.6.2 above.

3.5 TREATMENT OF TOP SURFACE OF PLINTH FILLING

The top surface of the filled earth within plinth wall shall be treated with chemical emulsion at the rate as per IS 6313 Part II (surface area) before the sand/sub grade is
laid. Holes upto 50 to 75mm deep at 150mm centers both ways shall be made with crow bars on the surface to facilitate saturation of the soil with chemical emulsion.

3.6 TREATMENT OF INNER WALL SURFACES

To achieve continuity of the vertical chemical barrier on inner wall surfaces from the ground level, small channel 30 x 30mm shall be made at all the junctions of wall and columns with the floor (before laying the sub grade) and rod holes made in the channel upto ground level 150mm apart and the chemical emulsion poured along the channel as per rate of application, mentioned in IS 6113 Part II (1981) so as to soak the soil right upto bottom. The soil shall be tamped back into place after this operation.

3.7 TREATMENT OF SOIL ALONG EXTERNAL PERIMETER OF BUILDING

During progress of work, provide holes in the soil with iron rods along the external perimeter of the building at intervals of about 150mm and depth 300mm and filling these holes with chemical emulsion at the rate (as per IS 6313 Part II) per metre of perimeter of the external wall.

3.8 TREATMENT FOR EXPANSION JOINTS

Anti-termite treatment shall be supplemented by treating through the expansion joint after the sub-grade has been laid as per IS-6313 Part II of 1981.

3.9 TREATMENT OF SOIL SURROUNDING AND CONDUITS

When pipes and conduits enter the soil inside the area of the foundations, the soil surrounding the points of entry shall be loosened around each such pipe, or conduit for a distance of 150mm and to a depth of 75mm before treatment is commenced. When they enter the soil external to the foundations, they shall be similarly treated unless they stand clear of the walls of the building by about 75mm for distance of over 30mm from ground level.

3.10 SAFETY PRECAUTIONS.

All chemicals used for anti-termite treatment are poisonous and hazardous to health. These chemicals can have an adverse effect upon health when absorbed through the skin, inhaled as vapors or spray mists or swallowed. Person using or handling these chemicals should be warned of these dangers and advised that absorption through the skin is the most likely source of accidental poisoning. They should be cautioned to observe carefully the safety precautions given below.

These chemicals are usually brought to site in the form of emulsifiable concentrates. The containers should be clearly labelled and should be stored carefully so that children and pets cannot get at them. They should be kept securely closed.

Particular care should be taken to prevent skin contact with concentrates. Prolonged exposure to dilute emulsions should also be avoided. Workers should wear clean clothing and should wash thoroughly with soap and water, especially before eating and smoking. In the event of severe contamination, clothing should be removed at once and the skin washed with soap and water. If chemicals splash into the eyes they should be flushed with plenty of fresh water and immediate medical attention should be sought.
The concentrates are oil solutions and present a fire hazard owing to the use of petroleum solvents. Flames should not be allowed nearby during the mixing.

Care should be taken in the application of chemicals to see that they are not allowed to contaminate wells or springs which serve as sources of drinking water.

3.11 MEASUREMENTS

The measurements shall be made in SQM on the basis of plinth area of the building at Ground Floor only for all operations described in schedule of quantities. Nothing extra shall be measured.

3.12 RATE

The rate shall include the cost of all materials and labour involved in all the operations described above including making holes and refilling and making good the same.

3.13 SAND FILLING.

The sand shall be clean and free from any foreign matter. Sand filling shall be done, measured and paid in the same manner as covered in specifications for earthwork and excavation.

3.14 HUME PIPES (REINFORCED)

Pipes: All pipes must be new and perfectly sound confirming to specifications for non pressure pipes as laid down in IS:456, free from cracks, cylindrical straight and of standard nominal diameter and length smooth from inside and outside. They shall be made of spun process and of approved make and shall have even texture. Each pipe shall have one collar with it.

3.15 VAPOUR BARRIER.

The lean mix concrete shall be plastered with cement plaster 1:4 (1 cement, 4 coarse sand), 12mm thickness to give a smooth even surface for laying the polythene sheet/bituminous craft paper vapour barrier.

Unless specified otherwise, a layer of 300 microns polythene sheet shall be laid over the cement plaster. Sheet shall be lapped 150mm (Plastering / lean concrete shall be measured and paid for separately at the quoted rates).
4.0 PLAIN AND REINFORCED CEMENT CONCRETE

4.1 SCOPE

The work covered by this section of the Specifications consists of furnishing all plant, labour, equipment, appliances and materials, and in performing all operations in connection with the supply and installation of plain and reinforced concrete work, complete in strict accordance with this section of the Specifications and relevant documents, subject to the Conditions of the Contract.

4.2 GENERAL

4.2.1 Full co-operation shall be given to other trades to install embedded items and/or any associated services.

4.2.2 Embedded items shall have been inspected, and tests for concrete and other material or for mechanical operations shall have been completed and approved, before concrete is placed.

4.2.3 Formwork shop drawings shall be designed and prepared by the Contractor at his own cost. Approval of shop drawings as well as those of mock-ups /actual samples of finished concrete shall be obtained before Work is commenced.

4.2.4 Contractor shall prepare BAR BENDING SCHEDULES, and get the same approved by the Project Engineer, prior to commencement of work.

4.3 RELATED SPECIFICATIONS

The codes and standards generally applicable to the work of this section are listed hereinafter.

- **IS 269**: Ordinary and low heat Portland Cement.
- **IS 8041**: Rapid Hardening Portland Cement.
- **IS 455**: Portland slag cement
- **IS 1489**: Portland Pozzolana Cement.
- **IS 8112**: High Strength Ordinary Portland Cement.
- **IS 383**: Coarse and fine aggregates from natural sources for concrete.
- **IS 456**: Code of practice for plain and reinforced concrete.
- **IS 516**: Method of sampling and analysis of concrete
- **IS 1199**: Method of sampling and analysis of concrete.
- **IS 1200**: Method of measurement of building and civil engineering work - concrete work.
- **IS 1139**: Hot rolled Deformed Bars.
- **IS 1786**: Specification for high strength Cold Twisted deformed steel
IS 1838: Performed fillers for expansion joints in concrete non extruding and resilient type.


IS 23896: Methods of testing of aggregates for concrete (Part I to III)

IS 2505: Concrete vibrators, immersion type

IS 2645: Integral cement waterproofing compounds

IS 2751: Recommended Practice for welding for reinforcement bars.

IS 3414: Code of practice for design and installation of joints in buildings.


IS 4082: Recommendations on stacking and storage of construction materials at site.

IS 4925: Batching Plants.

IS 6925: Methods of test for determination of water Soluble chlorides in concrete admixtures.

IS 7861: Code of practice for extreme weather concreting

IS 7861: Recommended practice for hot weather (Part I) concreting

IS 9103: Admixtures for concrete.

IS 10262: Recommended guide lines for concrete mixed design.

In addition to the above the Project Engineer may specify any other standard for special materials and construction.

The following clauses are intended to amplify the requirements of reference documents listed above and the Contractor shall comply with these clauses.

4.4 MATERIALS

4.4.1 Cement:


b. Only one brand of each type of cement shall be used for concrete in any individual member of the structure. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed.
c. There shall be sufficient cement at site to ensure that each section of Work is completed without interruption.

d. Cement reclaimed from cleaning of bags or from leaky containers shall not be used.

e. Contractor shall provide and erect, at his own cost, in a suitable place, dry, well ventilated, and water proof shed of sufficient capacity to store the cement.

f. The cement shall be used as soon as possible after delivery, and cement which the Project Engineer considers has become stale or unsuitable through absorption of moisture from the atmosphere or otherwise shall be rejected and removed immediately from the site at Contractor's expense.

g. The mixing together of different types of cement shall not be permitted.

4.4.2 Aggregates

a. The sources of supply of all fine and coarse aggregates shall be subject to the approval of Project Engineer.

b. All fine and coarse aggregates shall be clean and free from clay, loam, silt, and other deleterious matter. If required, Project Engineer reserves the right to have them washed by the Contractor at no additional expenses. Coarse and fine aggregates shall be delivered and stored separately at Site. Aggregates shall not be stored on muddy ground or where they are likely to become dirty or contaminated.

c. Fine aggregate shall be hard coarse sand, crushed stone or gravel screenings and shall conform to requirements of IS:383 latest edition.

d. Coarse aggregate shall be gravel or broken stone or hard, durable material free from laminated structure and conforming to IS:383 latest edition. The aggregates shall be graded as follows for use in mass concrete as in foundations:

<table>
<thead>
<tr>
<th>TOTAL PASSING</th>
<th>PERCENT BY WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2&quot; B.S. Sieve (50.00 mm)</td>
<td>100</td>
</tr>
<tr>
<td>1-1/2&quot; Sieve (38.10 mm)</td>
<td>95-100</td>
</tr>
<tr>
<td>3/4&quot; Sieve (19.00 mm)</td>
<td>35-70</td>
</tr>
<tr>
<td>3/8&quot; Sieve (9.50 mm)</td>
<td>10-30</td>
</tr>
<tr>
<td>No. 4 Sieve (4.75 mm)</td>
<td>0-5</td>
</tr>
</tbody>
</table>

Coarse aggregate for all cast-in-place concrete other than mass concrete as for foundations shall be graded with the following limits:-

<table>
<thead>
<tr>
<th>TOTAL PASSING</th>
<th>PERCENT BY WEIGHT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; Sieve (25.00 mm)</td>
<td>100</td>
</tr>
<tr>
<td>3/4&quot; Sieve (19.00 mm)</td>
<td>90-100</td>
</tr>
<tr>
<td>3/8&quot; Sieve (9.50 mm)</td>
<td>20-55</td>
</tr>
<tr>
<td>No. 4 Sieve (4.75 mm)</td>
<td>0-10</td>
</tr>
</tbody>
</table>
e. Wherever feasible the nominal maximum size of aggregate for cast-in-place reinforced concrete slabs and other thin members shall also be 20 mm. If there are difficulties in placing such a concrete the maximum size may be restricted to 12.5 mm provided the requirements for strength are satisfied.

f. The nominal maximum size of aggregate for precast fair faced concrete shall not be larger than one-fifth of the narrowest dimensions between sides of forms, one-third of the depth of slabs, nor three-fourth of the minimum clear distance between reinforcing bars or between bars and form but in no case greater than 12.5 mm whichever is least.

g. Coarse aggregate in precast concrete of normal weight may be of one maximum size for all concrete placed in 1 day when quantities to be placed are too small to permit economical use of more than one mix design. When a single mix design is so used, the maximum nominal size shall be as required for the most critical conditions of concreting, in accordance with the requirement of Section (4.1.f) above.

h. Except where it can be shown to the satisfaction of Project Engineer that a supply of properly graded aggregate of uniform quality can be maintained over the period of the Work, the grading of the aggregates shall be controlled by obtaining the coarse aggregate in two sizes for aggregate of 20 mm maximum nominal size, the different size being stacked in separate stock-piles and recombined in the correct proportions for each batch at batching plant. The materials shall be stockpiled for a period before use so as to drain nearly to constant moisture content (as long as Site and other conditions permit, preferably for at least a day). The grading of the coarse and fine aggregate shall be tested at least once for every 100 tons supplied to ensure that the grading is uniform and the same as that of the samples used in the preliminary tests.

4.4.3 Water:

Only clean potable water from the city supply, tube well installed at the Site or from other sources approved by Project Engineer shall be used. Contractor shall supply sufficient water for all purposes, including mixing the concrete, curing and cleaning plant and tools. Where doubts exist as to the suitability of the water, it shall be tested in accordance with IS: 3025. Where water can be shown to contain any sugar or an excess of acid, alkali or salt, Project Engineer may refuse to permit use. As a guide, the following concentrations represent the maximum permissible values:

a. To neutralize 200 ml sample it should not require more than 2 ml of 0.1 normal NaOH.
b. To neutralize 200 ml sample it should not require more than 10 ml of 0.1 normal HCL.

c. Percentage of solids should not exceed the following:

<table>
<thead>
<tr>
<th></th>
<th>PERCENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organic</td>
<td>0.02</td>
</tr>
<tr>
<td>Inorganic</td>
<td>0.30</td>
</tr>
<tr>
<td>Sulphates</td>
<td>0.05</td>
</tr>
<tr>
<td>Alkali Chlorides</td>
<td>0.10</td>
</tr>
</tbody>
</table>

In case of doubt, Project Engineer may require that concrete mixed with water proposed to be used should not have a compressive strength lower than 90 percent of the strength of concrete mixed with distilled water.
4.4.4 Reinforcement:

   a. Reinforcement for concrete shall conform to the respective IS or other standards as specified in the drawings and Contract Documents or as may be specified by Project Engineer.

   b. Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of IS: 432, and shall have a minimum yield stress of 248 N/sq mm.

   c. Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of IS: 1786 for deformed cold worked steel bars and shall have minimum characteristic stress of 415 N/sq mm.

   d. Reinforcement shall be obtained only from manufacturer's approved by Project Engineer. If and when required Contractor shall provide all necessary facilities to Project Engineer for the selection of test pieces and shall cause these to be prepared and submitted where directed for tests at Contractor's cost.

   e. If the reinforcement is to be supplied by Employer, Contractor shall inform Project Engineer of his requirements much before its use in construction.

   f. Reinforcement of all types is to be stored at Site in an approved manner so as to avoid damage.

   g. Contractor shall report immediately on receipt of any consignment, having any deviation in the standard weights of the reinforcing bars beyond those allowed in respective standards mentioned in clause (4.4.b) and (4.4.c) herein before.

4.5 CONCRETE MIX PROPORTIONS

4.5.1 General:

   4.5.1.1 The proportions of ingredients shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the Work, but without permitting the materials to segregate or excessive free water to collect on the surface. Specific approval of the Project Engineer is required to waive limitations on mixture proportions.

   4.5.1.2 The proportions of ingredients shall be selected in accordance with Section 5.7 to produce the proper placability, durability, strength and other required properties.

4.5.2 Strength:

   The Specified compressive strength of the concrete cube, shall be 15 N/sq mm. or 20 N/sq mm. as noted on drawings. Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

4.5.3 Durability:

   Requirements of Clause 7 of IS:456-1978 shall be followed.
4.5.4 Slump:

Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 100 mm or less. A tolerance of upto 25 mm above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit.

Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

Note: If S.R. Cement is used, permissible water-cement ratio may be increased by 0.05. Slump shall be determined by the "Test for slump for Portland Cement Concrete" as per relevant IS code.

4.5.5 Maximum Size of Coarse Aggregate:

The nominal maximum size of the aggregate shall be 20 mm for all portions of the structure except footings which may be 38 mm. These limitations may be waived if, in the judgment of the Project Engineer, workability and methods of consolidation are such that the concrete can be placed without honeycomb or voids.

4.5.6 Admixtures:

If required or permitted, admixtures used shall be in accordance with the manufacturer's instructions except as otherwise specified herein.

4.5.7 Methods of Obtaining Mix Design:

For concrete of normal weight, mix proportions to provide the desired characteristics shall be developed using the methods/procedure covered by the Recommended Practice for Selecting Proportions for Normal Weight Concrete ACI-211.1-77/ IS:456-1978

Trial mixtures having proportions and consistencies suitable for the Work shall be made based on above codes, using at least three different water-cement ratios which will produce a range of strengths encompassing those required for the Work. Trial mixes shall be designed to produce the specified slump. The temperature of concrete used in trial batches shall be reported.

For each water-cement ratio, compression test of cube shall be made, cured, and tested in accordance with IS:1199 and IS:516. From the results of these tests a curve shall be plotted showing the relationship between the water-cement ratio and compressive strength. From this curve, the water-cement ratio to be used in the concrete shall be selected to produce the required design strength. The cement content and mixture proportions to be used shall be such that this water-cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement content and slump.

4.6 Ready mix concrete

4.6.1 Grades and Strength Requirements of Concrete
General

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

Slump

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

Concrete Grades

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

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

<table>
<thead>
<tr>
<th>Grade</th>
<th>Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kg/Sq.cm</td>
</tr>
<tr>
<td></td>
<td>7 days</td>
</tr>
<tr>
<td></td>
<td>28 days</td>
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<tr>
<td>M - 100</td>
<td>70</td>
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<tr>
<td>M - 150</td>
<td>100</td>
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<tr>
<td>M - 200</td>
<td>135</td>
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<td>M - 250</td>
<td>170</td>
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<td>M - 300</td>
<td>200</td>
</tr>
<tr>
<td>M - 350</td>
<td>235</td>
</tr>
<tr>
<td>M - 400</td>
<td>270</td>
</tr>
</tbody>
</table>

4.6.2 Transporting Concrete

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

4.6.3 Concrete placement

General

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

The concrete shall be placed in the positions and sequences indicated on the drawings, in this specification and/or as directed by the Architect/Project Manager.
Contractor shall give adequate notice to the Architect/Project Manager of his intention to concrete any section of the works.

Except where otherwise directed, concrete shall not be placed unless the representative of the Architect/Project Manager is present and has previously examined and approved the positioning, fixing and condition of the reinforcement or any other items to be embedded and the cleanliness, positioning and suitability of the concreting surface.

The concrete shall be deposited as nearly as possible in its final position. It shall be placed in such a manner as to avoid segregation of the concrete and displacement of the reinforcement, other embedded items, or formwork. It shall be brought up in horizontal layers not exceeding 450 mm in compacted thickness unless otherwise authorised or directed by Architect/Project Manager. Concrete shall not be placed simultaneously on each side of large horizontal specified or approved construction joints.

Shutters for walls or thin sections of considerable height shall be provided with openings or other devices that will facilitate the cleaning of the accumulation of hardened concrete on the shutters or on the metal reinforcement above the level of the concrete and the removal of concrete in the case of segregations.

Placing concrete in cold weather

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

Placing of concrete in wet weather

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

4.6.4 Concrete placement under water

Concrete placed under water shall be deposited through a tremmie pipe the diameter of which shall be at least 8 times the size of the largest aggregate used in the concrete mix.

The construction of and the method of handling the tremmie pipes shall be approved by the Architect/Project Manager. The pipes shall be waterproof and sufficiently strong to withstand severe handling conditions and any joints must be sealed with adequate gaskets.

At the commencement of tremmie work the bottom of the pipe shall be sealed before being lowered in to position. The seal shall only be broken by the concrete being placed. The concrete placed in contact with a horizontal construction joint shall have a lower proportion of coarse aggregate and a higher proportion of cement than the remainder of the concrete. The proportion shall be agreed with the Architect/Project Manager’s Representative.
All underwater concrete shall be placed in still water within a cofferdam or formwork which shall extend above water level.

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

4.6.5 Quality Control

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

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

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

iv) Not withstanding the foregoing, additional samples shall be taken by the contractor when directed by the Architect/Project Manager. The test cube procedure shall be in accordance with IS: 516 throughout.

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

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

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

4.6.6 Seven day cube tests

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

4.6.7 Acceptance Criteria

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

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

4.7 PLANT AND WORKMANSHP

4.6.1 Formwork:

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

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

4.6.1.2 Earth cuts shall not be used as forms for vertical surface or reinforced concrete work unless required or permitted.

4.6.1.3 Mud centering shall not be permitted without the prior approval of Project Engineer.

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

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

Contractor shall establish and maintain in an undisturbed conditions, and until final completion and acceptance of the Work, sufficient control points and bench marks to be used for reference purpose to check tolerances.

4.6.1.6 Requirements for facing materials are given in clause 4.8 "Finishing of formed surface". The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

4.6.1.7 Where natural plywood form finish, grout cleaned finish, smooth rubbed finish, scrubbed finish, or sand floated finish is required, forms shall be smooth (faced with plywood, liner sheets, or prefabricated panels) and true to line, in order that the surfaces
produced with required little dressing to arrive at true surfaces. Where any as-cast finish is required, no dressing shall be permitted in the finishing operation.

4.6.1.8 Where as-cast surfaces, including natural plywood form finish, are specified, the panels of materials against which concrete is cast shall be arranged orderly with joints between panels planned in approved relations to opening, building corners, and other architectural features.

4.6.1.9 Where panels for as-cast surfaces are separated by recessed or otherwise emphasized joints, the structural design of the forms shall provide for locating form ties within the, joints so that patches of tie holes will not fall within the panel areas.

4.6.1.10 Forms shall not be re-used if there is any evidence of surface wear and tear or defect which would impair the quality of the surface. Forms shall be thoroughly cleaned and properly coated before re-use.

4.6.1.11 The formwork shall be designed so that soffits of slabs and sides of beams, columns, and wall may be removed first leaving the forms to the soffits of beams and their supports in position.

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

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

4.6.1.14 Where concreting of narrow members is required to be carried out within formwork of considerable depth, temporary openings in the sides of the formwork shall be provided where necessary to facilitate the placing and consolidation of the concrete. Small temporary openings shall be provided at the bottom of the formwork to columns, walls and deep beams to permit the cleaning out of debris and observations immediately before concrete is deposited.

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

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

Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will be prevented.

4.6.1.18 Runways or planks for moving labour and equipment shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

4.6.1.19 All surfaces of forms and embedded materials shall be cleaned and any accumulated mortar or grout from previous concreting and of all other foreign material is removed before concrete is placed in them.

4.6.1.20 Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opened by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed. Plywood and other wood surface not subject to shrinkage shall be sealed against absorption of moisture from the concrete either by (1) a field applied, approved form oil or sealer, or (2) a factory applied non-absorptive liner. When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Care shall be taken that such approved coating is kept out of contact with the reinforcement. Where as-cast finishes are required, materials, which will impart a stain to the concrete shall not be applied to the form surfaces. Where the finished surface is required to be painted, the material applied to form surface shall be compatible with the type of paint to be used.

4.6.1.21 For reinforced concrete, in no circumstances shall forms be struck until the concrete strength has reached at least twice the stress to which the concrete may be subject 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 those existing on the work where possible, the formwork should be left longer, as it would assist the curing.

In normal circumstances (generally where temperatures are above 68°F (20°C) and where ordinary cement is used, forms may be struck after expiry of the following periods.

- Walls, columns, 48 hours or as may vertical sides of beams be directed by the Project Engineer.
- Slabs (Shores or props 10 days. left under, removal and refixing of props not permitted).
- Beams soffits (Shores or 12 days props left under, removal and refixing of props not permitted).
- Removal of shores or props to slabs:
  1. Spanning upto 14 ft. 10 days.
     (4 meters)
  2. Spanning over 14 ft. 21 days
(4 meters)

- Removal of shores or props of beams:

1. Spanning upto 20 ft. 18 days
   (6 meters)

2. Spanning over 20 ft. 25 days
   (6 meters)

For rapid hardening cement 3/4 of the above period will be sufficient in all cases except vertical sides of slabs, beams and columns which should be retained for a minimum 24 hours. The number of shores or props, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab and beams as the case may be. Proper allowance shall be made for the decrease in rate of hardening of concrete in cold weather and the above minimum times must be increased when the mean daily temperature is below 68°F, (20°C).

4.6.1.22 When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

Top forms on sloping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or the treatment required on such sloping surfaces shall be performed at once and followed by the specified curing.

4.6.1.23 All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the soffits 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.

4.6.1.24 When reshoring or repropping is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is underway no live load shall be permitted on the new construction. In no case during reshoring shall concrete in beams, slab, columns or any other structural member be subject to combined dead and construction loads in excess of the load permitted by Project Engineer for the developed concrete strength at the time of reshoring. Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.

Reshores shall be tightened to carry their required loads without overstressing the construction. Reshores shall remain in place at least until tests representative of the concrete being supported have reached the strength specified.

4.6.1.25 Floors supporting props or shores under newly placed concrete shall have their original supporting props or shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases have a capacity equal to at least one half of capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other locations are permitted.
The reshoring or re-propping shall extend over a sufficient number of storeys to distribute the weight of newly placed concrete, forms, and construction live loads in such a manner that the design superimposed load of the floors supporting shores or props are not exceeded.

No loads, other than those permitted by Project Engineer in connection with the actual work in hand, shall be allowed on suspended floors until 28 days after concreting where ordinary portland cement is used and 14 days when rapid hardening portland cement is used.

4.6.1.26 It is generally desirable to give forms for reinforced concrete an upward camber to ensure that the beams or slabs (Specially cantilever slabs) do not have a sag when they have taken up their deflection. Camber should be about 1/360.

4.6.2 Reinforcement

4.6.2.1 All metal for reinforcement shall be free from loose mill scale, loose rust, mud, oil, grease, or other harmful matter immediately before the concrete is placed.

4.6.2.2 Reinforcement is to be accurately placed as shown in the drawings, and secured against displacement by using 18-20 gauge black annealed wire ties or suitable slips at intersections and supported from the formwork by using concrete, metal or plastic chairs and spacers or hangers of an approved pattern. Where concrete blocks are used for ensuring the cover they shall be made of mortar not leaner than 1 part of cement to 2 parts of sand. Where the concrete surface will be exposed to the weather in the finished structure the portions of all accessories in contact with the formwork shall be galvanized or shall be made of plastic.

4.6.2.3 Bars used for concrete reinforcement shall be fabricated in accordance with the dimensions shown in the Schedule.

4.6.2.4 The cutting tolerance for all bars shall be +/-25 mm.

4.6.2.5 Where an overall or an internal dimension of a bent bar is specified in the schedule, the bending tolerance, unless otherwise stated, shall be as in Table 1.

4.6.2.7 Bars may be moved as necessary to avoid interference with other reinforcing steel, conduits, or embedded items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, resulting arrangement of bars shall be subject to approval of Project Engineer.

4.6.2.8 Vertical bars in column shall be offset at least one bar diameter at lapped splices. To ensure proper placement, templates shall be furnished for all columns dowels.

4.6.2.9 Reinforcement shall not be bent or straightened in a manner that will injure the material. No bars shall be bent twice in the same place, nor shall they be straightened after bending.

Unless permitted by Project Engineer, reinforcement shall not be bent after being partially embedded in hardened concrete. Bars which depend for their strength on cold working shall not be heated for any reason (except for welding; refer 4.6.2.11 of this
section). Other kinds of reinforcement larger than 38 mm in dia may be bent by the use of heat at (not exceeding 1550°F). Bars bent shall not be cooled by quenching.

4.6.2.10 No splice of reinforcement shall be made except as shown on the working drawings.

4.6.2.11 Welding shall be permitted for bars only under suitable conditions and with suitable safeguards in accordance with applicable Indian codes or B.S 693. 1856, or AWS D 12.1, provided the type of reinforcement bars have the required welding properties. Tack welding may be used to fix in position bars that cross each other, only with prior approval of Project Engineer.

4.6.2.12 Exposed reinforcement intended for bonding with future extensions is to be effectively protected from corrosion. Protection is also to be provided to reinforcement partly built into concrete exposed part to be built into later concrete.

4.6.2.13 No concreting is to be carried out until the reinforcement has been checked and approved by Consultant/Project Engineer.

4.6.3 Batching:

4.6.3.1 All cement, including cement supplied in bulk, shall be batched by weight. A bag of cement may be taken as 50 kg with the prior approval of Project Engineer.

4.6.3.2 Aggregate shall be batched by weight, due allowance being made for water content. Aggregate may be batched by volume only with the prior permission of Project Engineer. The apparatus for weight batching may be an integral part of the mixer or a separate unit of a type approved by Project Engineer. It shall be accurate within 2% and shall be checked for accuracy at least once a week.

4.6.3.3 Where the batching plant is of the type in which cement and aggregate are weighed in the same compartment, the cement shall be introduced into the compartment between two sizes of aggregate.

4.6.3.4 Where volumetric batching of aggregate is permitted gauge boxes shall be provided for measuring the coarse and the fine aggregate. These shall be deep and narrow rather than shallow and wide and shall be fitted with suitable handles. Tests for the bulking of sand shall be made at intervals and the necessary quantity of sand added.

4.6.3.5 Each batch shall be so charged into the mixer that some water will enter in advance of the cement and aggregates. Water shall continue to flow for a period which may extend to the end of the first 25 percent of the specified mixing time. Controls shall be provided to prevent batched ingredients from entering the mixer before the previous batch has been completely discharged.

4.6.4 Mixing:

4.6.4.1 The concrete shall be mixed in an approved batch mixer conforming to the requirement of IS: 1791. It shall be fitted with the manufacturer’s plate stating the rated capacity and the recommended number of revolutions per minute and shall be operated in accordance therewith. It shall be equipped with a suitable charging mechanism and an accurate water measuring device.
4.6.4.2 Mixing shall continue for the period recommended by the mixer manufacturer or until apparently the mix is uniform in colour, whichever period is longer. If it is desired to use a mixing period less than 1-1/2 minute Project Engineer's approval shall be obtained in writing.

4.6.4.3 Controls shall be provided to ensure that the batch cannot be discharged until the required mixing time has elapsed. At least three quarters of the required mixing time shall take place after the last of the mixing water has been added.

4.6.4.4 The interior of the mixer shall be free of accumulations that will interfere with mixing action. Mixing blades shall be replaced when they have lost 10% of their original height.

4.6.4.5 Concrete shall be mixed only in quantities for immediate use. Concrete which has set shall not be re-tempered, but shall be discarded.

4.6.5 Transport:

4.6.5.1 The concrete shall be transported from the place of mixing to the place of final deposit as rapidly as practicable by means which will prevent segregation or loss or addition to ingredients. It shall be deposited as nearly as practicable in its final position so as to avoid rehandling or flowing. All skips vehicles, or containers used for transporting the concrete shall be thoroughly cleaned.

4.6.5.2 During hot or cold weather, concrete shall be transported in deep containers; the deep containers, on account of their lower ratios of surface area to mass, reduce the rate of loss of water by evaporation during hot weather and loss of heat during cold weather.

4.6.6 Placing:

4.6.6.1 Before placing of concrete, formwork shall have been completed, water shall have been removed, reinforcement shall have been secured in place, expansion joint material, anchors, and other embedded items shall have been kept in position, and the entire preparation shall have been approved.

No concrete is to be placed into the foundation trenches until the ground to receive the same has been examined and approved by Project Engineer for this purpose.

4.6.6.2 Concrete shall be deposited continuously, or in layers of such thickness that no concrete will be deposited on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, construction joints shall be located as shown in the drawings or as approved by Project Engineer. Placing shall be carried out at such a rate that the concrete which is being integrated with fresh concrete is still plastic. Concrete which has partially hardened or has been contaminated by foreign materials shall not be deposited. Temporary spreaders in forms shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. They may remain embedded in the concrete only if made of metal or concrete and if prior approval has been obtained.

4.6.6.3 The actual sequence of construction proposed by Contractor shall be subject to Project Engineer's approval before construction starts on any part of the structure, and this sequence shall not be varied without Project Engineer's prior approval.
4.6.6.4 The concrete shall be placed after it has been mixed as soon as is practicable. Once the concrete has left the mixer no more water shall be added, although the concrete may be mixed or agitated to help maintain workability. The concrete shall not be used if, through any cause, the workability of the mix at the time of placing is too low for it to be compacted fully and to an acceptable finish by whatever means are available.

The time between mixing and placing should be reduced if the mix is richer or the initial workability of the mix is lower than normal, if a rapid hardening cement or an accelerator is used, or if the work is carried out at a high temperature or exposed to a drying atmosphere. Contractor shall ensure that the delay between mixing and placing does not exceed 45 minutes under any circumstances. Any concrete which does not satisfy this requirement shall not be used.

4.6.6.5 The concrete shall be deposited as nearly as possible in its final position to avoid rehandling. In no circumstances may concrete be made to flow along the forms by the use of vibrators. Concreting shall be carried out on as a continuous operation using methods which shall prevent separation or loss of ingredients.

4.6.6.6 The free fall of concrete shall not be allowed to exceed 2.5 m. Where it is necessary for the concrete to be lowered more than this, it shall be placed through pipe, the lower end of which shall be kept in or close to the freshly deposited concrete. The size of the pipe shall be not less than 225 mm diameter.

4.6.6.7 For massive concrete, concrete shall be placed in layers approximately 450 mm thick. Vibrator heads shall extend into the previously placed layer.

4.6.6.8 The workmen carrying concrete to the Site, and all other workmen moving about on the reinforcement before the concrete is placed shall move only along runways or planks placed for the reinforcement itself.

4.6.6.9 Prior to the laying of concrete on load bearing masonry walls, bearing plates and at other points, as may be directed by Project Engineer, the surface will be brought to a true, hard smooth, level using a cement sand mortar in the ratio of 1 volume of cement to 3 volumes of sand. Two layers of building paper weighing 400 g/m (1.3 oz/sq.ft) will then be laid flat to separate the concrete from the surface on which it is to be laid.

4.6.7 Construction Joints:

4.6.7.1 Concreting shall be carried out continuously upto construction joints, the position and arrangement of which shall be pre-determined by Project Engineer.

4.6.7.2 Joints not shown on the drawings shall be so made and located as to least impair the strength of the structure and shall need prior approval of Project Engineer. In general, they shall be located near the middle of the spans of slabs and beams unless a secondary beam intersects a main beam at this point, in which case the joint in the main beam shall be offset to a distance equal to twice the width of the secondary beam. Joints in walls and columns shall be at the underside of floors slab or beams, and at the top of footings. Beams, panels shall be placed at the same time as slabs. Joints shall be perpendicular to the main reinforcement.

4.6.7.3 All reinforcing steel shall be continued across joints. Key and inclined dowels shall be provided as directed by Project Engineer. Longitudinal keys at least 40 mm deep shall be provided in all joints in walls and between walls and slabs or footings.
4.6.7.4 When the work is to be resumed on a surface which has hardened, such surface shall be roughened in an approved manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface.

4.6.7.5 The hardened concrete of construction joints and of joints between footings and walls or columns, between walls or columns and beams or floors they support, joints in unexposed walls and all others not mentioned below shall be dampened (but not saturated) immediately prior to placing of fresh concrete.

4.6.7.6 The hardened concrete of joints in exposed work, joints in the middle of beams, and slabs and joints in work designed to contain liquids shall be dampened (but not saturated) and then thoroughly covered with a coat of cement grout of similar proportions to the mortar in the concrete. The grout shall be as thick as possible on vertical surface and at least 12.5 mm thick on horizontal surface. The fresh concrete shall be placed before the grout has attained its initial set.

4.6.7.7 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brush, care being taken to avoid dislodging of particles of aggregate. The surface shall then be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm in thickness, and shall be well rammed against old work, particular attention being paid to corners and close spots.

4.6.7.8 Stop ends for movement joints or construction joints shall be made by splitting them along the lines of reinforcement or the concrete. Stop ends made of expanded metal or similar material may only be left permanently in the concrete with prior written approval of Project Engineer. Where such stop ends are used, no metal may be left permanently in the concrete closer to the surface of the concrete than the specified cover to the reinforcement. Wood strips inserted for architectural treatment shall be kerned to permit swelling without pressure on the concrete.

4.6.8 Embedded Items:

4.6.8.1 The material, design and location of water-stops in joints shall be as indicated in the drawings. Each piece of premolded water stop shall be of maximum practicable length in order that the number of end joints will be held to a minimum.

Joints at intersections and at end of pieces shall be made in the manner most appropriate to the material being used. Joints shall develop effective water tightness fully equal to that of the continuous water-stop material, and shall permanently develop not less than 50% of the mechanical strength of the parent section, and shall permanently retain their flexibility.

4.6.8.2 Electric conduits and other pipes which are planned to be embedded shall not, with their fittings, displace more than four percent of the area of the cross section of a column on which stress is calculated or which is required for fire protection. Sleeves, conduits, or other piles passing through floors walls, or beams shall be such size or in such location so as not to impair unduly the strength of the construction. Such sleeves, conduits in compression in the displaced concrete, provided that they are not exposed to rusting or other deterioration, are of uncoated or galvanized iron or steel not thinner than standard steel pipe, have a nominal inside diameter not over 50mm and are spaced at centres not less than thrice their diameter on centers. Except when plans of conduits and pipes are approved by Project Engineer embedded pipes or conduits other than those merely passing through, shall not be larger in outside diameter than one-third the thickness of
the slab, walls, or beam in which they are embedded nor shall be spaced closer than three diameters on centre, nor so located as to impair unduly the strength of the construction. Sleeve pipes, or conduits with-in the limitations of this section may be embedded in concrete with the approval of Project Engineer, provided they are not considered to replace the displaced concrete.

4.6.8.3 All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.

All Contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.

4.6.8.4 Expansion joint material, water stops and other embedded items shall be positioned accurately and supported against displacement. Voids in sleeves, inserts, and anchor slots shall be filled temporarily with readily removable material to prevent the entry of concrete into the voids.

4.6.9 Consolidation:

4.6.9.1 All concrete shall be consolidated by vibration, so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of form, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Internal vibrators shall have a minimum frequency of 800 vibrations per minute and sufficient amplitude to consolidate the concrete effectively.

They shall be operated by competent workmen. Use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at points approximately 450mm apart. At each insertions, the duration shall be sufficient to cause segregation, generally from 5 to 15 sec. A spare vibrator shall be kept on the Site during all concrete placing operations. Where the concrete is to have an as-cast finish, a full surface of mortar shall be brought against the form by the vibration process supplemented if necessary by spading to work the coarse aggregate back from the formed surface.

4.6.9.2 If there is any tendency for the mix to segregate during consolidation, particularly if this produces excessive laitance, the mix proportions shall be modified to affect an improvement in the quality of the concrete to the satisfaction of Project Engineer and in conformity with the provisions of Clause 5.

4.6.9.3 Vibrators shall not be allowed to contact the formwork for exposed concrete surface.

4.6.9.4 Mechanical vibrators shall be of a type suited in the opinion of Project Engineer to the particular conditions.

4.6.9.5 Over-vibration or vibration of very wet mix is harmful and should be avoided.

4.6.10 Curing and Protection:

4.6.10.1 Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relative constant temperature for the period
necessary for hydration of the cement and hardening of the concrete. The materials and methods of curing shall be subject to approval of Project Engineer.

4.6.10.2 For concrete surfaces not in contact with forms, one of the following procedure shall be applied immediately after completion and finishing:

- Ponding or continuous sprinkling.

- Application of absorptive mats or fabric kept continuously wet.

- Application of water proof sheet materials approved by Project Engineer.

- Application of other moisture retaining covering as approved.

- Application of curing compound: The compound shall be applied in accordance with the recommendations of the manufacturer immediately after any water sheen which develops after finishing has disappeared from the concrete surface. It shall not be used on any surface against which additional concrete or other material is to be bonded unless it is proved that the curing compound will not prevent bond, or unless positive measures are taken to remove it completely from area to receive bonded applications.

4.6.10.3 Moisture loss from surface placed against wooden forms or metal forms exposed to heating by the sun shall be minimized by keeping forms wet until they can be safely removed. After form removal, the concrete shall be cured until the end of the limit prescribed herein.

4.6.10.4 Curing in accordance with relevant clauses shall be continued for at least 10 days in the case of all concrete except concrete with rapid hardening portland cement for which the period shall be at least 3 days.

Alternatively, if tests are made of cubes kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached 70 percent of the minimum specified works cube strength. If one of the first four curing procedures of clause 4.6.10.2 us used initially, it may be replaced by one of the other procedures of that Clause any time after the concrete is not permitted to become surface dry during the transition.

4.6.10.5 When the mean daily outdoor temperature is less than 5°C (41°F) then temperature of the concrete shall be maintained between 10-20°C (50°F - 68°F) for the required curing period of Clause 4.6.10.4. When necessary arrangements for heating covering insulation or housing the concrete work shall be made in advance of placement and shall be adequate to maintain the required temperature without injury to concentration of heat. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

4.6.10.6 When necessary, provision for windbreak, shading for spraying, sprinkling, ponding or wet covering with a light coloured material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow.
4.6.10.7 Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed 5°F (-15°C) in any one hour or 50°F (10°C) in any 24 hour period.

4.6.10.8 During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials or methods by application of curing procedures, and by rain or running water, self-supporting structures shall not be loaded in such a way as to overstress the concrete.

4.6.11 Works in Extreme Weather:

4.6.11.1 Unless adequate protection is provided and approval is obtained concrete shall not be placed during rain. Rain water shall not be allowed to increase the mixing water nor to damage the surface finish.

4.6.11.2 When the temperature of the surrounding air is expected to be below 4.4°C (40°F) during placing or within 24 hours thereafter, the temperature of the plastic concrete, as placed shall be no lower than 12.5°C (55°F) for sections less than 300 mm in any dimension nor 10°C (50°F) for any other sections.

When necessary, concrete materials should be heated before mixing and carefully protected after placing; in general, heating or mixing water alone to about 60°C (140°F) may be sufficient for this purpose. Dependence should not be placed on salt or other chemicals for the prevention of freezing. Calcium Chloride up to 1-1/2 percent of the weight of cement may be used to accelerate the rate of hardening only with prior written permission of Project Engineer. Use of calcium chloride in excess of 1-1/2 percent is harmful. No frozen material or materials, containing ice shall be used. All concrete damaged by frost shall be removed. It is recommended that concrete exposed to the action of freezing weather should have entrained air and the water content of the mix should not exceed 25 liters per bag of cement. If water or aggregate is heated above 37.8°C (100°F) the water shall be combined with the aggregate in the mixer before cement is added. Cement shall not be mixed with water or with mixtures of water and aggregate having a temperature greater than 37.8°C (100°F).

4.6.11.3 During hot weather, the temperature of the concrete as placed shall not be so high as to cause difficulty from loss of slump, flash set, or cold joints and should not exceed 90°F (32.2°C). For massive concrete this temperature should not exceed 70°F (21.1°C). When the temperature of the concrete exceeds 90°F (32.2°C), precautionary measures approved by Project Engineer shall be put into effect. When the temperature of the steel is greater than 122°F (50°C) steel forms and reinforcement shall be sprayed with water just prior to placing the concrete. The ingredients shall be cooled before mixing, or flake ice or well-crushed ice of a size that will melt completely during mixing may be substituted for all or part of the mixing water if, due to high temperature, low slump, flash set or cold joints are encountered.

Other precautions recommended by IS:761(Part-I) and/or IS:7861 (Part-II) and/or ACI standard 305-72 shall also be adopted.
4.7 TEST FOR CONCRETE QUALITY

4.7.1 General:

Contractor shall provide samples of concrete for testing at Project Engineer's direction. Proper facilities shall be provided for making and curing the test specimens in accordance with the specifications. A competent person shall be employed by Contractor whose first duty shall be to supervise all stages in the preparation and placing of the concrete. All test specimens shall be made and Site tests carried out under his direct supervision and at Contractor's cost.

4.7.2 Samples:

Quantum of cubes and testing
The minimum frequency of cube casting shall be as follows. Each sample shall consist of 6 cubes.

<table>
<thead>
<tr>
<th>Concrete quantity</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upto 5 cu m in a day</td>
<td>1</td>
</tr>
<tr>
<td>5 cu m to 15 cu m</td>
<td>2</td>
</tr>
<tr>
<td>15 cu m to 30 cu m</td>
<td>3</td>
</tr>
<tr>
<td>30 cu m to 50 cu m</td>
<td>4</td>
</tr>
<tr>
<td>More than 50 cu m</td>
<td>4 + one additional per each 50 cu m or part thereof</td>
</tr>
</tbody>
</table>

Three cubes shall be tested on the 7th day and other three cubes on the 28th day.

4.7.3 Adequacy of Mix:

In case of Concrete mix, the appropriate strength requirement shall be considered to be satisfied if none of the strengths of the specimen is below the specified strength or if the average strength of the three specimens is not less than the specified strength and the difference between the greatest and least strengths is not more than 20% of that average.

When the results of tests show that the strength of any concrete is below the minimum specified, Project Engineer may give instructions for the whole or part of the work concerned to be removed and be replaced at the expense of Contractor. Contractor shall bear the cost of any other part of his, or any other Contractor's work, which has to be removed and replaced as a result of the defective concrete. If any concrete is held to have failed, Project Engineer may order the proportions of that class of concrete to be changed in order to provide the specified strength.

4.8 FINISHING OF FORMED CONCRETE

4.8.1 General:

4.8.1.1 After removal of forms the surfaces of concrete shall be given one or more of the finishes specified below in locations designated by the drawing or as specified in Clause 4.8.5.

4.8.1.2 When finishing is required to match a small sample furnished to Contractor, the sample finish shall be reproduced on an area at least 10 square meters in an inconspicuous location designated by Project Engineer before proceeding with the finishing the specified location.

4.8.2 As-Cast Finishes:
4.8.2.1 Rough Form Finish:

No selected form facing materials shall be specified for rough form finish surfaces. Tie holes and defects shall be patched. Unless if required to be retained if so directed by Engineer. Fins exceeding 6 mm in height shall be chipped off or rubbed off. Otherwise, surfaces shall be left with the texture imparted by the forms.

4.8.2.2 Smooth Form Finish:

The form facing material shall produce a smooth, hard uniform texture on the concrete.

It may be plywood, tempered concrete-form grade hard board, metal, plastic paper, or other approved material capable of producing the desired finish. The arrangement of the facing material shall be orderly and symmetrical, with the number of seams kept to the practical minimum. It shall be supported by studs or other backing capable of preventing excessive deflection. Material with raised grain, torn surfaces, worn edge, patches, dents, or other defects which will impair the texture of the concrete surface shall not be used. Tie holes and defects shall be patched. All fins shall be completely removed.

4.8.3 Architectural Finishes:

4.8.3.1 Textured Finishes:

Textured form liners may be of formed plastic sheet, wood, sheet metal, or other material designated in drawings. Liner panels shall be secured in forms by cementing or stapling, but not by methods which will permit impressions of nail heads, screw heads, washers, or the like to be imparted to the surface of the concrete, unless shown otherwise on the drawings. Edges of textured panels shall be sealed to each other or to dividing strips, if specified or shown, to prevent bleeding of grout. The sealant used shall be non-staining to the surface.

4.8.3.2 Applied Finishes:

When finishes of plaster or similar trowelled materials are to be applied, the surface of the concrete shall be prepared to ensure permanent adhesion of the finish. If the concrete is less than 24 hours old, it can be roughened with a heavy wire brush or scouring tool. If the concrete is older the surface may be roughened mechanically or by etching with dilute hydrochloric acid. After roughening, the surface shall be washed free of all dust, acid, chemical retarder, and other foreign material before the final finish is applied.

4.8.4 Rubbed Finishes:

The following finishes shall be produced on concrete with a smooth form finish. Where smooth rubbed finish is to be applied, the forms shall have been removed and necessary patching completed as soon after the placement of the concrete as possible without compromising any structural requirements.

4.8.4.1 Smooth Rubbed Finish:

Smooth rubbed finish shall be produced on newly hardened concrete not later than a day following form removal.
Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until uniform colour and texture are produced. No cement grout shall be used other than the cement paste drawn from the concrete itself by the rubbing process.

4.8.4.2 Grout Cleaned Finish:

No cleaning operations shall be undertaken until all contiguous surfaces to be cleaned are completed and accessible. Cleaning as the work progresses shall not be permitted.

Mix 1 part Portland Cement and 1-1/2 part fine sand with sufficient water to produce a grout having the consistency of thick paint. White Portland Cement shall be substituted for a part of the grey Portland Cement in order to produce a colour matching the colour of the surrounding concrete, as determined by a trail patch.

Wet the surface of the concrete sufficiently to prevent absorption of water from the grout and apply the grout uniformly with a brush or a spray gun. Immediately after applying the grout, scrub surface vigorously with a cork float or stone and fill all air bubbles and holes. While the grout is still plastic, remove all excess grout by working the surface with a rubber float, sack or other means. After the surface whitens from drying (about thirty minutes at normal temperature) rub vigorously with clean burlap. The finish shall be kept damp for at least 36 hours after final rubbing.

4.8.4.3 Cork Floated Finish:

1. Remove forms at an early stage, within 2 to 3 days of placement where possible.

2. Remove ties, and all burrs and fins.

3. Mix 1 part portland cement and 1 part fine sand with sufficient water to produce a stiff mortar.

4. Dampen surface.

5. Apply mortar with firm rubber float or with trowel, filling all surface voids.

6. Apply a small amount of water with a fog spray to prevent too rapid drying of compressed mortar.

7. Apply a small amount of water with a fog sprayer.

8. Produce the final texture with a cork float using a swirling motion.

4.8.5 Unspecified Finishes:

If the finish is not designated in the drawings, the following finishes shall be used as applicable:

a. Rough Form Finish:

For all concrete surface not exposed to public view.

b. Smooth Form Finish:
For all concrete surfaces exposed to public view.

4.8.6 Related Unformed Surfaces:

Tops of walls or buttresses, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces shall be struck smooth after concrete is placed and shall be floated to a texture reasonably consistent with that of the formed surfaces. Final treatment on form surfaces shall continue uniformly across the unformed surfaces.

4.9 REPAIR OF SURFACE DEFECTS:

4.9.1 General:

4.9.1.1 Any concrete failing to meet the specified strength or not formed as shown on drawings, concrete with surface beyond tolerances or with defective surfaces which cannot be properly repaired or patched in the opinion of Project Engineer and/or Structural Engineer shall be removed and replaced at Contractor’s expenses. Project Engineer may reject any defective concrete and order it to be cut out in part or in whole and replaced at the Contractor’s expense. Only in case of minor surface defects, Project Engineer may approve a surface treatment in accordance with the clause.

4.9.1.2 All ties and bolt holes and all repairable defective areas shall be patched immediately after the removal of forms.

4.9.2 Repair of Defective Areas:

4.9.2.1 All honeycombed and other defective concrete shall be removed down to sound concrete. The area to be patched and area at least 150 mm wide surrounding it shall be dampened to prevent absorption of water from the patching mortar. A bonding grout shall be prepared using a mix of approximately 1 part cement to 1 part fine sand and shall then be well brushed into the surface.

4.9.2.2 The patching mixture shall be made of the same material and of approximately the same proportions as used for the concrete, except that the coarse aggregate shall be omitted and the mortar shall consist of not more than 1 part cement to 2-1/2 parts sand by damp loose volume. White portland cement shall be substituted for a part of the grey portland cement on exposed concrete in order to produce a colour matching the colour of the surrounding concrete, as determined by a trial patch.

4.9.2.3 The quantity of mixing water shall be not more than necessary for handling and placing. The parching mortar shall be mixed in advance and allowed to stand with frequent manipulation with a trowel, without addition of water, until it has reached the stiffest consistency that will permit placing.

4.9.2.4 After surface water has evaporated from the area to be patched, the bond coat shall be well brushed into the surface. When the bond coat begins to loose the water sheen, the premixed patching mortar shall be applied. The mortar shall be thoroughly consolidated into place and struck off so as to leave the parch slightly higher than the surrounding surface to permit initial shrinkage; it shall be left undisturbed for at least one hour before being finally finished. The patched area shall be kept damp for seven days. Metal tools shall not be used in finishing a patch in a formed wall which will be exposed.
4.9.2.5 Where as-cast finishes are specified, the quantity of patched area shall be strictly limited. The combined total of patched areas in as-cast concrete surfaces shall not exceed 2 sq.metre in each 1000 sq.m of as-cast surface. This is in addition to form tie patches, if the project design permits to fall within as-cast areas.

4.9.2.6 Any patches in as-cast Architectural concrete shall be indistinguishable from surrounding surfaces. The mix formula for patching mortar shall be determined by trial to obtain a good colour match with the concrete when both patch and concrete are cured and dry. After initial set, surface of patches shall be dressed manually to obtain the same texture as surrounding surfaces.

4.9.2.7 Patches in architectural concrete surfaces shall be cured for 7 days. Patches shall be protected from premature drying to the same extent as the body of the concrete.

4.9.3 Tie and Bolt Holes:

After being cleaned and thoroughly dampened, the tie and bolt holes shall be filled solid with patching mortar.

4.9.4 Proprietary Materials:

If permitted or required by Project Engineer proprietary compounds for adhesion or as patching ingredients may be used in lieu of or in addition to the foregoing patching procedures. Such compounds shall be used in accordance with the manufacturer’s recommendation with prior approval of Project Engineer.

4.10 CONCRETE CONSTRUCTION TOLERANCE

Where tolerances are not stated in the Specifications or Drawing for any individual structure or feature, maximum permissible deviations from established lines, grades and dimensions shall conform to the following. The Contractor is expected to set and maintain concrete forms so as to ensure completed work within the tolerance limits. These allowable tolerances shall not relieve Contractor of his responsibility for correct fitting of indicated materials. Those tolerances are not cumulative.

4.10.1 Variation from the plumb (or as specified for sloped walls).

a. In the lines and surfaces of columns, piers and walls.

* In any 10 ft (3 m) of length or height: .........................1/4” (6 mm)

* In any storey or 20 feet (6 meters) Max: ................3/8” (10 mm)

* Maximum for the entire length or height: ................3/4” (20 mm)

b. For exposed corner columns, control joint grooves and other conspicuous lines.

* In any bay or 20 feet (6 meters) maximum: .................1/4” (6 mm)

* Maximum for the entire
length or height: ..................1/2" (12.5mm)

4.10.2 Variation from the levels or the grades indicated on drawings:

a. In floors, ceilings, beam soffits and in risers.

* In any 10 feet (3 meters) of length: ......................1/4" (6 mm)

* In any bay or 20 feet (6 meters) feet maximum: ......3/8" (10 mm)

* Maximum for the entire length: .............................3/4" (20 mm)

b. For exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:

* In any bay or 20 feet (6m) maximum: ......................1/4" (6 mm)

* Maximum for the entire length: .............................1/2" (12.5mm)

4.10.3 Variation of the entire building lines from established position in plan and related position of columns, walls and partitions.

a. In any bay or 20 feet (6m) maximum: ......................1/2" (12.5mm)

* Maximum for the entire length: .............................1" (25 mm)

4.10.4 Variation of the size and locations of sleeves, floors openings and wall openings: ...........1/4" (6 mm)

4.10.5 Variation in cross-sectional dimensions of columns and beams and in the thickness of slabs and walls.

Minus: .........................1/4" (6 mm)
Plus: .............................1/2" (12.5mm)

4.10.6 Footings:

a. Variations in dimensions in plan.

* Minus: .............................1/2" (12.5mm)

* Plus (plus variation applied to concrete only, not to Bars dowels): ....................2" (50 mm)

b. Misplacement or eccentricity.
* 2 percent of the footing width in the direction of misplacement but not more than (Applies to concrete only, not to reinforcing bars or dowels): .................2" (50 mm)

c. Reduction in thickness  
   * Minus 5 percent of specified thickness.

4.10.7 Variation in Steps
a. Rise: ..............................1/8" (3 mm)  
   Tread: ..............................1/4" (6 mm)

b. In Consecutive Steps  
   Rise: ..............................1/16" (1.5mm)  
   Tread: ..............................1/8" (3 mm)

4.10.8 Tolerance for Precast Concrete:  
Forms must be true to size and dimensions of concrete members shown on the plans and be so constructed that the dimensions of the finished product will be within the following limits at the time of placement of these units in the structure, unless otherwise noted on Project Engineer's drawings.

a. Overall dimensions of members
   per 10 ft (3 mm): ...............+/- 16" (1.5mm)

b. Cross-sectional dimensions
   Section less than 3" (75mm): ...+/- 1/16" (1.5mm)

   Section over 3" (75mm) less
   than 18" (450mm): ...............+/- 1/8" (3 mm)

   Section over 18" (450mm): ......+/- 1/4" (6 mm)

c. Deviations from straight lines in long sections. Not more than 1/8 inch (3mm) in 10 ft (3m).

d. Deviation from specified camber +/− 1/16" (1.5mm) per 10 ft (3m) of span. Maximum differential between adjacent units in erected position 1/4 inch (6mm).

4.10.9 Tolerance for Pavements:

a. Ramps  
   * Departure from established alignment +/− 1/2 inch (12.5mm).
   * Departure from established longitudinal +/− 1/4" (6mm) grade on any line.
   * Departure from transverse template contour except at transverse joints +/− 1/8 inch (+/- 3mm).
   * Departure from transverse template control at transverse joints +/− 1/4" (+/-6 mm) in width of one traffic lane.

4.10.10 Pavements for Parking Areas:  

   Twice values listed for ramp pavements.
**4.11 ACCEPTANCE OF STRUCTURE**

4.11.1 General:

4.11.1.1 Completed concrete work which meets all applicable requirements will be accepted subject to the other terms of the Contract Documents.

4.11.1.2 Completed concrete work which fails to meet one or more requirements and which has been repaired to bring it into compliance will be accepted subject to the other terms of the Contract Documents.

4.11.1.3 Completed concrete work which fails to meet one or more requirements and which cannot be brought into compliance may be accepted or rejected as provided in these specifications or in the Contract Documents. In this event, modifications may be required to assure that remaining work complies with the requirements.

4.11.2 Dimensional Tolerances:

4.11.2.1 Formed surfaces resulting in concrete outlines smaller than permitted by the tolerances of Section 4.10 considered potentially deficient in strength and subject to the provisions of Section 4.11.4.

4.11.2.2 Formed surfaces resulting in concrete outlines larger than permitted by the tolerances of Section 10 may be rejected and the excess material shall be subject to removal. If removal of the excess material is permitted, it shall be accomplished in such a manner as to maintain the strength of the section and to meet all other applicable requirements of function and appearance.

Permission is required if excess material is to be removed in accordance with this Section.

4.11.2.3 Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely effected or misplaced items interfere with other construction.

4.11.2.4 Inaccurately formed concrete surfaces exceeding the limits of Section 4.10.1 and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.

4.11.3 Appearance:

4.11.3.1 Architectural concrete with surface defects exceeding the limitations of Section 4.10 shall be removed in accordance with this Section.

4.11.3.2 Concrete members cast in the wrong location may be rejected if the strength, appearance or function of the structure is adversely effected or misplaced items interfere with other construction.

4.11.3.3 Inaccurately formed concrete surfaces exceeding the limits of section 4.10 and which are exposed to view, may be rejected and shall be repaired or removed and replaced if required.
4.11.3.4 Other concrete exposed to view with defects which adversely affect the appearance of the specified finish may be repaired only by approved methods.

4.11.3.5 Concrete not exposed to view, but of defective appearance, may be accepted at the discretion of the Project Engineer.

4.11.4 Strength of Structure:

4.11.4.1 The strength of structure in place will be considered potentially deficient if it fails to comply with any requirements which control the strength of the structure, including but not necessarily limited to the following conditions:

- Concrete strength requirements not considered to be satisfied in accordance with section 7.

- Reinforcing steel size, quantity, strength, position or arrangement at variance with the requirements of Section 4.4 & 6.3 of the Contract Documents.

- Concrete which differs from the required dimensions or location in such a manner as to reduce the strength.

- Curing less than that specified.

- Inadequate protection of concrete from extremes of temperature during the early stages of hardening and strength development.

- Mechanical injury as defined in section 6.10.h, construction fires, accidents or premature removal of formwork likely to result in deficient strength.

- Poor workmanship likely to result in deficient strength.

4.11.4.2 Structure analysis and/or additional testing may be required when the strength of the structure is considered potentially deficient.

4.11.4.3 Core tests may be required when the strength of the structure is considered potentially deficient.

4.11.4.4 If core tests are inconclusive or impractical to obtain or if structural analysis does not confirm the safety of the structure, load tests may be required and their results evaluated in accordance with IS:456.

4.11.4.5 Concrete work judged inadequate by structural analysis or by results of a load test shall be reinforced with additional construction, if so directed by Project Engineer or shall be replaced, at the Contractor's expense.

4.11.4.6 The Contractor shall pay all costs incurred in providing the additional testing and/or analysis required by this Section.

4.11.4.7 Employer will pay all costs of additional testing and/or analysis which are made at his request and which are not required by specifications, or the Contract Documents.
4.12 METHODS OF MEASUREMENT OF CONCRETE WORKS

4.12.1 General:

4.12.1.1 Unless otherwise specifically stated in the Bill of Quantities, or herein, all items shall be deemed to be inclusive of, but not limited to, the following:

i. Labour/plant and all costs in connection therewith.

ii. Materials, goods and all costs in connection therewith, e.g. conveyance, delivery, unloading, returning, packing, handling, hoisting, lowering.

iii. All fixtures and all costs in connection therewith for precast works.

iv. Fitting and fixing materials and goods in position.

v. Waste of materials, and Square cutting.

vi. Mixing, transporting, hoisting, placing in from at any level, compacting through vibration & curing etc complete including the cost of formwork & its removal (but excluding cost of reinforcement).

vii. Establishment charges, overhead charges and profit.

viii. All other expenses, charges and taxes specified in Conditions of Contract.

4.12.1.2 Works shall be measured net as fixed in position as per drawings and instructions of Project Engineer. Each measurement shall be taken to the nearest 12.5mm. This rule shall not apply to any dimensions stated in descriptions.

4.12.2 Concrete:

4.12.2.1 Concrete shall be measured as executed but no deduction shall be made for the following:

- Volume of any steel embedded in the concrete.

- Volume occupied by water pipes, conduits etc, not exceeding 2500 sq.mm each in cross-sectional area.

- Voids not exceeding 0.1 sq.m. If any void exceeds this limit total void shall be deducted.

- Voids not exceeding 0.03 cubic meter in work. If any void exceeds this limit, total void shall be deducted.

4.12.2.2 Voids, which are not to be deducted as per Section above, refer only to openings or vents which are wholly within the boundaries of measured areas. Openings or vents which are at the boundaries of measured areas shall always be subject to deduction irrespective of size.

4.12.2.3 Junctions between straight and curved works shall in all cases be deemed to be included with the work in which they occur.
4.12.2.4 Concrete work shall be classified and measured separately as follows unless otherwise described elsewhere:

- Buildings, foundation beams, foundation slabs, footings, bases of columns, machine foundations, mass concrete etc, in cubic meters.

- Floor slabs on ground with floor beams in cubic meters.

- Walls in foundations, plinth and superstructure in cubic meter stating thickness.

- Columns, piers, pilasters, pillars etc, in cubic meter.

- Lintels, beams and brackets in cubic meter.

- Suspended floors, roofs and stair landings in square meter stating thickness.

- Stairs (including landing) in cubic meter.

- Railings in cubic meter, square meter, or linear meter stating description.

- Parapets, purdees and the like in cubic meter stating thickness.

- Jali, blocks in square meters stating thickness & description.

- Precast concrete items shall each be enumerated except if otherwise shown in the bill of quantities, separately stating the description.

4.12.2.5 Measurement of walls shall be taken between attached columns, piers or pilasters. The thickness of attached columns, piers or pilasters shall be taken as the combined thickness of the wall and the columns, piers or pilasters. Attached or isolated columns, piers, pilasters and the like (except where caused by openings) having a length on plan not exceeding four times the thickness shall be classified as columns. Those having a length over four times the thickness and caused by openings in walls shall be classified as walls. Columns shall be measured from the top of footings/beams or floor surfaces to the under side of beams or slabs as the case may be. Where the width of the beams is less than the width of columns, the extra width at the junction shall be included in the beam.

The depth of the beams shall be measured from bottom of the slab to the bottom of the beams, except in case of inverted beams where it shall be measured from top of slab to the top of beam. The cross section below or above the slab.

4.12.3 Formwork:

4.12.3.1 Formwork (if separate and extra payment is specifically stated in the Bill of Quantities) shall be measured in square meters as the actual surface of the finished structure which required to be supported during the deposition of the concrete, including the upper surfaces to the work sloping more than 15 degree from the horizontal. No allowance shall be made for overlaps and passing at angles and no deduction shall be made for the following:-
- Voids not exceeding 1 Sq.m.
- Intersections of main beams with walls or columns.
- Intersections of secondary beams with main beams.

4.12.3.2 Formwork shall be deemed to be inclusive of, but not limited to items detailed in section 12.1 and the following: -

- Batten, struts, reversed cut strings, bolting, oiling, wedging, easing, striking, removing and making good exposed faces of concrete after removal of formwork. Also yokes, wales, sheathing, jack rods, jacks, working platforms and finishers, scaffolds, etc.

4.12.3.3 Forming chamfers not exceeding 50mm wide and forming splayed internal angles not exceeding 12.5mm wide shall not be paid for extra.

4.12.3.4 Temporary stop ends for constructed joints shall not be measured and paid for.

4.12.3.5 Classification of formwork (if separate and extra payment is specifically stated in the Bill of Quantities) shall be as follows:-

- To horizontal or sloping soffits of suspended slabs, floors, roofs, staircases, landings and the like.

- To sloping upper surfaces of suspended slabs, floors, roofs and the like where more than 15 degree from horizontal.

- To vertical or battering sides of foundations, foundation beams and slabs, ground beams, machine foundations and the like.
- To vertical or battering sides of walls, solid balustrades and the like.

- To vertical or battering sides.

- To vertical or battering sides of stanchion casings, columns, piers, plasters and the like.

- To sides and soffits of openings in walls, recesses in walls, projecting panels on walls and the like.

- To sides and soffits of horizontal or sloping beam casings, beams, brackets, lintels, staircase, strings and the like.

- To sloping upper surfaces of beam casings, beams, brackets, lintels, staircase-strings and the like where more than 15 degrees from horizontal.

- To edges of beds, roads, footpaths, paving and the like.

- To edges of suspended slabs, floors, roofs, landing and the like.

- To risers of steps and staircases.

- To sides of kerbs, upstands and the like.
4.12.3.6 Formwork to throats, grooves, chases, chamfers over 50mm wide splayed internal angles over 12.5mm wide moulding and the like shall each be measured separately in linear meter stating the size.

4.12.4 Rate for Reinforcement:

4.12.4.1 The rate tendered for any type of reinforcement by the Contractor shall also be inclusive of the cost of binding wire wastage, and the cost of concrete, metal or plastic chairs and spacers or hangers, etc.

4.12.4.2 All reinforcement shall be provided in length shown in drawings and as per Specifications. Should the Contractor provide lengths of reinforcement which are greater than shown on the drawings no payment of extra length shall be made. Overlaps, unless clearly shown in working drawings, shall not be allowed and measured.

4.12.4.3 The Contractor shall be paid for reinforcement by weight computed from Table-2 and from linear measurements of reinforcements actually used at Site as per the drawings, Specifications and instructions of Project Engineer. No payment shall be made for steel chairs or wastage. Contractor shall not claim for the difference in the actual weights of bars and their standard weights given below.

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4.13 FORM WORK

4.13.1 SCOPE OF WORK.

The work covered by this section of the specifications, consists of furnishing all plant, labour, equipment, appliances and materials and in performing all operations in connection with the supply and installation of form work for concreting, complete in strict accordance with this section of the specifications and subject to the terms and conditions of the Contract.

4.13.2 GENERAL.

It shall be the responsibility of the Contractor to perform the work by well trained and experienced staff or by the Sub-Contractor who shall have enough number of well trained and experienced staff and coordinate with the other operations. However the Contractor shall be responsible for the quality of work performed by the Sub-Contractor as per the requirements of these specifications.
4.13.3 MATERIALS.

The Contractor shall use the following Form work materials for different purposes as stated below:

1. Timber.
   Form framing, sheathing, and shoring.

2. Plywood.
   From sheathing and panels.

3. Steel.
   - Heavy forms and false work.
   - Column and joint forms.
   - Permanent forms.
   - Welding of Permanent forms.

4. Form Ties Anchors, and Hangers.
   Principle Use: For securing formwork against placing loads and pressures.

5. Coatings.
   Principle Use: Facilitate form removal.

   Principle Use: Form work support.

7. Steel Frame Shoring.
   Principle Use: Form work support.

4.13.4 Delivery and Storage.

4.13.4.1 Delivery.

The delivery of formwork materials shall be done in such a manner that damage can be prevented.

4.13.4.2 Storage.

Formwork should be stored, after cleaning and preparing for re-use if used before in such a manner that access to all different materials and kinds is available. Materials which can be stored in appropriate buildings or under covers.

4.13.5 WORKMANSHIP.

4.13.5.1 Forms shall be used, wherever necessary, to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances.
The main architectural theme is to retain the concrete as the finished facade material. Therefore, the Contractor shall provide a special and perfect formwork. The drawings set out details and locations of these special formwork. The Project Engineer shall refuse any formwork in any part of the building which has been constructed with a non-approved formwork. The Project Engineer shall refuse any concreting which will not be as perfect or conform to the approval model.

4.13.5.2 Earth cuts shall not be used as forms for vertical surfaces of reinforced concrete work unless required or permitted.

4.13.5.3 Mud centering shall not be permitted without the prior approval of the Project Engineer.

4.13.5.4 Formwork shall be of wrought timber, steel, plywood, proprietary building boards and such special materials, as may be shown on the drawings or approved by the Project Engineer, which gives the required finish to the surface of concrete, wooden formwork shall be free from loose knots and shall be well seasoned.

4.13.5.5 The formwork shall conform to the shape, lines and dimensions as shown on the plans, and be so constructed as to remain sufficiently rigid during the placing and compacting of the Concrete, and shall be sufficiently tight to prevent loss of liquid from the concrete, and shall be sufficiently tight to prevent loss of liquid from the concrete.

The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. Where necessary to maintain the specified tolerances the formwork shall be cambered to compensate for anticipated deflections in the formwork due to the weight and pressure of the fresh concrete and due to construction loads.

The Contractor shall establish and maintain in an undisturbed condition and until final completion and acceptance of the project sufficient control points and bench marks to be used for reference purposes to check tolerances.

4.13.5.6 Requirements for facing materials are given in section for 'Finishing of Formed Surfaces'. The maximum deflection of facing materials reflected in concrete surfaces exposed to view shall be 1/240 of the span between structural members.

4.13.5.7 Where natural plywood from finish, grout cleaned finish, smooth rubbed finish, scrubbed finish, or sand floated finish is required, forms shall be smooth (faced with plywood, liner sheets, or pre-fabricated panels) and true to line, in order that the surfaces produced will require little dressing to arrive at true surfaces. Where any as-cast finish is required, no dressing shall be permitted in the finishing operation.

4.13.5.8 Where as-cast surfaces, including natural plywood from finish are specified, the panels of material against which is cast shall be orderly in arrangement, with joints between panels planned in approved relation to opening, building corners, and other architectural features.

4.13.5.9 Where panels for as-cast surfaces are separated by recessed or otherwise emphasized joints, the structural design of the forms shall provide for locating form ties, where possible, within the joints so that patches of tie holes will not fall within the panel areas.
4.13.5.10 Forms shall not be re-used if there is any evidence of surface wear and tear or defect which would impair the quality of the surface. Forms shall be thoroughly cleaned and properly coated before-use.

4.13.5.11 The formwork shall be designed so that the soffits of slabs and sides of beams, columns, and walls may be removed first, leaving the forms to the soffits of beams and their supports in position.

4.13.5.12 Forms shall be sufficiently tight to prevent loss of mortar from the concrete. Unless otherwise specified in the Contract Documents chamfer strips shall be placed in the corners of forms to produce beveled edges on permanently exposed surfaces. Interior corners on such surfaces and the edges of formed joints will not required beveling unless required by the contract documents.

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

4.13.5.14 Where concreting of narrow members is required to be carried out within formwork of considerable depth, temporary openings in the sides of the formwork shall be provided where necessary to facilitate the placing and consolidation of the concrete. Small temporary openings shall be provided at the bottom of the formwork to columns, walls and deep beams to permit the cleaning out of debris and observation immediately before concrete is deposited.

4.13.5.15 Form ties shall be constructed so that the ends or end fasteners can be removed without causing appreciable spalling at the faces of the concrete.

   After the ends or end fasteners of form ties have been removed, the embedded portion of the ties shall terminate not less than 2 diameter or twice the minimum dimension of the site from the formed faces of concrete to be permanently exposed to view, except that in on case shall this distance be less than 20mm. When the formed face of the concrete is not to be permanently exposed to view, from ties may be cut off flush with the formed surfaces.

   Through bolt shall be permitted provided that they are greased to allow for easy withdrawal and the holes subsequently made good. Through bolts are not to be used on water-retaining structures.

4.13.5.16 At construction joints, contact surface of the form sheeting for flush surfaces exposed to view shall overlap the hardened concrete in the previous placement by no less than 25mm. The forms shall be held against the hardened concrete to prevent offsets or loss of mortar at the construction joints and to maintain a true surface.

4.13.5.17 Wood forms for wall opening shall be constructed to facilitate loosening, if necessary to counteract swelling of the forms.

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

4.13.5.19 Formwork shall be so anchored to shores or other supporting surfaces or members that upward or lateral movement of any part of the formwork system during concrete placement will be prevented.
4.13.5.20 Formwork shall be provided with struts or legs and shall be supported directly on the formwork or structural member without resting on the reinforcing steel.

4.13.5.21 All surfaces of forms and embedded materials shall be cleaned of any accumulated mortar or grout from previous concreting and of all other foreign material before concrete is placed in them.

4.13.5.22 Forms shall be sufficiently tight to prevent leakage of grout or cement paste. Board forms having joints opening by shrinkage of the wood shall be swelled until closed by wetting before concrete is placed.

Plywood and other wood surfaces not subject to shrinkage shall be sealed against absorption of moisture from the concrete to by either (1) a field applied, approved form oil or sealer, or (2) a factory applied non-absorptive liner. When forms are coated to prevent bond with concrete, it shall be done prior to placing of the reinforcing steel. Excess coating material shall not be allowed to stand in puddles in the forms nor allowed to stand in puddles in the forms nor allowed to come in contact with the concrete against which fresh concrete will be placed. Care shall be taken that such approved composition is kept out of contact with the reinforcement. Where as-cast finishes are required, materials, which will impart a stain to the concrete shall not be applied to the form surfaces. Where the finishes surface is required to be painted, the material applied to form surfaces shall be compatible with the type of paint to be used.

4.13.5.23 For reinforced concrete, in no circumstances shall forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subject at the time of striking.

The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions, and cured under conditions of temperature and moisture similar to those existing on the work. Where possible, the formwork should be left longer, as it would assist the curing.

In normal circumstances (generally where temperatures are above 20 degree C) and where ordinary cement is used, forms may be struck after expiry of the following periods.

- Walls, columns and vertical or sides of beams. 48 hours
- Sides of slab (shores or props left under) 6 days
- Beams soffits (Shores or props left under) 12 days
- Removal of shores or props to slabs.
  1. Spanning upto 13.124 ft/4 meter 10 days
  2. Spanning over 13.124 ft/4 meter 16 days
- Removal of shores or props to beams.
  1. Spanning upto 19.686 ft/6 meter 18 days
  2. Spanning over 19.686 ft/6 meter 25 days
For rapid hardening cement 3/7 of above period will be sufficient in all cases except vertical sides of slabs, beams and columns which should be retained for minimum 24 hours.

The number of shores or props, their sizes and disposition shall be such as to be able to safely carry the full dead load of the slab and beams as the case may be.

Proper allowance shall be made for the decrease in rate of hardening of concrete in cold weather and the above minimum times must be increased when the means daily temperature is below 20 degree C.

4.13.5.24 When repair of surface defects or finishing is required at an early age, forms shall be removed as soon as the concrete has hardened sufficiently to resist damage from removal operations.

4.13.5.25 Top forms on slipping surfaces of concrete shall be removed as soon as the concrete has attained sufficient stiffness to prevent sagging. Any needed repairs or treatment required on such sloping surfaces shall be performed at once and be followed by the specified curing.

4.13.5.26 Wood forms for wall openings shall be loosened as soon as this can be accomplished without damage to the concrete.

4.13.5.27 All formworks 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 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.

4.13.5.28 When reshoring or repropping is permitted or required, the operations shall be planned in advance and shall be subject to approval. While reshoring is underway no live load shall be permitted on the new construction.

In no case during reshoring shall concrete in beam, slab, column or any other structural member be subjected to combined dead and construction loads in excess of the load permitted by the Project Engineer for the developed concrete strength at the time of reshoring.

Reshores shall be placed as soon as practicable after stripping operations are complete but in no case later than the end of working day on which stripping occurs.

Reshores shall be tightened to carry their required loads without overstressing the construction. Reshores shall remain in place at least until tests representative of the concrete being supported the strength specified in sub-clause (5.23) earlier.

4.13.5.29 Floors supporting props or shores under newly placed concrete shall have their original supporting props or shores left in place or shall be reshored. The reshoring system shall have a capacity sufficient to resist the anticipated loads and in all cases shall have a capacity equal to at least one half of capacity of the shoring system above. The reshores shall be located directly under a shore position above unless other locations are permitted.
The reshoring or re-propping shall extend over a sufficient number of storeys to distribute the weight of newly placed concrete forms, and construction live loads in such a manner that the design superimposed loads of the floors supporting shores or props are not exceeded. Shoring or reshoring in multistory construction shall comply with ACI 347 or as specified herein.

Extend shoring at least 3 floors under floor or roof being placed for structures over 4 stories. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores space out shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimum if required to ensure the proper distribution of loads throughout the structure.

Remove shores and reshores in a sequence to avoid damage to partially cured concrete. Located and provide adequate reshoring to safely support the work.

Keep reshores in place a minimum of 15 days after placing supper ties and longer if required, until the concrete has attained its required 28 days strength and heavy loads due to construction operations have been removed.

4.13.5.30 It is generally desirable to give forms for reinforced concrete an upward camber to ensure that the beams or slabs (specially cantilever slabs) do not have taken up their deflection, but this should not be done, unless permitted by the Project Engineer.

4.13.5.31 No loads, other than man and light plant required in connection with the actual work in hand, shall be allowed on suspended floors until 28 days after concreting where ordinary portland cement is used and 14 days when rapid hardening portland cement is used.

4.13.5.32 Prior to placing concrete, all forms shall be inspected and all debris and extraneous matter removed. The form oil or release agent shall not react with concrete to affect the strength nor shall it given any colour. It shall be supplied in such a manner as not to be embedded in concrete.

4.13.2 MEASUREMENT AND PAYMENT.

No payment will be made for the works involved within the scope of this section of the specification unless otherwise specifically stated in the Bill of Quantities or herein.

The cost thereof shall be deemed to have been included in the relevant items of the Bill of Quantities.

4.14 STEEL REINFORCEMENT

4.14.1 SCOPE OF WORK.

The work to be done under this section consists of furnishing, cutting, fabricating, bending, placing and tying steel reinforcement in concrete structures or else where as shown on the drawings or directed by the Project Engineer. The scope of this section of this section of specifications as laid down herein.
14.2 MATERIAL AND SIZE OF BARS.

4.14.2.1 Reinforcement for concrete shall conform to the respective Indian or other standards as specified in the drawings and in the contract documents or as may be specified by the Project Engineer.

4.14.2.2 Unless otherwise specified, all plain mild steel reinforcing bars shall comply with the requirements of IS: 432 (Part-I) and shall have a minimum yield stress of 250 N/mm².

4.14.2.3 Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of IS: 1786 for deformed cold twisted steel bars and shall have a minimum characteristic strength of 415 N/mm².

4.14.2.4 Reinforcement shall be obtained only from manufacturers approved by the Consultant/Project Engineer. Each consignment of reinforcement steel shall be accompanied by a manufacturer's certificate or shall refer to a previous certificate, if the consignment is from the same batch, showing that the reinforcement steel complies with the following requirement.

If such certificate is not made available or if the Consultant / Project Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Project Engineer may direct and shall be tested at the Contractor's cost should the result of such test not meet with the specifications, the whole consignment shall be rejected and removed from the site at the Contractor's cost.

4.14.2.5 Reinforcement of all types is to be stored on site in approved manner so as to avoid damage.

4.14.2.6 Reinforcement shall be free from all loose or flaky rust and mill scale or coating, including ice, and other substance that would reduce or destroy the bond. Reduced section steel reinforcement shall not be used.

4.14.2.7 Steel wire mesh reinforcement shall conform to requirement of relevant Indian codes or those of ASTM: A 185-64 or BS. 4483, 1969: Standard Specifications for welded steel wire fabric for concrete reinforcement. It shall be used where shown on the drawings.

4.14.3 APPLICABLE STANDARDS.

Latest editions of Indian Standards as per 4.3 or other International Standards.

4.14.4 DELIVERY & STORAGE.

4.14.4.1 Delivery.

Steel reinforcement bars shall be delivered in bundles firmly secured and tagged. Each bars or bundle of bars shall be identified by marks stamped on hot or cold or painted on or by any other means. The identifying marks shall contain the following information:

- Name of the producer or his trade.
- Standard to which the bars have been manufactured.
- The clause, type and strength respectively.
- The diameter.
- The number of the test certificate (if available).

4.14.4.2 STORAGE.

The method of storage shall be approved by the Project Engineer.

Reinforcing bars shall be stored in racks or platforms above the surface of ground and shall be protected free from scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different diameters and grades of steel reinforcement shall be kept separate.

4.14.5 BAR BENDING SCHEDULES.

The Contractor shall prepare bar bending schedule of all the reinforcing steel bars and these bar bending schedules will be supplied to the Consultants/Project Engineer in duplicate on the basis of which the work shall be carried out. However, the Contractor shall be responsible to satisfy himself as to the correctness and accuracy of the bar bending schedule. Any discrepancy shall immediately be notified to the Consultant / Project Engineer before commencing work.

4.15 MEASUREMENT & PAYMENT.

4.15.1 General.

Except otherwise specified herein or else where in the Contract documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities.

Providing and installing chairs, supports, hooks, spacers, binding wires, and laps not shown on drawings including wastage and rolling margin.

4.15.2 Measurement.

Measurement for acceptably completed works of reinforcement shall be made by weight according to bar bending schedules approved by the Consultant / Project Engineer.

4.15.3 Payment.

Payment will be made for acceptable measured quantity of reinforcement on the basis of unit rate per ton or kg quoted in the bill of quantities and shall constitute full compensation for all the works related to the item.
5.0 **BRICK MASONRY**

5.1 **GENERAL.**

Brick Masonry shall consist of all work required in connection with constructing brick masonry at locations shown on drawings including, but not limited to, furnishing brick, portland cement and sand for mortar and all other materials, and mixing, placing brick masonry as per bill of quantities.

5.2 **MATERIALS.**

i) All portland cement for mortar shall be furnished by the Contractor and shall conform to the applicable requirements specified in the section "Plain and Reinforced Concrete".

ii) All sand for mortar shall be furnished by the Contractor and shall conform to the applicable requirements for sand specified in the section "Plain and Reinforced Concrete".

iii) All water used in the manufacture of bricks and in the preparation of mortar shall be free from objectionable quantities of silt, organic matter, alkali, salts and other impurities, and will be tested and approved by the Project Engineer as per the guidelines of IS: 456.

5.3 **MORTAR.**

i) MIX: Mortar for all brick masonry, except where otherwise directed by the Project Engineer, shall consist of one part cement to six parts of damp loose mortar sand by volume for brickwork 230mm and above. For brick piers, half brick walls, honey-combed brickwork and hollow (cavity) walls, the mortar mix shall consist of one part cement and four parts of sand. Quantity of water shall be just sufficient enough to produce proper consistency for the intended use. Where directed and approved by the Project Engineer, hydrated lime putty, shall be added to the mortar for increased workability. The putty shall, however, not exceed 25% by volume of the dry cement.

ii) Methods and equipment used for mixing mortar be such as will accurately determine and control the amount of each separate ingredient entering into the mortar and shall be subject to the approval of the Project Engineer. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of the water to the mix shall be wasted. Re-tempering of mortar will not be allowed. The mixers shall be thoroughly cleaned and washed at the end of each day's work.

5.4 **BRICK.**

i) All bricks shall be of first class quality made from good brick earth, free from saline deposits and shall be sand moulded. They shall be thoroughly burnt without being vitrified, shall be regular, uniform in shape and size with sharp and square edges parallel faces and of deep red or copper colour. First class bricks shall be homogeneous in texture and emit a clear ringing sound when struck, and shall be free from flaws, cracks, chips, stones and nodules of lime. First class brick in an oven dried condition shall not absorb more than 1/5 of its weight of water when immersed for one hour in water at 21 to 27 degrees centigrade and shall show no signs of efflorescence on subsequent drying. The average compressive strength of five representative first class bricks shall be 15 N/mm.sq. and shall no result shall fall below 10 N/mm sq. The bricks in general shall conform to the requirements of IS:1077.
ii) All bricks shall be manufactured by the Trench Kiln method or other standard methods approved by the Project Engineer. The earth used in manufacturing bricks shall be carefully selected and shall be free from objectionable quantities of lime, gravel coarse sand, roots, or other organic matter salts shall not exceed 0.3% and calcium carbonate shall not exceed 2.0%.

iii) The moulds used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. The size ready for use shall be 9" by 4 3/8" by 2 3/4" (229X 112X 70mm) and shall weigh between 3.2 to 4.2 Kilograms. All bricks shall have a "Frog" 1/4" deep on one face.

5.5 PLACING.

i) The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the brick nor delay the use of mixed mortar. Brick shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar which becomes diluted by rain shall be removed and replaced before continuing with the work. All bricks to be used in brick masonry shall be moistened with water for three to four hours before they are used. The chosen method of wetting shall ensure that all bricks are thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry.

ii) Bricks shall be laid "Frog" upward with mortar joints and in English bond as shown on the drawings or as directed by the Project Engineer. Both bed and vertical joints shall be 6mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and repointed.

iii) The exterior faces of the walls shall be finished by striking the joints as the work proceeds. The joints shall be struck by raking the green mortar after the brick work has been laid and finishing the joint with a pointing tool. Horizontal joints shall be struck to form a weathered joints and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge as the object of striking the joint is to compress the mortar into the joints.

iv) REINFORCED BRICKWORK:

All half brickwork shall be reinforced with 2 no. 6.mm dia M.S. round bars or equivalent reinforcement at every fourth course. The reinforcement cleaned of rust and loose flakes with a wire brush, shall be embedded thoroughly in cement mortar at every fourth course. It shall be cast in or securely fixed to adjoining columns or walls, in a manner approved by the Project Engineer.
5.6 CURING AND REPAIR.

i) All brick masonry shall be water cured and shall be kept wet for least seven days by an approved method which will keep all surfaces continuously wet. Water used for curing shall meet the requirements of these specifications for water used in the manufacture of bricks.

ii) If, after the completion of any brick masonry work, the brick are not in alignment or level or does not conform to the lines and grades shown on the drawings, or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Project Engineer grants permission, in writing to patch or replace the defective area.

5.7 SCAFFOLDING.

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expenses. Scaffolding which is unsafe in the opinion of the Project Engineer shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Contractor in the unit rate for masonry items.

Damaged, masonry from scaffolding or from any other objection shall be repaired by the Contractor at his own cost.

5.8 TOLERANCES.

The brickwork shall be erected plumb and true to line at level with the maximum variation in any storey height of any length of wall being one meter. The maximum tolerance in the length, height or width of any single masonry unit shall be +/- 3mm.

5.9 MEASUREMENT AND PAYMENT.

5.9.1 GENERAL.

Except otherwise specified herein or elsewhere in the contract documents, the measurement and payment will be made for the under mentioned specified works related to the relevant items of the bill of quantities.

5.9.1.1. Cutting & chiseling of masonry wherever required.

5.9.1.2. Cement sand mortar used in laying bricks including wastage.

5.9.1.3. Curing & repairing the masonry work.

5.9.1.4. All joint reinforcing bars, reinforcing anchor bars and dove tail anchors.

5.9.2 BRICK MASONRY.
5.9.2.1. Measurement.

Measurement of acceptable completed works of brick masonry will be made on the basis of cubic meters provided and installed in position as shown on the drawing or as directed by the Project Engineer.

5.9.2.2. Payment.

Payment will be made for acceptable measured quantity of brick masonry on the basis of unit rate per cum quoted in the bill of quantities and shall constitute full compensation for all the works related to the items.

5.10 CEMENT CONCRETE BLOCK MASONRY.

5.10.1 SCOPE OF WORK.

The work covered by this section of the specifications, consist of furnishing all plant, labour, equipment, appliances & materials and in performing all operations in connection with the supply and installation of ordinary cement concrete solid and hollow block masonry including wall ties, anchors, damp-proof courses and expansion joints, complete in strict accordance with this section of the specifications and the applicable drawings and subject to the terms and conditions of the contract.

5.10.2 APPLICABLE STANDARDS.

Following Indian Standards which are relevant to these specifications shall be applicable.

- IS: 712-1984
- IS: 1077-1986
- IS: 1200 (Pt.III)-1976
- IS: 2212-1962
- IS: 3102-1971
- IS: 3495-(Pts i-iv)-1976
- IS: 3812-1981
- IS: 5454-1978
- IS: 12894-1990

5.10.3 MATERIALS.

5.10.3.1 For Block.

Cement, aggregates and water for concrete blocks shall conform to the requirements as specified in the section for plain and reinforced concrete or as approved by the Project Engineer.

5.10.3.2 For Mortar.

5.10.3.2.1 Sand.

Sand for mortar shall be clean and shall comply with the requirements IS codes and as specified in the section for plain and reinforced concrete.
5.10.3.2.2 Cement.

Ordinary portland cement conforming to IS:269 shall be used in preparation of mortar.

5.10.3.2.3 Lime.

If directed as an additive by the Project Engineer, lime to be used shall comply with relevant IS codes.

5.10.3.2.4 Water.

Water shall be clean and free from any harmful impurity. Where the quality of the water is doubtful, it shall be tested in accordance with IS codes.

5.10.3.2.5 Additives.

Additives where used, shall be proprietary products used in the proportions and manner recommended by the manufacturer. The additives shall in no way adversely affect the mortar strength or contain chemicals which may be harmful to other buildings materials. Adding of gypsum to cement is strictly forbidden.

5.10.3.3 Mortars and Grout.

Materials for mortar, sand binding agent and water, shall be mixed by volume or by weight for at least 3 minutes with the minimum amount of water to produce a correctly mixed workable consistency in a mechanical batch mixer. For small jobs, hand mixing may be permitted. The ingredients shall be mixed with just enough water to produce a correctly mixed workable mortar.

Mortar shall be as strong, but no stronger than the materials it bonds together. Mortar shall be mixed in batches which can be used within its setting period. Once a mix begins to dry off it shall be discarded, no ingredients shall be added to it once the setting process has begun.

5.10.4 CONCRETE BLOCK MAKING.

5.10.4.1 The solid and hollow blocks shall be machine moulded. The block making machines shall be of the standard approved by the Project Engineer. They shall be operated according to the instructions laid down by the manufacturers.

5.10.4.2 The Contractor shall provide test certificates providing the average minimum crushing strength of the blocks prior to the commencement of the construction. Further test certificates shall be provided as required by the Project Engineer to ensure that all batches of blocks have the minimum crushing strength specified. The block strengths are to be determined in accordance with IS specs.

5.10.4.3 The test shall be carried out by a laboratory approved by the Project Engineer. Evidence shall be produced that the block manufacturer has an efficient method of quality control. The Project Engineer will require to periodically test samples of blocks, and the Contractor shall made any necessary arrangements. The method of sampling for all tests shall be in accordance with IS codes.
5.10.4.4 All properties or specifications of blocks, not explained in these specifications or CPWD specifications shall comply with the requirements of I.S. codes, as directed by the Project Engineer.

5.10.4.5 The specifications of Hollow block units shall be in conformity with the Indian Standards, according to the requirements. The constituent materials equipment, aggregates, water, process of manufacture including mixing, dimensions including tolerance, density, width of cavities in hollow blocks, bedding joints, surface plain curing, compressive/transverse strength, drying shrinkage, moisture movement, shall be strictly controlled/determined and tested in accordance with the relevant IS codes.

5.10.5 SOLUBLE SALT CONTENT.

For exposed block work, the contents by weight percent of soluble sulphate, calcium, magnesium potassium and sodium radicals, shall not exceed respectively 0.30, 0.10, and 0.03 percent when ascertained in accordance with IS codes at the cost of the Contractor.

5.10.6 REINFORCING AND ANCHORS.

Unless otherwise stated reinforcing and anchors shall conform to under mentioned sizes.

5.10.6.1 Tie bars shall be provided at the rate of 3' (0.9m) c/c horizontal, and 16"(0.4m) vertical, of the size and shape as shown in the drawings in cavity block masonry with insulation.

5.10.6.2 Dovetail anchors and slots (if used as an alternate anchorage) shall be not less than 18 gauge galvanized steel.

5.10.7 ERECTION.

5.10.7.1 Blocks shall be laid true to line, level and laid in accurately spaced courses in stretching bond with vertical joints of each course located at centre of units in alternate courses below vertical joints shall be buttered the entire height of blocks. Each course shall be bonded at corners and intersections of walls and shall be properly bonded. Courses of block shall be kept plumb throughout and corners, reveals shall be true and in plumb.

Standard width of mortar joints for both horizontal and vertical joints shall be 9-10mm (3/8") mortar joints in walls shall have full mortar coverage on vertical and horizontal faces between the blocks. Mortar joints on walls including struck joints, shall be thoroughly compacted and pressed tight against the edges of the blocks with proper tools. Blocks terminating against soffits of beam or slab construction shall be wedged tight with mortar between the top of the block and the bottom of slab or beam. Control expansion joints shall be kept free from mortar or other debris.

Unless otherwise shown on the drawings of specified by the Project Engineer, the spaces around door frames and other materials or built in items shall be solidly filled with mortar. Spaces around the door and window holdfasts shall be filled in with concrete.

Work required to be built in with masonry including door frame anchors, wall plugs dovetail anchors and accessories shall be built in as the erection progresses.

5.10.7.2 The block work shall be carried up in uniform manner and no portion shall be carried more than one 1m above the adjoining one at any time. All masonry shall be kept strictly true and square and the whole properly bonded together and levelled round each floor.
5.10.7.3 Sleeves, chases, holes, sinking and mortices for other trades shall be correctly located and formed to the sizes as required by the relevant trades, chiseling of completed walls or the formation of holes shall only be carried out with the approval of the Project Engineer.

5.10.7.4 All bolts, anchors, ties, pep sleeves, finishing metal attachments lintels and the like required to be built into the work shall be correctly inserted and executed as the work proceeds. Walls or partitions abutting concrete columns or walls shall be securely anchored and tied with metal anchors or ties at not more than 18”/450 mm vertical centers.

Wall ties cost in with concrete shall be bent down after the removal of form work and securely jointed into the mortar beds of walling.

5.10.7.5 Walls of blocks indicated as being non-load bearing shall be constructed on the in-situ concrete floor slab unit after the floor formwork is struck and the concrete has obtained sufficient strength to support their weight. Toothing into load bearing walls shall not be permitted.

5.10.8 SCAFFOLDING.

Contractor shall provide safe scaffolding of adequate strength for use of workmen at all levels and heights at his own expense. Scaffolding which is unsafe in the opinion of the Project Engineer shall not be used until it has been strengthened and made safe for use of workmen. Cost of scaffolding etc., shall be included by the Contractor in the unit rate for masonry items.

Damage to masonry form scaffolding or from any other object shall be repaired by the Contractor at his own cost.

5.10.9 JOINTING.

Jointing is the forming of joints as work proceeds.

Joints shall be as follows:

5.10.9.1 Exterior exposed joints shall be tightly formed to a weather joint with the point of the trowel.

5.10.9.2 Interior exposed joints shall be tightly formed to a concave joint.

5.10.9.3 Joints which are subsequently covered with plaster or other finish materials shall be struck flush.

5.10.10 TOLERANCES.

All block work shall be erected plumb and true to line and level with the maximum variation in any storey height or any length of wall being one mm in one meter. The maximum tolerance in the length, height or width of any single masonry unit shall be +,- 3mm.
5.10.11 DAMP PROOF COURSE.
Damp proof courses shall be laid on an even mortar bed, free from projections which may puncture the material. Where the damp proof course is to be stepped only flexible membranes shall be used.

Damp proof course unless otherwise specified shall consist of cement concrete 50mm thick, mixed with approved quality water proofing compound as per manufacturers specifications and shall be laid at required level as per drawings and instructions of the Project Engineer. The D.P.C. shall be tamped, consolidated, levelled and edges and corners made to the requirements of drawings and shall include finishing and curing.

5.10.12 SOLID BLOCK WORK AROUND OPENING OF HOLLOW MASONRY.
Around all openings in hollow block masonry, the Contractor shall provide solid block work of same thickness as that of hollow block masonry wall and of width as indicated on the drawings. Solid block shall be laid around openings in a manner that these are bonded integrally with hollow block masonry.

5.10.13 EXPANSION JOINT.
Where shown on the drawings, expansions joint shall be provided. The joint shall be filled with silicon sealant and finished true to line and level.

5.10.14 CURING AND REPAIRS.

i) All block masonry shall be water cured and shall be kept wet for at least seven days, by an approved method which will keep all surfaces to be cured continuously wet. Water used for curing shall meet the requirements of these specifications for water used in the manufacture of blocks.

ii) If, alter the completion of any block masonry work, the block is not in alignment or level or does not, conform to the lines and grades shown on the drawings or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Project Engineer grants permission, in writing, to patch or replace the defective area.

5.10.15 MEASUREMENT AND PAYMENT.

5.10.15.1 General.

Except otherwise specified herein or else where in the contract documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the bill of quantities. The cost there of shall be deemed to have been included in the quoted unit rate of the respective items of the bill of quantities.

______ Chiseling of masonry, where required.

______ Providing and fixing all joint reinforcing bars and dove tail anchors.

______ Providing and filling Class 'D' concrete in the cavity of hollow block masonry.

______ Providing and laying damp proof courses.

______ Providing and installing expansion joint in block masonry.
5.10.15.2. HOLLOW BLOCK MASONRY.

5.10.15.2.1 Measurement.

In case of different thickness of slab in different areas or rooms or for any other reasons, whatsoever, if chiseling of masonry is required, the Contractor shall do so at his own cost. Where for any reason whatsoever the height of the wall is short of ceiling height shall be made good with Class ‘C’ nominal mix concrete. This concrete shall neither be measured nor be paid under item of concrete but will be paid for under the item of wall masonry. Similarly where the lintel heights are such that the Contractor has to chisel the masonry or provide cast-in-place concrete to make up the height of the course, no payment will be made for chiseling, but where such cast-in-place concrete is provided, payment for the same will be made at the unit rate of masonry.

Measurement for acceptably works of Hollow block masonry will be made on the basis of number of Sft provided and installed in position as shown on the drawings or as directed by the Project Engineer. Each measurement shall be taken to the nearest 1/2”. All openings left in the masonry wall be deducted.

5.10.15.2.2. PAYMENT.

Payment will be made for acceptable measured quantity of Hollow block masonry work on the basis of unit rate per square foot quoted in the bill of quantities and shall constitute full compensation for all the works related to the item.
6.0 WATER PROOFING

6.1 General

It is the intent of this specification to secure a completely water tight basement guaranteed for at least 10 (Ten) years. The contractor shall provide all materials, labour, plant, equipment, incidentals and everything necessary for securing a fully water proof job as called for above.

All water proofing work shall be carried out by specialists approved by the Project Manager. Installation and materials shall be as per best practices for obtaining water proof work and as recommended by the manufacturer.

Water proofing work shall be commenced only after the surface is prepared, cleaned free of dirt, dust and foreign matters, inspected and approved. Compressed air shall be used for effective cleaning of all surfaces. The vents and other projections through the roof shall be made absolutely secure before flashing.

6.2 Injection method waterproofing treatment to the basement

a) Horizontal Surface: After the excavation and PCC leveling course, water proofing cement plaster 20mm thick shall be laid consisting of cement mortar 1:3 (1 cement:3 sand) and mixed with Acrylic water proofing chemicals. Two coats of polymer (cementitious base) shall be applied over the plaster. Polymer coating shall be protected by 20mm thick waterproofing plaster. After the necessary curing, and fixing raft reinforce cement in partition provide G.I Nozzles not less than 18mm dia. at 1.5 m c/c on both ways by tying it with reinforcement in such a manners to ensure that the bottom end of the pipe remain free from getting chocked and the length of the pipes shall be that of total thickness of the raft plus 25 mm above to protrude from the surface of the raft.

After concreting the raft, grouting Acrylic based waterproofing chemical mixed with neat cement slurry through the pipe inserts shall be carried and for the required period. The projected pipe ends shall be cut after grouting the mouths. The same procedure shall be adopted for all joints around the column wall joints.

b) Vertical Surfaces: The vertical surfaces shall be treated by making holes on the surface at 1.50 m centre to centre on both ways and also at all joints, corners and fixing nozzles of pipe (not less than 18mm) and inject Acrylic based chemicals mixed with neat cement slurry as explained above. After grouting the pipe, nozzles shall be removed and the packets shall be made good. The external surface of the walls shall be neatly plastered with cement mortar (1:3) admixed with Acrylic Chemicals in two layer of 15 to 20 mm thick each so that the average thickness shall be 40 mm. Between the two layers of plaster two coats of polymer (cementitious base) shall be done.

The minimum proportion of the approved Acrylic based chemicals to be used in respect of ordinary Portland cement shall be 1 kg of chemical with 100 kg of cement. The total operation has to be got done through approved agency with Ten years guarantee on stamped paper.
6.3 **Roof Waterproofing (BRICK BAT COBA)**

Brick bat coba treatment shall be got done from an approved agency. The surface should be prepared and construction joint if any are to be raked and cleaned. Cement slurry mixed with approved chemical compound is to be spread on the surface so as to fill the undulation and other porous areas.

15 mm thick cement mortar mixed with approved chemical in CM 1:4 (1 cement : 4 coarse sand) is laid over the prepared surface.

A layer of brick bat coba is laid over the mortar to required slope. The joints between the brick bats should be kept 15-25 mm wide. These joints be filled with CM 1:4 mixed with specialized chemical compound. Curing is done continuously for two days.

The top surface should be finished smooth with 20 mm thick CM (mixed with specified quantity of approved chemical). Curing of the treatment should be done for two weeks.

The side wall shall be provided with 20 mm thick cement plaster 1:4 mixed with specialized chemical compound upto a height of 30 Cm. A 20 mm thick gola with brick bats shall be provided and finished with CM 1:4 mixed with approved chemicals compound. The gola shall be cured continuously for two weeks. The work shall be got done from a specialized agency duly approved by the Consultants.

6.4 **Tapecrete Waterproofing**

All the chasings or cuttings in the floors and walls shall be carried out prior to the commencement of the treatment. The depressions in the concrete shall be filled with filler made of 1cement: 1.5silica sand: 0. 52tapecrete P151 or equivalent by weight. The prepared surface then shall be plastered (18 to 20mm thick) with cement mortar 1:3 mix, mixed tapecrete P151 or equivalent as per manufacturers' specifications. The plastering shall be carried out throughout the sunk portion and carried up to all sides of the walls. The specialist then shall carry out ‘TAPECRETETE’ waterproofing treatment comprising of 3 coats of tapecrete. After 1st coat of tapecrete P151 polymer modified cementitious (PMC) spread glass on the wet slurry layer and impregnate with tapecrete P-151(PMC) or equivalent slurry. 2nd coat of tapecrete P-151(PMC) or equivalent slurry coating over fiber glass fabric, 3rd coat of tapecrete P-151(PMC) or equivalent, brush topping on the tapecrete P-151 equivalent slurry coating. After three coats apply plaster (18 to 20mm) with cement mortar 1:3 mix, mixed tapecrete P151 or Equivalent After the first coat of Tapecrete all corners, junctions, joints of pipes and masonry to be sealed with Epoxy putty. The treatment is laid underneath and behind all pipes. The specification on verticals is taken 150mm above the finished floor level. Treatment for sunken portion shall be measured and paid for on Sqm basis for the Tapecrete work carried out.

6.5 **Toilet Waterproofing**

All the chasings or cuttings in the floors and walls shall be carried out prior to the commencement of the treatment. The depressions in the concrete shall be filled with filler made of 1cement: 1.5silica sand: 0. 52tapecrete P151 or equivalent by weight. The prepared surface then shall be plastered (12 to 15 mm thick) with cement mortar 1:3 mix, mixed with waterproofing compound. (CICO or equivalent). Apply 2 coats of flexible cementitious water proofing coating master seal 550 manufactured by M/s Master Builders Technologies (I) Pvt. Ltd. which would be water research counsel (UK) certified for use in potable water and would have no leakage when tested under specifications of
DIN 1048 and would have 95% greater improvement against water absorption than concrete when tested under specifications of BS 1881 part V, 1983 ISAT. The surface then shall be protected with plaster (12 to 15 mm thick) with cement mortar 1:3 mix, mixed with waterproofing compound. (CICO or equivalent) Water test for 2 days to be conducted to check for any possible leakage and guarantee to be given for 10 years.

6.6 Insulation & Waterproofing Roof with Inverted Roofing

A. WATERPROOFING: For waterproofing of roofs APP polymer modified bituminous POLYMERIC POLYETHYLENE MEMBRANE felt which will take structural thermal movements i.e. expansion, contractions, vibrations etc. The polymeric polyethylene membrane consists of a central core of HMHDPE film (High molecular high density polyethylene) and with top and bottom layers of thermo fusible HMHDPE films. The specification is covered and protected against ultra violet rays of the sun, it is resistant to Ageing.

B. INSULATION: Lightweight rigid Extruded Polystyrene of 32 Kg/Cum density of 75mm thickness to be used.

For ABSOLUTE WATERPROOFING laying 2 layers of APP polymeric polyethylene membrane felt – each layer laid on the base in hot asphalt over a coat of bituminous primer with 75mm & 100mm side and end laps with staggered joints. (B) for EFFECTIVE INSULATION Extruded Polystyrene of 32 Kg/Cum density of 50mm thickness is laid directly on top of the waterproofing specification laid in hot asphalt. Extruded Polystyrene is then covered with Bitumenised Kraft Paper with 6″ over-laps sealed with bitumen and spot stuck. A layer of polymeric polyethylene membrane felt is laid over kraft paper with hot asphalt with 75mm and 100mm side and end laps respectively. The waterproofing specification is further protected with a protective layer of Hessioan based felt type 3 grade 1 with 75mm and 100mm side and end laps respectively.

AND ON VERTICALS: 1 layers of fibre glass tissue and finally protected with 1 layers of Hessian based felt type 3 grade 1 – each layer laid in hot asphalt over a coat of bituminous primer with 75mm and 100mm side and end laps respectively.

The ‘Insulation & waterproofing’ specification should be laid directly on the RCC slab after it has been plastered smooth. A cement concrete fillet is made at the junction of the roof slab and parapet/walls. A chase of 50mm depth and 50mm width is cut in parapets at a height of 100mm above the proposed finished roof level for the specification to be tucked in.

Immediately after the insulation & waterproofing specification has been laid on the base it should be covered with cement concrete laid to slope. Measurement only plain area will be measured and paid for.

**Horizontal:**

1. A layer of bituminous primer.

2. A layer of hot refined mineral asphalt.
3. A layer of APP polymeric polyethylene felt with 75mm and 100mm side and end laps.

4. A layer of hot refined mineral asphalt.

5. A layer of APP polymeric polyethylene felt with 75mm and 100mm side and end laps.

6. A layer of hot refined mineral asphalt.

7. A layer of Extruded Polystyrene – of 32 Kg/Cum density of 75mm thickness.

8. Bitumenised kraft paper with 6” overlaps sealed with bitumen and spot stuck.


10. A layer of APP polymeric polyethylene felt with 75mm and 100mm side and end laps.

11. A protective layer of Hessian based felt type 3 grade 1 laid with hot asphalt with 75mm and 100mm side and end laps and further sealed with hot bitumen.

**Vertical:**

Laying 2 layers of fiber glass tissue and protected with 2 layers of Hessian based felt type 3 grade 1 – each layer laid in hot asphalt over a coat of bituminous primer with 75mm and 100mm side and end laps respectively.

**6.7 Guarantee**

The waterproofing work shall be guarantee for 10 years on the non judicial stamp paper of Rs.50/-.
7.0 FINISHING

7.1 General

7.1.1 All plaster work shall be of the best workmanship and in strict accordance with the dimensions of the drawings. All plastering shall be finished to true levels including plumbs, without imperfections, and square with adjoining work. It shall form proper foundations for finishing materials such as paint etc. Masonry and concrete surface to which plaster is to be applied shall be clean, free from efflorescence, sufficiently rough and keyed to ensure proper bond.

7.1.2 Wherever directed all joints between RCC frames and masonry walls, shall be expressed by a groove in the plaster. This groove will exactly coincide with the joint beneath. At the corners of all windows and doors or other openings and wherever instructed, 24 gauge expanded galvanized metal mesh strips 200 mm wide 450 mm long shall be placed diagonally to prevent plaster cracks.

7.1.3 Where grooves are not called for, the joint between concrete and masonry in filling shall be covered by 24 gauge expanded galvanized metal strips, 200 mm wide installed before plastering. The contractor shall supply all necessary labour, material, tools and scaffolding necessary for the completion of the work detailed. He shall be responsible to take proper precautions to all works from damage. Any work rejected through non-compliance with the specifications or damaged work shall be removed and replaced at the expense of the contractor.

7.1.4 All chasing, installation of conduits, boxes, etc. shall be completed before any plastering is commenced on a surface. Chasing or cutting of plaster will not be permitted. Broken corners shall be cut back less than 150 mm on both sides and patched with plaster of Paris as directed. All corners shall be rounded to a radius. Contractor shall get samples of each type of plaster work approved by the Architect/Project Manager.

7.1.5 The materials used for plastering shall be proportioned by volume by means of gauge boxes. Alternatively it may be required to proportion the materials by weight.

7.2 Plaster Work

7.2.1 The joints in the brick work, concrete blocks, shall be raked to a depth of 15 mm while the masonry is green. Concrete surfaces to receive plaster shall be suitably roughened. All walls shall be washed with water and kept damp for 10 hours before plastering.

7.2.2 The plaster unless specified otherwise shall be average of 15 mm thick on walls and minimum 6 mm thick for the ceiling. The finished texture shall be as approved by the Architect/Project Manager. The mix for plaster unless otherwise specified, shall be one part cement and four parts sand, to walls and one part cement, 3 parts sand to ceiling.

7.2.3 The interior plaster shall be applied in one coat only. The surface shall be trowelled smooth to an approved surface. All plaster work shall be kept continuously wet for seven days.

7.2.4 The external plaster shall be of two coats on an overall thickness of minimum 20 mm. Preparations of walls to receive plaster work shall be the same as in internal plaster. Backing coat shall be 12 to 15 mm thick with cement mortar 1:5 and finishing coat shall be with cement mortar 1:3. Backing coats shall be combed on wet surface to form keys for finishing coat. All external plaster shall be waterproofed with approved water proofing powder added to cement in proportion of 1.5 Kg. to 50 Kg. of cement as per the manufacturers' instruction, for both the coats. Cost of waterproofing powder per Kg. shall be paid for separately.
7.2.5 For sand faced cement plaster, the finishing coat shall be in cement mortar 1:3, sand used shall be of selected colour, properly graded and washed so as to give a grained texture. Finishing plaster coat shall be 8 mm thick, uniformly applied and surface finished with special rubbing by sponge pads and other tools and recommended by the Architect/Project Manager.

7.2.6 For rough cast plaster, the backing shall be floated with 3 mm thick cement mortar 1:4 with fine sand, spread in small areas not exceeding 2 Sq.mt at a time. While this coat is still wet, the rough cast containing a mixture of 1 part of cement, 2 parts of fine sand and 1 part of gravel, 3 to 6 mm size, shall be dashed on the floating coat, to a uniform thickness of 15 mm thick and finished even.

7.3 **White Washing**

7.3.1 **White washing with Lime**

The wash shall be prepared from fresh stone lime (Narnaul/Satna or Dehradun quality). The lime shall be thoroughly slaked on the spot, mixed and stirred with sufficiencies to water to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 40 gm of gum desolved in hot water, shall be added to each 10 entire delimiters of cream. The approximate quantity of water to be added in making ht cream will be 5 liters of water to 1 Kg. of lime.

Indigo (Neel) up to 3 gm. per Kg. of lime desolved in water, shall then be added and wash stirred well. Water then shall be added at the rate of about 5 liters per Kg. of lime to produce a milky solution.

7.3.2 **Preparation of surface**

Before white washing is started, the surface shall be thoroughly brushed free from mortar droppings and foreign matter. Any unevenness shall be made good by applying putty made of plaster of Paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it dry.

7.3.3 **Application**

The white wash shall be applied with moon brushes to the specified number of coats. The operation for each coal shall consist of a stroke of the brush given from top downwards, another from bottom upwards over the first stroke, and similarly one stroke horizontally from the right and another from the left before it dries up.

7.3.4 **Rate**

The rate shall include cost of all materials and labour involved in all the operations described above including scaffolding, protecting doors, windows, floor etc. from splashes and dropping.

7.4 **White washing with whiting**

Preparation of mix: Whiting (ground white chalk) shall be dissolved in sufficient quantity of warm and thoroughly stirred to form a thin slurry which shall then be screened through a clean coarse cloth. Two Kg. of gum and 0.4 Kg. of copper sulphate dissolved separately in hot water shall be added for every cum of the slurry which shall then be diluted with water to the consistency of milk also as to make a wash ready for use.

Other specifications described in above shall be applied in this case also.
7.5 **Colour Washing**

The mineral colours not affected by lime, shall be added to white wash. Indigo shall however, not be added. No colour wash shall be done until a sample of the colour wash of the required tint or shade has been got approved from the Architect/Project Manager. The colour shall be of even tint or shade over the whole area.

A priming coat of white wash with lime or with whiting shall be applied. Two or more coats, shall then be applied on the entire surface till it represents a smooth and uniform finish.

Other specifications described in above shall apply in this case also.

7.6 **Distempering**

Dry distemper of required colour and (IS: 427 - 1965) of approved bran and manufacture shall be used. The shade shall be got approved from the Architect/Project Manager before application of the distemper. The dry distemper colour as required shall be stirred slowly in clean water using 6 deciliters (0.6 litre) of water per Kg. of distemper or as specified by the makers. Warm water shall preferably be used. It shall be allowed to stand for at least 30 minutes (or if practicable over night) before use. The mixture shall be well stirred before and during use to maintain an even consistency. Distemper shall not be mixed in larger quantity than is actually required for one day's work.

**Preparation of surface**

Before new work is distempered, the surface shall be thoroughly brushed free from mortar droppings and other foreign matter and sand papered smooth. Pitting in plaster shall be made good with plaster of Paris mixed with the colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The patched surface shall be allowed to dry thoroughly before the regular coat of distemper is applied.

A priming coat of whiting shall be applied over the prepared surface. No white washing coat shall be used as a priming coat for distemper.

**Application**

The treatment shall consist of a priming coat of whiting followed by the application of two or more coats of distemper till the surface shows an even colour.

Other specifications described as above shall apply in this case also.

7.7 **Oil emulsion (Oil bound) distempering**

Material: Oil emulsion (oil bound) distemper (IS:428-1929) of approved brand and manufacture shall be used. The primer used shall be cement primer or distemper primer. This shall be of same manufacture as distemper. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer. Only sufficient quantity of distemper required for days work shall be prepared. The distemper and primer shall be brought by the contractor in sealed tins in sufficient quantities, at a time to suffice for a fortnights work. The empty tins shall not be removed from the site of work, till this item of work has been completed and passed by the Architect/Project Manager.
Preparation of surface

Before new work is distempered, the surface shall be thoroughly brushed free from mortar droppings and other foreign matter and sand papered smooth. Pitting in plaster shall be made good with plaster of Paris mixed with the colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The patched surface shall be allowed to dry thoroughly before the regular of distemper is applied.

A priming coat of whiting shall be applied over the prepared surface. No white washing coat shall be used as a priming coat for distemper.

Application

The priming coat shall be with distemper or cement primer, as required in the description of the item and as recommended by the manufacturer.

Note:

If the wall surface plaster has not dried completely cement primer shall be applied before distempering the walls. But if distempering is done after the wall surface is dried completely, distemper primer shall be applied.

Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

After the primer coat has dried for atleast 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rule out the priming coat. All loose particles shall be dusted off after rubbing. One coat of distemper properly diluted with thinner (Water or other liquid as stipulated by the manufacture) shall be applied with brushes in horizontal strokes followed immediately by vertical ones which together constitute one coat. The subsequent coats shall be applied in the same way.

For distemper 15 cm double bristled brushes shall be used. After each days work, brushes shall be thoroughly washed in hot water with soap solution and hung down to dry.

The specifications in respect of scaffolding protective measures and rute shall be as described under.

Cement Primer Coat

Cement primer shall be used as lease on wall finish of cement lime or lime cement plaster or asbestos cement surface before oil distemper paints are applied on them. Only approved cement primer shall be used. Primer coat shall be preferably applied by brushing and not by spraying.

Preparation of surface

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface then be allow to dry for atleast 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.
Application

Cement primer shall be applied with a brush. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. The entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for atleast 48 hours, before oil emulsion paint is applied.

Rate shall include cost of all material and labour involved in all the operations described above including scaffolding.

7.9 Cement Paint

Cement paint shall be (conforming to IS:5410 - 1969) of approved brand and manufacture.

Preparation of surface

The surface shall be thoroughly cleaned of all mortar dropping, dirt, dust, alga, grease and other foreign matter by brushing and washing. The surface shall be thoroughly wetted with clean water before the cement paint is applied.

Preparation of mix

Cement paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish.

Cement paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the cement paint gradually to the water and not vice versa. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturers instructions shall be followed meticulously. The lid of cement paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly becomes air set due to its hydrophobic qualities.

Application

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application shall be as per manufacturer's specifications. The completed surface shall be watered after day's work.

Water cement paint shall not be applied on surface already treated with white wash, colour wash distemper dry or oil bound, varnishes, paints etc. It shall not be applied on gypsum, wood and metal surfaces.

Rate shall include cost of all material and labour involved in all the operations described above including scaffolding.
7.10 Painting

i) Painting priming coat of wood surface

Primer for wood work shall be as specified in the description of the item. Surface to be primed shall be dry and thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted, knots, if any, shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate wood filler material with same shade as paint shall be used where so specified.

The surface treated for knotting shall be dry before primer is applied. After the primer is applied the holes and indentation on the surface shall be stopped with glaziers putty or wood putty, stopping shall not be done before the priming coat.

ii) Painting priming coat on Iron & Steel surfaces

All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during raking which becomes loose by rushing, shall be removed. All dust and dirt shall be thoroughly wiped away from the surface.

iii) Textured paint

The textured finish (SPECTRUM) to external surfaces of walls as per manufacturer's specification and approved by the Consultants including scaffolding etc. complete.

iv) Painting priming coat on plastered surface

The surface shall ordinarily not be painted shall be applied to get correct finish until it has dried completely. Before primer is applied, holes and undulations shall be filled up with plaster of Paris and rubbed smooth.

The primer shall be applied with brushes, worked well into the surface and spread even and smooth. Painting shall be done by crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite direction, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left the laying off is finished. The full process of crossing and laying off will constitute one coat.

Rate
Rate shall include cost of all labour and material involved the operations described above including scaffolding etc.

Painting with enamel paint (conforming to IS:2933 - 1975) and with synthetic enamel paint (conforming to IS:1932 - 1964).

The surface to be painted shall have received the approval of the Architect/Project Manager after inspection, before painting is commenced.

Application

The number of coats including the under coat shall be stipulated in the item.

a) Under Coat

One coat of specified paint of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet
abrasive paper to ensure a smooth and even surface, free from brush marks and all loose particles dusted off.

b) **Top Coat**

Tops coats of specified paint of desired shade shall be applied. Each coat shall be allowed to dry for not less than 24 hours and lightly rubbed down smooth with finest wet abrasion paper to get an even glossy surface. If, however, the surface is not satisfactory additional coats as required.
8.0 FLOORING/DADO/CLADDING

8.1 General

All flooring shall be laid to the best practice known to the trade. The flooring shall be laid to the level except where slopes are called for on the drawings in which case the slopes shall be uniform and so arranged to drain in to the indicated outlets.

Particular care shall be exercised to ensure that all flooring, skirting and dado are perfectly matched for colour and finish. Sufficient extra tiles (not less than 5%) shall be cast/ordered to ensure an adequate supply of matched floor tiles. The contractor shall furnish for approval by the Architect/Project Managers, samples of each type of floor finish.

8.2 Cement Concrete flooring (IPS Flooring)

Indian patent stone flooring shall be 1.5” or of thickness specified and laid in two layers, bottom layer 1.1/4” thick or as specified in 1 part of portland cement, 2 parts of coarse sand and 4 parts of crushed stone aggregate 1/2” down well graded machine mixed with not more than 5.5 gallons of water for each bag of cement and top layer 1/4” thick in one part of portland cement, 2.5 parts of selected crushed stone chips 1/8” down with just enough sand maximum part to make workable mix, machine mixed with not more than 5 gallons of water. Top layer to be laid before the bottom layer has hardened. Flooring shall be laid in squares or bays as directed and each layers shall be well compacted by ramming with heavy teak wood floats. The top shall be brought to a smooth and even surface free from blemishes and finished smooth by steel trowelling. After the concrete surface has hardened sufficiently to prevent dislodgement of aggregates, the patent stone shall be polished with No. 1, 2 & 3 polishing stone. The flooring shall be kept wet for seven days for curing.

Where ironite/hardonite topping is specified in the "Schedule of Quantities" the bottom layer shall be 40mm thick or in the item of B.O.Q. and the top layer shall be 12mm thick mixed with ironite/hardonite as per manufacturers specification and finished fair.

8.3 Granolithic Flooring

The general specifications for granolithic floors, where called for, shall be as per the cement flooring except that the top 12mm finish shall be of granolithic consisting of 1 part of cement and 1.1/2 part of well graded crushed aggregate. The aggregate shall be of approved quality.

8.4 Ceramic/Glazed Tiles

All white or coloured glazed tiles shall be minimum 5 mm thick of approved manufacturer as stated in the schedule of quantities. Only first quality tiles of pure white/uniform colour and glaze shall be used. No cracked or warped tiles shall be used in the work. All tiles shall be required to be set in cement mortar. Prior to setting the tiles the contractor shall at his own cost, clear the whole surface and thoroughly saturate it with water. A layer of 12 mm thick cement mortar shall then be applied to the surface and the tiles laid firmly over a layer of clear cement slurry. The tiles shall be set in perfect line, level and true to plumb line. The joints of tiles shall have white or coloured cement painting. After the setting operation is completed, the contractor shall carefully remove all cement and dribbling and cure the tiled surface for atleast seven days with water.
8.5 Ceramic/Glazed tile dado

Glazed tile dado where called for in the drawings, shall be minimum 5 mm thick white glazed tiles of approved manufacture. The tiles shall be free from cracks, twists, uneven edges, cracking and such other defects. The rear face of tiles shall be grooved and/or recessed to provide an adequately key for the plaster. The tiles shall be laid true and plumb over a cement screed 12 mm thick composed of cement and sand 1:3 (1 cement: 3 coarse sand). The tiles shall be finally set in the mortar bedding, the joints in white cement slurry. After laying the tiles shall be thoroughly washed and cleaned to the satisfaction of the Architect/Project Manager.

8.6 Shahabad/Kota Stone Flooring

The best quality stone from approved quarry, shall be laid either with rough stone or machine cut and machine polished as specified in respective items and shall be of specified thickness and of approved quality and size, free from cracks and flakes and shall be uniform in colour, with straight edges. The sides of machine cut and machine polished stones shall have perfect right and finished as described under plain cement or colour, cement, tiles, on a beeding of 1:4 mix 20 mm (average) thickness. The finished stone surface thus laid shall then be polished to the required degree as approved by the Architect/Project Manager. Flooring shall be finally wax polished and protected till the handing over of the building.

8.7 Marble Stone

Marble shall be the best Indian Marble to be approved by the Architect/Project Manager/Client and a sample piece should be kept in the office of the Project Manager. The quality shall be uniform and it shall be hard and free from any discolorations, cracks, flaws, veins of foreign materials or any other defects. When marble of different colour and kinds associated, care shall be taken to see that they are of equal hardness so as to wear evenly. The marble slabs shall be machine cut true to the shape and size and machine polished. Care shall be taken to cut the slabs so as to provide a pattern as indicated. Marble stone slabs for wall lining and dadoes shall be machine polished edges. The wall shall be lined with the marble in courses as indicated and grain of the marble shall be arranged in pattern as per detailed drawings. The marble shall be bedded in cement mortar backing covering the full area of the marble. The wall surface shall cleaned from all dirt, mortar droppings etc. before applying the base plaster. The marble shall be fixed to the wall by bronze/copper cramps 5”x1.1/2”x1/4” and Bronze pins 1/4” diameter x2” embedded firmly in to wall by cutting hole and grouting alternately stainless steel cramps and pins as per design shall be used. The load of one marble slab shall not be borne by the slab below. Joints between slabs shall be hair fine and filled with coloured cement to match the marble. The marble lining and dadoes shall be finally hand polished by Carborundum stone, buffing with polishing felt and cleaned with diluted oxalic acid wash.

8.8 Italian Marble flooring & Dado

The thickness of Italian Marble slabs shall be 18 to 20 mm and tile shall be 10mm thick. All small cracks/voids etc. in the marble slab and tile shall be filled with imported resin. The marble slabs shall be machine cut true to shape and size. Proper care shall be taken to arrange the grains of the marble in required pattern as approved by the Architect/Project Manager, while fixing the Italian marble slab or tile. The marble shall be bedded in cement mortar backing covering the full area of the marble. The slab or wall surfaces shall be cleaned thoroughly before applying cement slurry or mortar. Joints between slabs shall be hair fine and filled with white cement mixed with.

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8.9 PVC Floor/Antistatic Floor

PVC floor tiles shall be 2 mm thick and shall have fast colour as required by relevant Indian standards and shall not have an indentation after 10 minutes of 0.3 mm and residual indication after 60 minutes of 0.02 mm with 10 minutes time load applied at 25°C. The tile shall be to the colour and pattern selected by consultant from approved manufacturer and shall be fixed with approved adhesives and finished according to his instructions. Matching PVC coved skirting will be as above in specifications and fixings.

Flooring will be fixed only on completely dry screeding/backing. Welding of tiles and rolls with 4 mm PVC welding rod is recommended or as required by the Consultant. All PVC tiles/Rolls will be Premier vinyl or equivalent approved. Heavy duty PVC flooring will be resilient minimum 4.5 mm thick and suitable for use in exercise and fitness rooms to consultants approved.

8.10 Expansion and compression joints

These shall be clearly indicated on the shop drawings and formed of non-staining two parts polysulphide with polyethylene foam backing to full depth of screed in pavings.

In no instance shall expansion joints be less than 10 mm. Supporting corbels cover shall be recessed into the back of the above slab and not placed in the expansion joint. Expansion joint shall be kept completely free of all fixing materials and are to be inspected by the consultant prior to filling.

8.11 Gang Saw Cut Bansi Paharpur Stone/Dholpur Stone Lining (Cladding)

a) Stone shall be all hard, sound durable and tough, free from cracks, decay and weathering and defects like cavities, cracks, flaws, sand holes, veins, patches of soft or loose materials uniform shade.

b) The stone shall be cut into slabs of required thickness along the flames parallel to the natural bed of stones.

c) The stone shall be wetted before laying. They shall then be fixed with mortar in position without the use of chips, or underpinning of any sort.

d) Where so desired, the adjoining stones shall be secured to each other by means of stainless steel pins 40mm long and 6mm diameter or as specified in the item of BOQ.

e) The stones shall be secured to the backing by means of stainless steel angle or cramps of design/size given in the drawing or item of BOQ.

Stainless steel cramps can also be of 25x6mm flat 30cm or 16.5cm long required according to thickness of wall or as per site conditions unless specified otherwise they may be provided as directed by Consultant/contruction Manager. The cramps shall be spaced not more than 60 cms apart or as shown on the drawing.

f) Cramps may be attached to its sides or top and bottom and or sides top and bottom. The minimum number of cramps required for fixing facing unit to the wall shall be two and two pins. The actual number of cramps and their sections, however shall be as per requirements of design to carry the loads.
When cramps are used to hold the unit in position only, the facings shall be provided with a continuous support in which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recesses into the concrete floor slab, or a beam between the columns or stainless steel angle attached to the floor slab or beams.

The pins, cramps and dowels shall be laid in cement mortar 1:2 (1 cement : 2 fine sand) and their samples got approved by Engineer-in-Charge.

Stainless steel angle cramps/bracket shall be held in position with the help of expansion hold fasteners (Wedge expansion type).

The veneering work curved on plan shall be measured at plain work, but extra payment shall be allowed for radii not exceeding 6 meters on external face. For radii beyond 6 meters the work shall be measured as plain work only, even when the face may have to be dressed to curve.

Expansion fasteners and cramps and pins shall be paid separately if not included in the item of BOQ.

## VACCUM DEWATERED CONCRETING/TREMIX FLOORING

### PREPARATION

The surface to receive flooring shall be clean, free from dirt and free from foreign material. Any undulations or mortar remaining on the floor shall be trimmed. Base course shall be trimmed. The base shall be cleaned and watered before laying the floor. Work includes at all depths and heights. The finished surface shall be kept wet for a maximum period of one week.

### CONCRETING

**General**

Concreting shall have a concrete base of M15 of specified thick. Flooring shall have hard top on the concrete base. Flooring shall be laid in strips, the size of which is mentioned on the drawings.

**Materials**

- Cement - Portland
- Sand - River sand
- Aggregate - Max. size 10 to 20mm
- Water - Potable

Floor hardener (Optional) - @3kG/Sqm

Sealant (Colpor or equivalent) - At all control joints of size 10mmx6mm at every 20 Sqm area

**Execution**

Concrete shall be M 15 of specific thick. Prepared concrete shall be laid immediately after mixing. The base shall be free from water and other foreign materials, dust and dirt. A coat of cement slurry of the consistency of thick cream shall be brushed on the surface of the base course. The concrete shall then be spread over this base evenly and leveled carefully. Low areas shall be filled with concrete and humps removed. Devacumisation shall be done for removing the voids. The whole concrete surface shall be leveled, compacted by ramming and trowelling.
Prepared surface shall be allowed to set.
Hardner screed
Hard top to be prepared as per the specifications with Nitohardner and one part of dry cement.
The hard top shall be provided over concrete base immediately after it is set, compacted and leveled with a steel trowel.
The surface shall be trowelled to bring the hardener coat to a leveled surface.
Excessive trowelling shall be avoided.
After the initial set, further compaction shall be done by steel trowelling.
Final brushing shall be made before the floor top becomes too hard.

CURING
Curing shall commence as soon as the surface is hard enough to receive the water.
The surface shall be covered with sacks or sand and shall be kept continuously wet for a period of at least one week.
9.0 STRUCTURAL STEEL WORK

9.1 General

9.1.1 This specification covers the fabrication and transportation to site and erection on prepared foundations and structural steel work consisting of beams, columns, vertical trusses, bracings, shear connections etc.

9.1.2 Fabrication, erection and approval of steel structures shall be in compliance with:

- These General Specifications and IS : 800 - 1984
- Drawings and supplementary drawings to be supplied to the contractors during execution of the work.

9.1.3 Providing shop primer coat for steel structures. Grouting of holding-down bolt pockets and below base plates where required.

9.1.4 In case of conflict between the Clauses mentioned here and the Indian Standards, those expressed in this specification shall govern.

9.2 Scope

9.2.1 The fabrication and erection of the steel work consists of accomplishing of all jobs here-in enumerated including providing all labour, tools and plant all materials and consumables such as welding electrodes, bolts and nuts, oxygen and acetylene gases, oils for cleaning etc. of approved quality as per relevant IS. The work shall be executed according to the drawings, specifications, relevant codes etc. in an expeditious and workman like manner, as detailed in the specifications and the relevant Indian Standard Codes and Standard Practice and to the complete satisfaction of the Architect/Project Manager.

9.3 Fabrication Drawings

9.3.1 The contractor shall prepare all fabrication and erection drawings on the basis of design drawings supplied to him and submit the same in triplicate to the Architect/Project Managers for review. Architect/Project Managers shall review and comment, if any, on the same. Such review, if any, by the Architect/Project Managers, does not relieve the contractor of any of his required guarantees responsibilities. The contractor shall however be responsible to fabricate the structural strictly conforming to specifications and reviewed drawings.

9.3.2 Fabrication drawings shall include the following:

- Member sizes and details
- Types and dimensions of welds and bolts
- Shapes and sizes of edge preparation for welding
- Details of shop and field joints included in assemblies.

Bill of material

- Quality of structural steels, welding electrodes, bolts, nuts and washers etc. to be used.
- Erection assemblies, identifying all transportable parts and sub-assemblies, associated with special erection instructions, if required.
9.3.3 Calculations where asked for, for approval. Connections, splices etc. other details not specifically detailed in design drawings shall be suitably given on fabrication drawings considering normal detailing practices and developing full member strengths. Where asked for calculations for the merit shall also be submitted for approval.

9.3.4 Any alternate design or change in section is allowed when approved in writing by the Architect/Project Manager.

9.3.5 However if any variation in the scheme is found necessary later, the contractor will be supplied with revised drawings. The contractor shall incorporate these changes in his drawings at no extra cost and resubmit for review.

9.3.6 Architect/Project Managers/Consultants review shall not absolve the contractor of his responsibility for the correctness of dimensions, adequacy of details and connections. One copy will be returned reviewed with or without comments to the contractor for necessary action. In the former case further three copies of amended drawings shall be submitted by the contractor for final review.

9.3.7 The contractor shall supply three prints each of the final reviewed drawings to the Architect/Project Managers within a week since final review, at no extra cost for reference and records.

9.3.8 The Architect/Project Managers will verify the correct interpretation of their requirements.

9.3.9 If any modification is made in the design drawing during the course of execution of the job, revised design drawings will be issued to the contractor. Further changes arising out of these shall be incorporated by the contractor in the fabrication drawings already prepared at no extra cost and the revised fabrication drawings shall be duly got reviewed as per the above Clauses.

9.4 Materials

9.4.1 Rolled Sections

The following grades of steel shall be used for steel structures:

Structural steel will generally be of standard quality conforming to IS: 226. Whenever welded construction is specified plates of more than 20 mm thickness will generally conform to IS: 2062.

9.4.2 Welding Materials

Welding electrodes shall conform to IS: 814.

Approval of welding procedures shall be as per IS: 823.

9.4.3 Bolts, Nuts & Washers

Bolts and nuts shall be as per IS: 1367 and tested as per IS: 1608. It shall have a minimum tensile strength of 44 Kg/mm² and minimum elongation of 23% on a gauge length of 5.65 (A - Original cross sectional area of the gauge length). Washers shall be as per IS: 2016.
9.4.4 All materials shall conform to their respective specifications. The use of equivalent or higher grade or alternate materials will be considered only in very special cases subject to the approval of the Architect/Project Managers in writing.

9.4.5 Receipt & Storing of Materials

Steel materials supplied by the contractor must be marked for identification and each lot should be accompanied by manufacturer's quality certificate, conforming chemical analysis and mechanical characteristics.

All steel parts furnished by supplier shall be checked, sorted out, straightened, and arranged by grades and qualities in stores.

Structurals with surface defects such as pitting, cracks, laminations etc. shall be rejected if the defects exceed the allowable tolerances specified in relevant standards or as directed by the Architect/Project Managers.

Welding wire and electrodes shall be stored separately by qualities and lots inside a dry and enclosed room, in compliance with IS: 816 - 1969 and as per instructions given by the Architect/Project Managers. Electrodes shall be perfectly dry and drawn from an electrode even, if required.

Checking of quality bolts of any kind as well as storage of same shall be made conforming to relevant standards.

Each lot of electrodes, bolts, nuts, etc. shall be accompanied by manufacturer's test certificate.

The contractor may use alternative materials as compared to design specification only with the written approval of the Architect/Project Managers.

9.4.6 Material Tests

The contractor shall be required to produce manufacturer's quality certificates for the materials supplied by the contractor. Notwithstanding the manufacturer's certificates, the Architect/Project Managers may ask for testing of materials in approved test houses. The test results shall satisfy the requirements of the relevant Indian Standards.

Whenever quality certificates are missing or incomplete or when material quality differs from standard specifications the contractor shall conduct all appropriate tests as directed by the Architect/Project Managers at no extra cost.

Materials for which test certificates are not available or for which test results do not tally with relevant standard specifications, shall not be used.

9.5 Fabrication

Fabrication shall be in accordance with IS: 800 Section V in addition to the following:

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawings. Work shall also include fabricating built up sections.

Any defective material used shall be replaced by the contractor at his own expense, care being taken to prevent any damage to the structure during removal.
All the fabricated and delivered items shall be suitably packed to be protected from any damage during transportation and handling. Any damage caused at any time shall be made good by the Contractor at his own cost.

Any faulty fabrication pointed out at any stage of work shall be made good by the contractor at his own cost.

9.5.1 Preparation of Materials

Prior to release for fabrication, all rolled sections warped beyond allowable limit shall be pressed or rolled straight and freed from twists, taking care that an uniform pressure is applied.

Minor warping, corrugations etc. in rolled sections shall be rectified by cold working.

The sections shall be straightened by hot working where the Architect/Project Managers so direct and shall cooled slowly after straightening.

Warped members like plates and flats may be used as such only if wave like deformation does not exceed $L/1000$ but limited to 10 mm ($L$-Length).

Surface of members that are to be jointed by lap or fillet welding or bolting shall be even so that there is no gap between overlapping surfaces.

9.5.2 Marking

Marking of members shall be made on horizontal pads, of an appropriate racks or supports in order to ensure horizontal and straight placement of such members. Marking accuracy shall be atleast $\pm 1$ mm.

9.5.3 Cutting

Members shall be cut mechanically (by saw or shear or by oxyacetylene flame).

All sharp, rough, or broken edges, and all edges of joints which are subjected to tensile or oscillating stresses, shall be ground.

No electric metal arc cutting shall be allowed.

All edges cut by oxyacetylene process shall be cleaned of impurities prior to assembly.

Cutting tolerances shall be as follows:

a) For members connected at both ends $\pm 1$ mm.
b) Elsewhere $\pm 3$ mm.

The edge preparation for welding of members more than 12 mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough.

Edge preparation shall be as per IS : 823 - 1964.

9.5.4 Drilling

Bolts holes shall be drilled.

Drilling shall be made to the diameter specified in drawings.
No enlarging of holes filling, by mandrolling or oxyacetylene flame shall be allowed. Allowed variations for holes (out-of-roundness, eccentricity, plumb-line deviation) shall be as per IS:800.

- Maximum deviation for spacing of two holes on the same axis shall be $\pm 1$ mm.
- Two perpendicular diameters of any oval hole shall not differ by more than 1 mm.

Drilling faults in holes may be rectified by reaming the holes to the next upper diameter, provided that spacing of new hole centers and distance of hole centers to the edges of members are not less than allowed and that the increase of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the number of faulty holes does not exceed 15% of the total number of holes for one joint.

9.5.6 Preparation of Members for Welding

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, axes nodes etc.)

Sharp edges, rust of cut edges, notches, irregularities and fissures due to faulty cutting shall be chipped or ground or filled over the length of the affected area, deep enough to remove faults completely.

Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint.

Generally no special edge preparation shall be required for members under 8 mm thick.

Edge preparation (bevelling) denotes cutting of the same so as to result in V, X K or U seam shapes as per IS: 823.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy, rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter likely to get in to the gaps between members to be welded.

Before assembly the edges to be welded as well as adjacent areas extending for atleast 20 mm shall be cleaned (until metallic polish is achieved).

When assembling members, proper care shall be taken of welding shrinkage and distortions, as the drawing dimensions cover finished dimensions of the structure.

The elements shall be got checked and approved by the Architect/Project Managers or their authorised representative before assembly.

The permissible tolerances for assembly of members preparatory to welding shall be as per IS: 823-1964.

After the assemble has been checked, temporary tack welding in position shall be done by electric welding, keeping in view finished dimensions of the structure.

9.5.7 Welding procedures
Welding shall be carried out only by fully trained and experienced welders as tested and approved by the Architect/Project Managers. Any test carried out either by the Architect/Project Managers of their representative or the inspectors shall constitute a right by them for such tests and the cost involved thereon shall be borne by the contractor himself.

Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823. The nature of test for performance qualification of welders shall be commensurate with the quality of welding required on this job as judged by the Architect/Project Managers.

The steel structures shall be automatically, semi-automatically or manually welded.

Welding shall begin only after the checks mentioned in Clause 5.1 to 5.6 have been carried out.

The welder shall mark with his identification mark on each element welded by him.

When welding is carried out in open air, steps shall be taken to protect the face of welding against wind or rain. The electrodes, wire and parts being welded shall be dry.

Before beginning the welding operation, each joint shall be checked to ensure that the parts to be welded are clean and root gaps provided as per IS: 823.

For continuing the welding of seems discontinued due to some reason, the end of the discontinued seem shall be melted in order to obtain a good continuity. Before resuming the welding operation, the groove as well as the adjacent parts shall be well cleaned for a length of approx. 50 mm.

For single butt welds (in V, 1/2 V or U) and double butt welds (in K, double U etc.) the re-welding of the root is mandatory but only the metal deposit on the root has been cleaned by back gouging or chipping.

The welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other method.

For multi-layer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping and wire brushing. Backing strips shall not be allowed.

The order and method of welding shall be so that -

- No unacceptable deformation appears in the welded parts.

- Due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses.

The defects in welds must be rectified according to IS: 823 and as per instruction of Architect/Project Manager.

9.5.8 Weld Inspection

The weld seams shall satisfy the following:

- shall correspond to design shapes and dimensions.
shall not have any defects such as cracks, incomplete penetration and fusion, under-cuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible limits.

During the welding operation and approval of finished elements, inspections and tests shall be made as shown in annexure-B.

The mechanical characteristics of the welded joints shall be as in IS: 823.

9.5.9 Preparation of Members for Bolting

The members shall be assembled for bolting with proper jigs and fixtures to sustain the assemblies without deformation and bending.

Before assembly, all sharp edges, shavings, rust dirt, etc. shall be removed.

Before assembly, the contacting surfaces of the members shall be cleaned and given a coat of primer as per IS: 2074.

The members which are bolt assembled shall be set according to drawings and temporarily fastened with erection bolts (minimum 4 pieces) to check the coaxiality of the holes.

The members shall be finally bolted after the deviations have been corrected, after which there shall not be gaps.

Before assembly, the members shall be checked and got approved by the Architect/Project Managers.

The difference in thickness of the sections that are butt assembled shall not be more than 3% or maximum 0.8 mm whichever is less. If the difference is larger, it shall be corrected by grinding or filling.

Reaming of holes to final diameter or cleaning of these shall be done only after the parts have been check assembled.

As each hole is finished to final dimensions (reamed if necessary) it shall be set and bolted up. Erection bolts shall not be removed before other bolts are set.

9.5.10 Bolting up

Final bolting of the members shall be done after the defects have been rectified and approval of joints obtained.

The bolts shall be tightened starting from the centre of joint towards the edge.

9.5.11 Planning of Ends

Planning of ends of members like column ends shall be done by grinding when so specified in the design.

Planning of butt welded members shall be done after these have been assembled, the spare edges shall be removed with grinding machines or files.

The following tolerances shall be permitted on member that have been planed.
- On the length of the member having both ends planed, maximum ± 2 mm with respect to design.

- Level differences of planed surfaces, maximum 0.3 mm.

- Deviation between planed surface and member's axis maximum 1/1500.

9.5.12 **Holes for Field Joints**

Holes for field joints shall be drilled in the shop to final diameters and tested in the shop, with trial assemblies.

When three-dimensional assembly is not possible in the shop, the holes for field joints may be drilled in shop and reamed on site after erection, on approval by the Architect/Project Managers.

For bolted steel structures, trial assembly in shop is mandatory.

The tolerance for spacing of holes shall be ± 1 mm.

9.5.13 **Tolerances**

All tolerances regarding dimensions, geometrical shapes and sections of steel structures, shall be as per Annexure B, if not specified in the drawing.

9.5.14 **Marking for Identification**

All elements and members prior to dispatch for erection shall be shop marked.

The members shall be visibly marked with a weather proof light coloured paint. The size and thickness of the numbers shall be chosen as to facilitate the identification of members.

For the small members that are delivered in bundles or crates, the required marking shall be done on small metal tags securely tied to the bundle, while the crates shall be marked directly.

Each bundle or crate shall be packed with members for one and the same assembly; in the same bundle or crate, general utility members such as bolts, quests etc. may be packed.

All bill of materials showing weight, quality and dimension of contents shall be placed in the crates.

The members shall be marked with a durable paint, in a visible location, preferably at one end of the member so that these may be easily checked during storage and erection.

All members shall be marked in the shop before inspection and acceptance.

When the member is being painted, the marking area shall not be painted but bordered with white paint.

The marking and job symbol shall be registered in all shop delivery documents (transportation, for erection etc.)
9.5.15 **Shop Test Pre-assembly**

For steel structures that have the same type of welding the shop test pre-assembly shall be performed on one out of every 10 members minimum.

For bolted steel structures, shop test pre-assembly is mandatory for all elements as well as for the entire structure in conformity with Clause 5.12.

9.6 **Shop Inspection and Approval**

9.6.1 **General**

The Architect/Project Managers or their representative shall have free access at all responsible times to the contractors fabrication shop and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with drawings and specifications.

Technical approval of the steel structure in the shop by the Architect/Project Managers is mandatory.

The contractor shall not limit the number and kinds of tests, final as well as intermediate ones, or extra tests required by the Architect/Project Managers.

The contractor shall furnish necessary tools, gauges, instruments etc. and technical non-technical personnel for shop tests by the Architect/Project Managers, free of cost.

9.6.2 **Shop Acceptance**

The Architect/Project Managers shall inspect and approve at the following stages:

The following approvals may given in shop:

- Intermediate approvals of work that cannot be inspected later.
- Partial approvals
- Final approvals

Intermediate approval of work shall be given when a part of the work is performed later:

- Cannot be inspected later
- Inspection would be difficult to perform and results would not be satisfactory.

Partial approval in the shop is given on members and assemblies of steel structures before the primer coat is applied and includes:

- Approval of materials
- Approval of field joints
- Approval of parts with planed surfaces
- Test erection
- Approval of members
- Approval of markings
- Inspections and approvals of special features, like Rollers, loading platform mechanism etc.
During the partial approval, intermediate approvals as well as all former approvals, shall be taken into consideration.

9.6.3 Final approval in the Shop

The final approval refers to all elements and assemblies of the steel structures, with shop primer coat, ready for delivery from shop to be loaded for transportation, or stored.

The final approval comprises of:

- Partial approvals
- Approval of shop primer coat
- Approval of mode of loading and transport
- Approval of storage (for materials stored)

9.7 Painting and Delivery

9.7.1 Preparation of parts for shop painting

Painting shall consist of providing one coat of red oxide zinc chromate primer to steel members before dispatch from shop.

Primer coat shall not be applied unless:

- Surface have been wire brushed, cleaned of dust, oil, rust etc.
- Erection gaps between members, spots that cannot be painted or where moisture or other aggressive agents may penetrate, have been filled with an approved type of oil and putty.
- The surface to be painted are completely dry.
- The parts where water of aggressive agents may collect (during transportation, storage, erection and operation) are filled with putty and provided with holes for drainage of water.
- Members and parts have been inspected and accepted
- Welds have been accepted.

The following are not to be painted or protected by any other product:

- Surface which are in the vicinity of joints to be welded at site.
- Surfaces bearing markings
- Other surfaces indicated in the design.

The following shall be given a coat of hot oil or any approved resistant lubricant only.

- Planed surfaces
- Holes for links

The surfaces that are to be embedded or in contact with the concrete shall be given a
of cement wash.

The surfaces which are in contact with the ground, gravel or brick work and subject to moisture, shall be given bituminous coat.

The other surfaces shall be given a primer coating.

Special attention shall be given to locations not easily accessible, where water can collect and which after assembly and erection cannot be inspected, painted and maintained. Holes shall be provided for water drainage and in accessible box type sections shall be hermetically sealed by welds.

If specified elsewhere, in the schedule of quantities, the contractor shall paint further coats of red-oxide after erection and placing in position of the steel structures.

9.7.2 Packing, transportation, delivery

After final shop acceptance and marking, the item shall be packed and loaded for transportation.

Packing must be adequate to protect item against warping during loading and unloading.

Proper lifting devices shall be used for loading, in order to protect items against warping.

Slender projecting parts shall be braced with additional steel bars, before loading, for protection against warping during transportation.

Loading and transportation shall be done in compliance with transportation rules.

If certain parts cannot be transported in the lengths stipulated in the design, the position and type of additional splice joints shall be approved by the Architect/Project Managers.

Items must be carefully loaded on platforms of transportation means to prevent warping, bending or falling during transportation.

The small parts such as fish plates, quests etc. shall be securely tied with wire to their respective parts.

Bolts, nuts and washers shall be packed and transported in crates.

The parts shall be delivered in the order stipulated by the Architect/Project Managers and shall be accompanied by document showing:

- Quality and quantity of structure or members
- Position of member in the structure
- Particulars of structure
- Identification number job symbol.

9.8 Field Erection

9.8.1 The erection work shall be permitted only after the foundation or other structure over which the steel work will be erected is approved and is ready for erection.

9.8.2 The contractor shall satisfy himself about the levels, alignment etc. for the foundations well in advance, before starting the erection. Minor chipping etc. shall be carried out by the contractor on his expense.
9.8.3 Any faulty erection done by the contractor shall be made good at his own cost.

9.8.4 Approval by the Architect/Project Managers or their representatives at any stage of work does not relieve the contractor of any of his required guarantees of the contract.

9.8.5 **Storage and preparation of parts prior to erection**

The storage place for steel parts shall be prepared in advance and got approved by the Architect/Project Managers before the steel structures start arriving from the shop.

A platform shall be provided by the Contractor near the erection site for preliminary erection work.

The contractor shall make the following verifications upon receipt of material at site.

- for quality certificates regarding materials and workmanship according to these general specifications and drawings.

- Whether parts received are complete without defects due to transportation, loading and unloading and defects, if any, are well within the admissible limit.

For the above work sufficient space must be allotted in the storage area.

Steps shall be taken to prevent warping of items during unloading.

The parts shall be unloaded, stored and stored so as to be easily identified.

The parts shall be stored according to construction symbol and markings so that these may be taken out in order or erection.

The parts shall be at least 150 mm clear from ground on wooden or steel blocks for protection against direct contact with ground and to permit drainage of water.

If rectification of members like straightening etc. are required, these shall be done in a special place allotted which shall be adequately equipped.

The parts shall be clean when delivered for erection.

9.8.6 **Erection & Tolerances**

Erection in general shall be carried out as required and approved by the Architect/Project Managers.

Positioning and levelling of the structure, alignment and plumbing of the stanchion and fixing every member of the structure shall be in accordance with the relevant drawings and to the complete satisfaction of the Architect/Project Managers.

The following checks and inspection shall be carried out before during and after erection.

- damage during transportation
- accuracy of alignment of structures
- erection according to drawings and specifications
- progress and workmanship.
In case there be any deviations regarding positions of foundations or anchor bolts, which would lead to erection deviations, the Architect/Project Managers shall be informed immediately. Minor rectifications in foundations, orientation of bolts holes etc. shall be carried out as part of the work, at no extra cost.

The various parts of the steel structure shall be so erected so to ensure stability against inherent weight, wind and erection stresses.

The structure shall be anchored and final erection joints completed after plan and elevation positions of the structural members have been verified with corresponding drawings and approved by the Architect/Project Managers.

The bolted joints shall be tightened so that the entire surface of the bolt heads and nuts shall rest on the member. For parts with sloping surfaces tapered washers shall be used.

9.9 **Final acceptance and handing over the structure**

9.9.1 At acceptance, the contractor shall submit the following documents:

- Shop and erection drawings - either in tracings or reproducible.
- 4 copies of each of the following:
  - shop acceptance documents
  - quality certificate for structurals, plates, etc. (electrodes, welding wire, bolts, nuts, washers etc.)
  - List of certified welders who worked on erection of structures.
  - acceptance and intermediate control procedure of erection operations.

9.9.2 Approval by the Architect/Project Managers at any stage of work does not relieve the contractor of any of his required guarantees of the contract.

9.10 **Method of Payments**

9.10.1 Payment for steel work shall be made on basis of admissible weight of the structure accepted, the weight being determined as described in such Clause 9.10.2 below:

The rate for supply, fabrication and erection, shall include cost of all handling and transportation to Owner's store/site of work where supply and fabrication only are involved, trimming, straightening, edge preparation, preparation and getting reviewed of fabrication drawings, and providing one or more coat of Red-oxide zinc chromate primer as specified in the schedule of quantity.

In the case, Owner supplies materials the rate shall include cost of steel materials taking delivery of the materials, from owner's store all handling and rehandling, loading and unloading, transport to site or work, returning of surplus materials to owner's stores etc. complete as well as the cost of all handling and transport, scaffolding, temporary supports, tools and tackles, touching up primer coat, grouting etc.

9.10.2 The actual lengths installed shall be measured and the weight of structural material/plate shall be calculated wherever necessary on the basis of IS handbook. If sections are different from IS section, then manufacturers handbook shall be adopted. No allowance in weights shall be made for rolling tolerance.
9.10.3 Sections built out of plates, structural shall be paid on the actual weight incorporated except for gussets which will be paid on the weight of the smallest rectangle enclosing the shape. No deductions shall be made for skew cuts in rolled steel sections.

9.10.4 Welds, bolts, nuts, washers, etc. shall not be measured. Rate for structural steel work shall be deemed to include the same.

9.10.5 No other payment either for temporary works connected with this contract or for any other item such as welds, shims, pacing plates etc. shall be made. Such item shall be deemed to have been allowed for in the rate quoted for steel work.

9.11 **Grouting of Pockets**

9.11.1 Grouting of pockets and under base plates will be done only after the steel work has been levelled and plumbed and the bases of stranchions are supported by steel shims. The space below the base plate and pockets shall be thoroughly cleaned.

911.2 The mortar used for grouting shall not be leaner than 1:2 (1 cement : 2 sand) (grade 300 in case of concrete) and shall be mixed to the minimum consistency required. It shall be poured under suitable head and tamped until the space has been completely filled.

912 **Tolerances allowed in the erection of plant building without cranes**

The maximum tolerances for line and level of the steel work shall be $\pm 3.00$ mm on any part of the structure. The structure shall not be out of plumb more than 3.5 mm on each 10 M. section of height and not more than 7.0 mm per 30 M. section.

These tolerances shall apply to all parts of the structure unless the drawings issued for erection purposes state otherwise.
ANNEXURE – A

INSPECTION

<table>
<thead>
<tr>
<th>Inspection</th>
<th>Coverage</th>
<th>Procedure</th>
<th>Evaluation findings and remedy of defect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection of weld seam appearance</td>
<td>All welds</td>
<td>Naked eye or lens</td>
<td>All faulty welds shall be rectified.</td>
</tr>
<tr>
<td>Checking of sizes</td>
<td>At least one for each weld seam</td>
<td>Ordinary measuring instruments (rule, templates)</td>
<td>Should faulty weld be found all welds shall be checked &amp; all defects shall be rectified.</td>
</tr>
<tr>
<td>Mechanical tests for welding procedure performance and electrodes</td>
<td>As per IS : 823</td>
<td>As per IS : 823</td>
<td></td>
</tr>
</tbody>
</table>

ANNEXURE - B

INADMISSIBLE WELD DEFECTS AND TOLERANCE ALLOWED FOR WELDS

<table>
<thead>
<tr>
<th>Defects</th>
<th>Detailing of sketching of defects</th>
<th>Allowed tolerance and remedy of defects</th>
<th>Cause of defects</th>
<th>Mode of finding defects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unsatisfactory appearance</td>
<td>uneven width rugged</td>
<td>at discretion cut weld &amp; reweld</td>
<td>uneven welding progress, voltage fluctuations, varying Arc length, negligence, inexperience welder</td>
<td>external (visual) inspection</td>
</tr>
<tr>
<td>Unsatisfactory shape</td>
<td>shallow or jutting welds</td>
<td>No variance from design shape shall be allowed</td>
<td>negligence</td>
<td>Visual inspection template checking</td>
</tr>
<tr>
<td>Incomplete weld</td>
<td>not allowed fill in weld</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Molten metal flow</td>
<td>not allowed fill in weld</td>
<td>excessive melting wrong handling of electrode.</td>
<td></td>
<td>visual inspection</td>
</tr>
<tr>
<td>Pits</td>
<td>not allowed cut &amp; reweld</td>
<td>wrong welding technique</td>
<td></td>
<td>visual inspection</td>
</tr>
<tr>
<td>Surface cracks</td>
<td>not allowed cut &amp; reweld</td>
<td>Great stresses, sudden cooling, wrong type of electrode.</td>
<td></td>
<td>visual inspection</td>
</tr>
<tr>
<td>Incorrect Sectional Dimensions</td>
<td>b1 = ± 2mm b2 = ± 2mm b = ± 1mm c = ± 1mm Chisel &amp; grind.</td>
<td>negligence</td>
<td>Template checking</td>
<td></td>
</tr>
<tr>
<td>Insufficient</td>
<td>For weld length 11 + 5mm for 12 + 10mm for shorter seams cut and reweld or complete to length</td>
<td>Negligence</td>
<td>Rule checking</td>
<td></td>
</tr>
<tr>
<td>Back cuts</td>
<td>if 0.5mm for 10mm &amp; C 1mm for 10mm replace relevant members</td>
<td>Burned material excessive melting</td>
<td>Visual Inspection</td>
<td></td>
</tr>
<tr>
<td>Surface porosities</td>
<td>Max. 5% of weld seam area cut and reweld</td>
<td>Frequent interruptions or welding electrodes inadequately covered</td>
<td>Visual inspection</td>
<td></td>
</tr>
</tbody>
</table>

INADEQUATE APPEARANCE OF WELD MAY BE ALLOWED IF NO OTHER DEFECTS THAT MIGHT DIMINISH WELD STRENGTH ARE PRESENT. SECTIONAL WELD SHAPE MUST COMPLY WITH DESIGN INDICATIONS. NO CONCAVE WELDS SHALL BE ALLOWED FOR SPECIFIED CONVEX WELDS, OR VICE VERSA. TOLERANCE FOR CONCAVITY OR CONVEXITY OF WELDS SHALL BE 1 x a ("a" BEING THE HEIGHT OF THE TRIANGLE WITHIN THE SECTION SHOWN), BUT NOT MORE THAN 0.6 mm.
LIST OF CODES

The materials and workmanship shall be in accordance with the requirement of the appropriate IS code wherever applicable together with any building regulations or bye-laws governing the works.

The following list is included for guidance only and the omission from the list does not relieve the contractor from compliance therewith:

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>IS 1200</td>
<td>Mode of measurement.</td>
</tr>
<tr>
<td>IS 269</td>
<td>Ordinary portland cement.</td>
</tr>
<tr>
<td>IS 3812, 1981</td>
<td>Flyash for use as pozzolana and admixtures,</td>
</tr>
<tr>
<td>IS 2386</td>
<td>Method of test for aggregate for concrete.</td>
</tr>
<tr>
<td>IS 516</td>
<td>Method of test for strength of concrete.</td>
</tr>
<tr>
<td></td>
<td>Coarse and fine aggregate from natural sources for concrete.</td>
</tr>
<tr>
<td>IS 1597</td>
<td>Code of practice for construction of stone masonry.</td>
</tr>
<tr>
<td>IS 1597 PART 1</td>
<td>Code of practice for construction of rubble stone masonry.</td>
</tr>
<tr>
<td>IS 6313 PART 2</td>
<td>Anti-termite measures in buildings, pre-constructional chemical treatment measures.</td>
</tr>
<tr>
<td>IS : 210</td>
<td>Gray Iron Castings</td>
</tr>
<tr>
<td>IS : 226</td>
<td>Structural Steel (Standard Quality)</td>
</tr>
<tr>
<td>IS : 800</td>
<td>Code of Practice for Use of Structural Steel in General Building Construction</td>
</tr>
<tr>
<td>IS : 806</td>
<td>Code of Practice for Use of Steel Tubes in General Building Construction</td>
</tr>
<tr>
<td>IS : 813</td>
<td>Scheme of Symbols for Welding</td>
</tr>
<tr>
<td>IS : 814</td>
<td>Covered Electrodes for Metal Arc Welding of (part I &amp; II) Structural Steel</td>
</tr>
<tr>
<td>IS : 816</td>
<td>Code of Practice for Use of Metal Arc Welding for General Construction in Mild Steel</td>
</tr>
<tr>
<td>IS : 822</td>
<td>Code of Practice for Inspection of Welds</td>
</tr>
<tr>
<td>IS : 961</td>
<td>Structural Steel (High Tensile)</td>
</tr>
<tr>
<td>IS : 1024</td>
<td>Code of Practice for Use of Welding in Bridges and Structures Subject To Dynamic Loading</td>
</tr>
<tr>
<td>IS : 1030</td>
<td>Carbon Steel Casting for General Engineering Purposes</td>
</tr>
<tr>
<td>IS : 1120</td>
<td>Coach Screws</td>
</tr>
<tr>
<td>IS : 1161</td>
<td>Steel Tubes for Structural Purposes</td>
</tr>
<tr>
<td>IS : 1182</td>
<td>Recommended Practice for Radiographic Examination of Fusion Welded Butt joints in Steel Plates</td>
</tr>
<tr>
<td>IS : 1363</td>
<td>Black Hexagon Bolts, Nuts and Lock Nuts and Black Hexagon Screws</td>
</tr>
<tr>
<td>IS : 1365</td>
<td>Slotted Countersunk Screws</td>
</tr>
<tr>
<td>IS : 1367</td>
<td>Technical Supply Conditions for Threaded Fasteners</td>
</tr>
<tr>
<td>IS : 1915</td>
<td>Code of Practice for Steel Bridges</td>
</tr>
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<td>--------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>IS : 2016</td>
<td>Plain Washers</td>
</tr>
<tr>
<td>IS : 2062</td>
<td>Structural Steel (Fusion Welding quality)</td>
</tr>
<tr>
<td>IS : 3757</td>
<td>Specification for High Tensile Friction Grip Bolts</td>
</tr>
<tr>
<td>IS : 5624</td>
<td>Specification for Foundation Bolts</td>
</tr>
<tr>
<td>IS : 3063</td>
<td>Single Coil Rectangular Section Sprint Washers for Bolts, Nuts and Screws</td>
</tr>
<tr>
<td>IS : 3443</td>
<td>Crane Rail Sections</td>
</tr>
<tr>
<td>IS : 3600</td>
<td>Code of Practice for Testing of Fusion Welded (part I) joints and Weld Metal in Steel</td>
</tr>
<tr>
<td>IS : 4923</td>
<td>Hollow Steel Sections for Structural Use</td>
</tr>
<tr>
<td>IS : 6227</td>
<td>Code of Practice for Use of Metal Arc Welding in Tabular Structure</td>
</tr>
<tr>
<td>IS : 801</td>
<td>Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members in General Building Construction</td>
</tr>
<tr>
<td>IS : 811</td>
<td>Specifications for Cold Formed Light Gauge Structural Steel Sections.</td>
</tr>
<tr>
<td>IS : 823</td>
<td>Procedure Coat for Metal Arc Welding of Mild Steel</td>
</tr>
<tr>
<td>IS : 1024</td>
<td>Code of Practice for Welding of Structure Subject To Dynamic Loading</td>
</tr>
<tr>
<td>IS : 1261</td>
<td>Code of Practice for Seam Welding in Mild Steel</td>
</tr>
<tr>
<td>IS : 1323</td>
<td>Code of Practice for Oxy Acetylene Welding for Structure Work in Mild Steel</td>
</tr>
</tbody>
</table>
# Basic Rates of Materials – F. O. R. Site

(Adopted for quoting item rates in the tender)

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Rates</th>
<th>Unit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Grey Cement 43 Grade</td>
<td>Bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>White Cement</td>
<td>Bag</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Mild Steel</td>
<td>M.T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Structural Steel</td>
<td>M.T</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>First Class Bricks</td>
<td>No.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The contractor is to fill in the rate and his source required above while tendering. Also the samples of all items as proposed while quoting are to be furnished with tender.

Signature of the Contractor
**LIST OF APPROVED MAKES OF MATERIALS**

1. **Cement Bonded Board** - E-Board, Bison or approved
2. **Welding Rod** - Advani / ESAB/ Weld Alloy or as approved
3. **Imidacloprid – 30.50 SC** - Rallis India Ltd., TATA Product Bayer India
4. **Structural Steel** - SAIL / TISCO / Rashtriya Ispat or as approved
5. **Tor/ TMT Steel** - Sail/ Tisco/ Rastrriya Ispat/ KLRathi / or as approved
6. **P.V.C.Pipes** - Garware Plastics / Prakash or as approved
7. **Polysulphide Sealant** - Pidilite/ Fosroc/ Chemetall-Rai or as approved
8. **Water proof cement paint** - Snocem India Ltd/ Unitile or as approved
9. **Water proofing compound** - CICO / STP/ MBT or as approved
10. **Bitumen Impregnated Board** - Shalitex or as approved
11. **PVC water bars/railing** - Fixopan / Syntex or approved
12. **Cement** - L&T/ Vikram/ J.K./ Gujrat Ambuja
13. **Ready Mix Concrete** - Birla Ready Mix/ L & T/ JK or as approved
15. **Extruded Polystyrene** - Dow Chemical Company (Market by TEXSA INDIA LTD.) or approved Equivalent
16. **Hessian Based Felt** - Bitumat Co. Ltd / Soprema, Tamco
17. **Concrete admixture** - Fosroc/ CICO/ Mc Bauchemie

**Note**: In the list of recommended above, out of two three makes mentioned in the list, only first make shall be quoted for and used unless specified in the Bill of quantities.
LIST OF SPECIALIST FIRMS

1 WATERPROOFING TREATMENT

1. M/s Roofers Combine (India) Pvt Ltd
   Grover Mansion 4th Floor
   3/27 Asaf Ali Road, New Delhi
   Phone: 2326 2423, 2328 4256, 2328 5322

2. M/s CICO Technologies,
   A-9, C.R Park,
   New Delhi
   Phone: 2642 0544, 2623 5335,
   Fax: 2622 2055

3. M/s R.B Waterproofing (I) Pvt Ltd.
   14, Arjun Nagar (2nd Floor)
   New Delhi
   Tel: 26104221, 26182832

4. M/s Pioneer Aqua
   S-36/33 (Basement)
   DLF City Phase –III
   Gurgaon
   Tel: 95124-3092711
   Mob: 9310032422
II PEST CONTROL CONTRACTORS

1. M/s Premier Pest Control
   421, Sant Nager (East of Kailash)
   New Delhi-110065
   Phone-2641 4910, 26422181
   Fax-26217403

2. M/s Indo Asia Pest Control
   E-262/2, G.L. House
   Gautam Nagar
   Green Park
   New Delhi-220049.
   Phone-2652 7220/2652 4023

3. M/s Pest Control India Pvt. Ltd.
   7, Jantar Mantar Road
   New Delhi 110001
   Phone-2336 8768-70/72
   Fax-2336 8772

4. M/s Pest Control Company
   C-260, Greater Kailash-I (Basement)
   New Delhi
   Phone-2647 9450, 2641 8031
   Fax-2642 8032

5. M/s Pest Control & Eradication Services.
   Near PNB Sukhrali,
   Mehrauli Road, Gurgaon.
   Phone: 2341621, 2346621.
### PRELIMINARIES AND GENERAL MATTERS

<table>
<thead>
<tr>
<th>S.No</th>
<th>Description</th>
<th>Qty.</th>
<th>Unit</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Safety Health and Welfare of Work People</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Provide for all the costs and charges incurred by complying with all safety</td>
<td></td>
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<tr>
<td></td>
<td>health and welfare regulations, appertaining to staff and work people</td>
<td></td>
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<td></td>
<td>employed on the site including those employed by all sub-contractors,</td>
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<td></td>
<td>including registration with the labour department of Government. The</td>
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<tr>
<td></td>
<td>Contractor shall be responsible for and shall allow for providing</td>
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<tr>
<td></td>
<td>medical facilities including emergency medical facilities for his staff.</td>
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<tr>
<td></td>
<td>Cost to be included in the Contract rates.</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td><strong>Disposal of Refuse</strong></td>
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<tr>
<td></td>
<td>Keep the site free from debris arising from the work during the</td>
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<tr>
<td></td>
<td>construction period, and leave the site free from debris on completion</td>
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<td></td>
<td>to the satisfaction of the Project Manager.</td>
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<td></td>
<td>Cost to be included in the Contract rates.</td>
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<tr>
<td>3</td>
<td><strong>Site Notice Board</strong></td>
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<tr>
<td></td>
<td>The contractor shall provide necessary site notice boards as required by</td>
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<td></td>
<td>the Project Manager to display the project name, the Employers name and</td>
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<tr>
<td></td>
<td>the names of all consultants associated with the work and sign / warning</td>
<td></td>
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<tr>
<td></td>
<td>boards, direction and demarcation signs at various location stressing the</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>prime need for safety etc.</td>
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<td></td>
<td>Cost to be included in the Contract rates.</td>
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<tr>
<td>4</td>
<td><strong>Statutory Approvals</strong></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Provide all assistance in getting statutory approvals from various bodies</td>
<td></td>
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<tr>
<td></td>
<td>as directed by the Project Manager. A list of all such approvals the</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>particulars of approving bodies and time &amp; schedule shall be submitted by</td>
<td></td>
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<td></td>
<td>the contractor</td>
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<tr>
<td></td>
<td>Cost to be included in the Contract rates.</td>
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<tr>
<td>5</td>
<td><strong>General Lighting for the work</strong></td>
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<tr>
<td></td>
<td>Provide electric lights, maintain system, all as required for the works</td>
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<tr>
<td></td>
<td>and of other contractors, and remove the temporary installations on</td>
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<td></td>
<td>completion.</td>
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<tr>
<td></td>
<td>Cost to be included in the Contract rates.</td>
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<tr>
<td>6</td>
<td>**Coordination with Development Commissioner Office located within the</td>
<td></td>
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<tr>
<td></td>
<td>SEZ for verification etc. for availing benefits of exemptions for</td>
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<tr>
<td></td>
<td>works within SEZ</td>
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<tr>
<td></td>
<td>Cost to be included in the Contract rates.</td>
<td></td>
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</tr>
<tr>
<td>7</td>
<td><strong>Insurance</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Provide insurance policies as mentioned in General Condition of Contracts</td>
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<tr>
<td></td>
<td>with an approved insurance company, jointly in the name of Project</td>
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</tr>
<tr>
<td></td>
<td>Manager and Contractor. The original policy to be deposited with Project</td>
<td></td>
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<tr>
<td></td>
<td>Manager.</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Cost to be included in the Contract rates.</td>
<td></td>
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</tr>
</tbody>
</table>

**TOTAL TO SUMMARY**

<p>| Rs. | NIL |</p>
<table>
<thead>
<tr>
<th>S. No.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00</td>
<td>EARTH WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Surface Dressing/ preparation of excavated area suitable for foundation incl excavation up to 300 mm average for footing/ foundation of retaining walls and columns by mech compactor/ plate vibration etc</td>
<td>Sqm</td>
<td>3500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>Earth work in excavation below existing level in basements, foundations, trenches, pits etc. Including shoring, strutting, dressing sides and levelling, grading, ramming and bailing or pumping out water from the excavated areas collected from any source including sub soil water and keeping the excavated surface dry for subsequent works including taking out the excavated soil spreading in layers and stacking as directed, including a free lead and lift within the site for all types of soil upto depths and levels as shown in the drawings and as directed by the Project-in-charge</td>
<td>Cum</td>
<td>10000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>For all kinds of soil below existing excavated level as handed over to the contractor by the Project-in-charge.</td>
<td>Cum</td>
<td>5000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Backfilling with available excavated earth (excluding rock) in layers not exceeding 20cm in depth and rammed watered and consolidated complete in trenches, plinth sides of foundation etc.</td>
<td>Cum</td>
<td>2500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>Disposal of surplus excavated earth by means of mechanical transport, including loading, unloading etc., complete for all leads as per direction of Project-in-charge</td>
<td>Cum</td>
<td>2470</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>Providing and filling with fine river sand in plinth and under floor, above raft, including watering, ramming and consolidation, dressing complete.</td>
<td>Cum</td>
<td>305</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>Antitermite treatment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6.1</td>
<td>Providing and injecting chemical emulsion for pre-constructional anti-termite treatment and creating a chemical barrier under and all round the column pits, wall trenches, basement excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of building, expansion joints, surroundings of pipes and conduits etc. complete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>With Premise - Bayer or Chloropyrophos based emulsifiable concentrates 1% by Durmet 20% EC-BASF as per recommended application instructions of the manufacturer and as approved by Engineer-in-Charge</td>
<td></td>
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</tbody>
</table>

Note: The work must be executed by approved specialised Agency who is the member of IPCA. The Contractor shall give a 10 years guarantee in the approved format.
### Peripheral Anti-termite treatment for basement at finished ground level

The Anti-termite treatment shall be applied on the periphery of the basement in form of a barrier having horizontal width of 1000 mm and vertical depth of 500 mm from finished level of earth work/ground level. The soil / earth will be backfilled in manner specified and then the treatment would be carried out in two or more layers as per methodology specified by the Manufacturer or as per Engineer-in-Charge. The area of application of anti-termite treatment will be measured in plan i.e. length x width and will be paid for.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peripheral Anti-termite treatment for basement at finished ground level</td>
<td>Sqm</td>
<td>450</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2.0 CONCRETE WORK (CAST-IN-SITU)

#### 2.1 Providing and laying in position cement concrete of specified grade including the cost of centring and shuttering – All work upto plinth level

| 2.1.1 | M-7.5 Concrete | Cum | RO  |
| 2.1.2 | 1:4:8 (1 Cement : 4 coarse sand : 8 graded stone aggregate 40mm nominal size) | Cum | 685 |
| 2.1.2 | 1:5:10 (1 Cement : 5 coarse sand : 10 graded stone aggregate 40mm nominal size) | Cum | 50  |

<table>
<thead>
<tr>
<th>Total</th>
<th>Rs.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>117</td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>3.0</td>
<td>REINFORCED CEMENT CONCRETE</td>
</tr>
<tr>
<td>3.1</td>
<td>Providing and laying ready mix concrete of M-25 grade for reinforced cement concrete structural elements, excluding the cost of centring, shuttering, finishing and reinforcement, including admixtures in recommended proportions. (As per IS9103) to accelerate, retard setting of concrete improves workability without impairing strength and durability as per direction of Engineer-in-charge (RMC /Batching plant at site)</td>
</tr>
<tr>
<td>3.1.1</td>
<td>Footing, raft, pedestals.</td>
</tr>
<tr>
<td>3.1.2</td>
<td>Columns, pillars, posts and struts</td>
</tr>
<tr>
<td>3.1.3</td>
<td>Beams, plinth beams, girders, bressumers, cantilevers, Suspended floors, facias, lintels roofs and staircases including spiral staircases, shelves etc.</td>
</tr>
<tr>
<td>3.1.4</td>
<td>Walls of any thickness.</td>
</tr>
<tr>
<td>3.2</td>
<td>Blank</td>
</tr>
<tr>
<td>3.3</td>
<td>Extra for providing richer mixes respectively at all floors</td>
</tr>
<tr>
<td>3.3.1</td>
<td>Providing M-30 grade instead of M-25 grade RCC</td>
</tr>
<tr>
<td>3.4</td>
<td>Centering and shuttering including strutting, propping etc. and removal of form for:</td>
</tr>
<tr>
<td>3.4.1</td>
<td>Footing, raft, pedestals.</td>
</tr>
<tr>
<td>3.4.2</td>
<td>Columns of any size/Shear Walls</td>
</tr>
<tr>
<td>3.4.3</td>
<td>Suspended floors, roofs, landings balconies, access platform, Lintels, beams, plinth beams, girders, bressumers, Stairs, cantilevers (excluding landing) except spiral staircases etc.</td>
</tr>
<tr>
<td>3.4.4</td>
<td>Walls of any thickness</td>
</tr>
<tr>
<td><strong>Note :-</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Nothing extra shall be paid for circular, semicircular in shape, irregular shuttering, additional height in shuttering and it is assumed to be included in the quoted rates.</td>
</tr>
<tr>
<td>2</td>
<td>It should be ensured that all joints between the shuttering plates is not exceeding 3 mm.</td>
</tr>
<tr>
<td>3</td>
<td>The plates shall have fairly flat surface with undulations not exceeding ± 3 mm</td>
</tr>
<tr>
<td>4</td>
<td>The pattern of shuttering including the deployment of various sizes of plates shall be got approved in advance from owners.</td>
</tr>
<tr>
<td>3.5</td>
<td>Providing and laying reinforcements high yield strength ribbed TMT steel of various diameters grade FE 500 conforming to IS code 1786 for reinforced concrete work including cutting, bending, binding with annealed 18G MS binding wire, placing in position according to drawings. (Rate shall include cost of binding wire, cover blocks, etc.</td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
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<td>-------</td>
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</tr>
<tr>
<td>4.0</td>
<td>STRUCTURAL STEEL</td>
</tr>
<tr>
<td>4.1</td>
<td>Supplying and fixing in position insert plates, bolts, angles, tees, plats, anchor bolts, anchor plates, cleats and grillage beams etc. in reinforced cement concrete work including cost of cutting, bending, drilling, threading and welding lugs etc. with all tools, tackles and labour as per design or as directed including a coat of approved primer and making good the concrete surface if required.</td>
</tr>
<tr>
<td></td>
<td>Note :-Quantity includes Canopy &amp; Bridge betn. Two floors</td>
</tr>
<tr>
<td>4.3</td>
<td>Providing &amp; fixing in position MS grating made out of M.S. Flat iron angle iron frame including providing &amp; applying two coats of synthetic enamel paint over one coat of steel primer complete as per details.</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
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<tr>
<td>5.0</td>
<td><strong>ROOFING &amp; WATER PROOFING</strong></td>
</tr>
<tr>
<td>5.1</td>
<td>Brick bat coba water proofing of 110mm average thickness with brick aggregate and admixture of water proofing etc. Necessary gradient for easy flow of water shall be provided and the treated surface shall be covered with joint less water proof layer finished smooth with trowel in cement colour, marked into 300mm false squares. The job shall be completed including round vatas and khurrahs as per specifications of the specialist. <em>(in Mumty and Mechine Room)</em></td>
</tr>
<tr>
<td>5.1.1</td>
<td>Extra for additional thickness where required over and above 110mm (average) thickness.</td>
</tr>
<tr>
<td>5.2</td>
<td><strong>TERRACE WATER PROOFING</strong> : Providing and laying terrace insulation and waterproofing with the following specification <em>(Treated area shall be measured and paid for)</em></td>
</tr>
<tr>
<td></td>
<td>Horizontal Surface</td>
</tr>
<tr>
<td></td>
<td>* A layer of bituminous primer@ .2 to .25 kg/ sqm</td>
</tr>
<tr>
<td></td>
<td>* 1st layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 2nd layer of APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 3rd layer of 50mm thk Extruded Polystyrene of 32-35 Kgs/Cum density over a layer of hot refine minrel asphalt@ 1.5 Kg/ Sqm</td>
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<tr>
<td></td>
<td>4th layer of geo textile 100 GSM loosely laid as separation layer over the extruded polystrene sheet.</td>
</tr>
<tr>
<td></td>
<td>Vertical Surfaces</td>
</tr>
<tr>
<td></td>
<td>* A layer of bituminous primer.</td>
</tr>
<tr>
<td></td>
<td>* 1st layer of hessian based felt type 3 grade 1 over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 2nd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 3rd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>Note: Contractor shall give 10 yrs guarantee against leakages &amp; seepages of wPT on Rs. 100/- non judial stamped paper and as per approved format for WPT( Work of WPT To be executed thru appd specialist water proofing agency)</td>
</tr>
<tr>
<td>5.3</td>
<td>Providing and laying Screed concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) at terrace for the protection layer of waterproofing including weldmesh of weight 1.5Kg./Sqm and marking pattern with 300x300mm or appd size and pattern with rope on top surface over terrace</td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
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<tr>
<td>5.4</td>
<td>Providing and laying three coats of tapecrete waterproofing after preparation of surface etc. Each coat shall be mixed with cement in the proportions recommended by the manufacturer. Tapecrete slurry shall be applied over 10mm thick plaster 1:3 (1Cement : 3 coarse sand) including cleaning of substrata. The rate shall include the cost of the protection plaster 10 mm thick in CM 1:4 (1 Cement : 4 Coarse Sand) mixed with waterproofing compound complete nothing extra shall be paid. Note: The total item is to be considered complete as per the specifications for the purpose of quotation and nothing extra shall be paid over and about.</td>
</tr>
<tr>
<td>5.5</td>
<td>EXTENDED BASEMENT WATER PROOFING: Providing and laying waterproofing on podium. Basement terrace without insulation with the following specification (Treated area shall be measured &amp; paid for):</td>
</tr>
<tr>
<td>A</td>
<td>Horizontal Surface</td>
</tr>
<tr>
<td></td>
<td>* A layer of bituminous primer.</td>
</tr>
<tr>
<td></td>
<td>* 1st layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 2nd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 3rd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td>A</td>
<td>Vertical Surface</td>
</tr>
<tr>
<td></td>
<td>* A layer of bituminous primer.</td>
</tr>
<tr>
<td></td>
<td>* 1st layer of hessian based felt type 3 grade I over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 2nd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td></td>
<td>* 3rd layer of 1.0mm thick APP polymeric polyethylene membrane over a coat of hot refined mineral asphalt @1.5 Kg./Sqm with 75mm &amp; 100mm side &amp; end laps.</td>
</tr>
<tr>
<td>5.6</td>
<td>Providing and laying Screed concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) at terrace for the protection layer of waterproofing including weldmesh of weight 1.5Kg./Sqm. Extended Basement</td>
</tr>
<tr>
<td>5.7</td>
<td>Placing &amp; laying injection grouting cum polymer coating water proofing by applying two coats of polymer (cementious base) coating after cleaning the surface and providing not less than 18mm G.I. Nozzles, covering 1.5m x 1.5m grid for pressure grouting of cement slurry admixed with expandable powder of approved manufacture, admixture, waterproofing plasticiser etc. polymer coating shall be protected by 20mm thick water proofing plaster complete as per detailed specifications (work to be executed by approved specialized agency). water tank and Basement wall</td>
</tr>
<tr>
<td>5.7.1</td>
<td>Raft foundation</td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
</tr>
<tr>
<td>--------</td>
<td>-------------</td>
</tr>
<tr>
<td>5.7.2</td>
<td>Walls</td>
</tr>
<tr>
<td>5.8</td>
<td>Making Khurra's 450 x 450mm size using 50mm thk. Cement concrete 1:2:4 mix over pvc sheet 100 micron 600 x 600mm size, mixing water proofing compound of approved make @ 3% by weight of cement finished with a coat of neat cement punning, making offsets for rain water / other down take pipe etc. complete as per drawing and as directed.</td>
</tr>
<tr>
<td>5.9</td>
<td>Providing and making gola 75mm x 75mm size with Cement concrete 1:2:4 finished with a coat of neat cement i/c rounding, finishing etc. complete as epr drawing and design and as directed by Site In charge.</td>
</tr>
<tr>
<td>5.10</td>
<td>Providing and laying light weight foam concrete (cast-in situ) of max. density 800 kg / cum as per specification for all floor levels</td>
</tr>
</tbody>
</table>

**NOTE:**
Client reserves the option to delete the scope of Water Proofing from the contract and getting it done directly.

**Total**  Rs.
<table>
<thead>
<tr>
<th>S. No.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>BRICK WORK</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and constructing Brick masonry with bricks of class designation 75 [Crushing strength not less than 75 kg/sqcm] and thickness specified at all heights and levels in foundations, plinth and superstructure including providing scaffolding, raking out joints, curing, dewatering etc., complete as per drawing.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>6.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1.1</td>
<td>In foundation &amp; plinth 230 mm thick and above in cement mortar 1:6 mix (1 cement: 6 coarse sand).</td>
<td>Cum</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.1.2</td>
<td>230 mm thick and above (nominal dimension) in super structure in cement mortar 1:6 mix (1 cement: 6 coarse sand).</td>
<td>Cum</td>
<td>200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.2</td>
<td>a) Providing and constructing half brick masonry wall with brick of class designation 75 in cement mortar 1:4 (1 cement : 4 sand - 50% coarse sand and 50% fine sand) from ground floor level to terrace floor level including the cost of one No. 6mm dia bars in full length at every third coarse embedded in cement mortar at all floors and heights including racking out joints, cleaning soaking the bricks atleast for 24 hours before use and necessary scaffolding, curing atleast for 7 days etc. all complete at all floors and at all heights. (Hoop reinforcement to be supplied by Contractor)</td>
<td>Sqm</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) same as above using Fly ash bricks</td>
<td>Sqm</td>
<td>1200</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.3</td>
<td>a) Providing &amp; laying brick work using bricks of class designation 75 in stair case steps in cement mortar 1:3 (1 cement :3 coarse sand ) including joints finished flush/raked to 6 mm depth as work proceeds, curing etc.complete. including cleaning and soaking the bricks at least for 24 hours before use , curing etc. for 7 days etc. all complete at all heights / depth .</td>
<td>Cum</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) same as above using Fly ash bricks</td>
<td>Cum</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.40</td>
<td>Providing and constructing RR stone masonry with hard stone in Cement mortar 1:6 (One cement and 6 coarse sand) and thickness specified at all heights and levels in foundations, walls columns up to plinth level including providing scaffolding, raking out joints, curing, dewatering etc., complete as per drawing.</td>
<td>Cum</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td>Rs. 123</td>
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<table>
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<tr>
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<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.0</td>
<td>FINISHING</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.1</td>
<td>Providing &amp; laying 12 mm thick cement plaster to walls columns, piers etc. in cement mortar 1 : 3 : 3 (1 cement : 3 fine sand : 3 coarse sand) on plain side of wall or R.C.C. surface including curing, scaffolding etc. complete for all levels and heights.</td>
<td>Sqm</td>
<td>11400</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.2</td>
<td>Providing &amp; laying 15 mm thick cement plaster to walls in cement mortar 1 : 3 : 3 (1 cement : 3 fine sand : 3 coarse sand) on rough side of wall including curing, scaffolding etc. complete for all levels and heights.</td>
<td>Sqm</td>
<td>6150</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.3</td>
<td>Providing and fixing 24 gauge x 19 mm size galvanized chicken wire mesh to junctions of concrete and masonry work and other locations where called for including cutting to required sizes side laps of minimum 75 mm and fixing in position with necessary clips and U shaped galvanised wire nail etc. complete.</td>
<td>Sqm</td>
<td>600</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.4</td>
<td>Providing &amp; applying three or more coats of white wash with whitening to walls, ceiling etc. as called for applied and brought to uniform finish as approved.</td>
<td>Sqm</td>
<td>8000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.5</td>
<td>Providing and finishing two or more coats of synthetic enamel paint of approved manufacture and shade to steel faces applied evenly to give a uniform finish as approved including preparation of surface and a coat of steel primer.</td>
<td>Sqm</td>
<td>RO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.6</td>
<td>Providing and applying upto 18-20mm thick plaster in two coats with cement mortar 1 : 4 (1 cement : 4 coarse sand) to external wall surface at all heights and levels including scaffolding, cost of providing &amp; mixing water proofing compound CICO No-1 @1Kg per 50 Kg Cement Bag, making groove, curing etc., complete. (Under texture paint and shafts)</td>
<td>Sqm.</td>
<td>3570</td>
<td></td>
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</tbody>
</table>

**Total**  **Rs.**  124
# FLOORING

## 8.1 Providing and laying Vacuum dewatered flooring (Tremix Floor) of RMC of grade M-20 including providing and making 4 x 10mm groove at 4mtr. x 6 mtr. maximum panels or as directed and filling the groove with sealant (Colpor 200 of Fosroc chemical or Approved make), side shuttering with MS channels, vibrating concrete by using screed vibrator and suction dewatering using approved make equipment and finishing the top surface to required level and grade using power trowels of standard make including Virigin homopolymer polypropylene fibrous reinforcement, (Form Collated Fibrillated Fiber, specific gravity 0.91, length 38 mm, colour white, compliance with A.S.T.M.C -1116) as per manufacturer’s instructions **Parking Area**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.1</td>
<td>Providing and laying Vacuum dewatered flooring (Tremix Floor) of RMC of grade M-20 including providing and making 4 x 10mm groove at 4mtr. x 6 mtr. maximum panels or as directed and filling the groove with sealant (Colpor 200 of Fosroc chemical or Approved make), side shuttering with MS channels, vibrating concrete by using screed vibrator and suction dewatering using approved make equipment and finishing the top surface to required level and grade using power trowels of standard make including Virigin homopolymer polypropylene fibrous reinforcement, (Form Collated Fibrillated Fiber, specific gravity 0.91, length 38 mm, colour white, compliance with A.S.T.M.C -1116) as per manufacturer’s instructions <strong>Parking Area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) 150mm thk</td>
<td>Sqm.</td>
<td>RO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) 100mm ave thk</td>
<td>Sqm.</td>
<td>3100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.2</td>
<td>Providing and fixing 22 mm thick grey heavy duty precast chequered terrazzo tiles with graded marble chips of size up to 6 mm in floors jointed with neat cement slurry mixed with pigment to match the shade of the tiles laid over 20 mm thick bed of cement mortar 1:4 (1 cement : 4 coarse sand) all complete <strong>Ramp</strong></td>
<td>Sqm.</td>
<td>RO</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and laying 25 mm thick polished Kota stone slab flooring in floors, landing with slabs of approved size and shade with machine cut edges laid to required pattern over a bed of 20 mm (approx.) thick cement mortar 1:4 (1 cement : 4 coarse sand) including laying slabs in cement slurry pigmented to match the shade of slabs, grinding, rubbing and polishing complete. <strong>Fire staircase-floor and landing</strong></td>
<td>Sqm.</td>
<td>162</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and laying 18-20 mm thick Green Marble slab flooring in floors, landing with slabs of approved size and shade with machine cut edges laid to required pattern over a bed of 20 mm (approx.) thick cement mortar 1:4 (1 cement : 4 coarse sand) including laying slabs in cement slurry pigmented to match the shade of slabs, grinding, rubbing and polishing complete. <strong>Fire staircase-floor and landing</strong></td>
<td>Sqm.</td>
<td>80</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and laying 25 mm thick polished Kota stone slab in dado, skirting, treads &amp; riser of steps (single piece) &amp; pillers with slabs of approved size and shade with machine cut edges laid to required pattern over a bed of 12 mm (approx.) thick cement mortar 1:3 (1 cement : 3 coarse sand) including laying slabs in cement slurry pigmented to match the shade of slabs, grinding, rubbing and polishing complete. <strong>Fire staircase</strong></td>
<td>Sqm.</td>
<td>245</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and laying 18-20 mm th slab in dado, skirting, treads &amp; riser of steps (single piece) &amp;pillers with slabs of approved size and shade with machine cut edges laid to required pattern over a bed of 12 mm (approx.) thick cement mortar 1:3 (1 cement : 3 coarse sand) including laying slabs in cement slurry pigmented to match the shade of slabs, grinding, rubbing and polishing complete. <strong>Fire staircase</strong></td>
<td>Sqm.</td>
<td>125</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Providing and fixing tiles of approved make, size and shade in floors over 20 mm thick cement mortar 1:4 (1 cement : 4 coarse sand) jointed with white cement slurry mixed with pigment to match the shade of tiles, complete as per detail &amp; as shown in the drawing only.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
<td>UNIT</td>
<td>Qty</td>
<td>RATE</td>
<td>AMOUNT</td>
</tr>
<tr>
<td>-------</td>
<td>------------------------------------------------------------------------------</td>
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<td>--------</td>
</tr>
<tr>
<td>8.5.1</td>
<td>5mm thick white (second quality) glazed tile in water tank</td>
<td>Sqm.</td>
<td>320</td>
<td>8.60</td>
<td>2680</td>
</tr>
<tr>
<td>8.60</td>
<td>Providing &amp; laying 50 mm thick IPS flooring with M2O grade concrete including Glass/ PVS strips (2 Sqm panels) complete in all respect as per instruction of engineer-in-charge</td>
<td>Sqm</td>
<td>100</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>8.7</td>
<td>Providing &amp; laying 75 mm thick IPS flooring with M2O grade concrete including Glass/ PVS strips (2 Sqm panels) complete in all respect as per instruction of engineer-in-charge</td>
<td>Sqm</td>
<td>100</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
<td>UNIT</td>
<td>Qty</td>
<td>RATE</td>
<td>AMOUNT</td>
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<td>--------</td>
</tr>
<tr>
<td>9.0</td>
<td>MISCELLANEOUS WORKS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.1</td>
<td>Providing and fixing GI heavy duty puddle flange to sumps/RCC tanks, complete.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>50 mm dia</td>
<td>Each</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>65 mm dia</td>
<td>Each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>80 mm dia</td>
<td>Each</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>100 mm dia</td>
<td>Each</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>e)</td>
<td>150 mm dia</td>
<td>Each</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>200 mm dia</td>
<td>Each</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.2</td>
<td>Providing and making hole/ openings in RCC slab (all thickness by diamond cutter/ core cutter) including supporting of slab, floor finishing, scaffolding, shuttering, repairing and packing remaining opening by CC/plaster as per instruction of Project Manager etc complete.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>100mm dia</td>
<td>Each</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>150mm dia</td>
<td>Each</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>200mm dia</td>
<td>Each</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>250mm dia</td>
<td>Each</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.3</td>
<td>Providing and laying RCC hume pipes for cable crossings or wherever called, of class NP2 with collars, jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including excavation, dressing, compaction of bed and testing of joints etc. The rates shall include cost of 75mm thk PCC 1:4:8 all around the pipe complete.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>150 mm dia</td>
<td>Rmt</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>200 mm dia</td>
<td>Rmt</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>300 mm dia</td>
<td>Rmt</td>
<td>10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.4</td>
<td>Providing &amp; fixing in position maximum 400 mm long M.S. sleeves in beams for passing sprinklers pipes including the cost of cutting,bending &amp; welding in position etc.,complete in respect.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>40mm dia</td>
<td>Each</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>b)</td>
<td>50mm dia</td>
<td>Each</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c)</td>
<td>65mm dia</td>
<td>Each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d)</td>
<td>80mm dia</td>
<td>Each</td>
<td>3</td>
<td></td>
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<tr>
<td>e)</td>
<td>100mm dia</td>
<td>Each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>f)</td>
<td>150mm dia</td>
<td>Each</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.5</td>
<td>Providing and fixing Orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS: 10910 on 12 mm dia. steel bar conforming to IS: 1786 having minimum cross section as 23mm x 25mm and over all minimum length 263 mm and width as 165 mm with minimum 112 mm space between protruded leg shaving 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per specification including fixing complete. Mark to be visible even after fixing.</td>
<td></td>
<td></td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
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<td>RATE</td>
<td>AMOUNT</td>
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<tr>
<td>9.6</td>
<td>Sealing the GI/ MS sleeves by applying a coat of bonding coat of pidicrete MPB and filling the sleeve with cement concrete 1:2:3 (1 Cement:2 coarse sand:3 coarse aggregate 10mm down size) by mixing pidicrete URP acrylic waterproofing compound. The sleeve should be filled in such a manner not to seep any water through it and the gap, after passing cables/ wires/ pipes etc., where the concrete can not be filled, shall be filled with polysulphide sealant from both sides of sleeve so that water leakage should not occur and as per direction of PMC.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a) 40mm dia</td>
<td>Each</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>b) 50mm dia</td>
<td>Each</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c) 65mm dia</td>
<td>Each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d) 80mm dia</td>
<td>Each</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e) 100mm dia</td>
<td>Each</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>f) 150mm dia</td>
<td>Each</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.7</td>
<td>Providing and fixing column guards in basement consists 50mm dia MS pipe section around the column at 75mm distance from the column finished face connected with 50mm dia pipe sections on each face of column to be fixed with 6mm thick 200x200mm plate grouted/ welded with column reinforcement as per drawing for protecting the column. The item includes providing and applying a coat of zinc chromate primer and two coats of synthetic enamel complete as per drawing.</td>
<td>Rmt</td>
<td>RO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.8</td>
<td>Providing and fixing in position Closed cell polyethylene joint filler &quot;Armour Board of Supreme&quot; or equivalent make for expansion joints by holding the board in position using synthetic rubber adhesive Fevicol SR 998 or equivalent complete as per drawings, specifications and directions of Project-in-charge</td>
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<tr>
<td></td>
<td>A) 25 mm thick</td>
<td>Sqm</td>
<td>40</td>
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<td>9.9</td>
<td>Providing and filling grooves (size 25 x20 mm ) with polysulphide / silicon sealant by Choksy chemical or approved equivalent in expansion joints and other situations as shown in the drawings . The rate will include the cost of all ancillary works as required as per specifications as recommended by the manufacturer including cost of approved masking tape and backer rod of required size etc. complete .</td>
<td>Rmt</td>
<td>80</td>
<td></td>
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<tr>
<td>9.10</td>
<td>Providing and placing in position suitable PVC water stopper for construction/expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete etc. &amp; later providing complete</td>
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<tr>
<td></td>
<td>a) Dumb bell with Central bulb (180mm wide, 8mm thick)</td>
<td>Rmt</td>
<td>30</td>
<td></td>
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<tr>
<td>9.11</td>
<td>Providing and laying in position cement concrete M20 for Drains including the cost of centering , shuttering but excluding the cost of reinforcement at all levels.</td>
<td>Cum</td>
<td>150</td>
<td></td>
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<tr>
<td>9.12</td>
<td>Providing and fixing aluminium strips as per IS 737 covering over expansion joints with stainless steel screws as per design to match the color/shade of wall treatment.</td>
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<td></td>
<td>a) 300 mm wide X 3 mm thick</td>
<td>Rmt</td>
<td>10</td>
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<td></td>
<td>b) 200 mm wide X 3 mm thick</td>
<td>Rmt</td>
<td>80</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>b) 150 mm wide X 3 mm thick</td>
<td>Rmt</td>
<td>20</td>
<td></td>
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</tr>
<tr>
<td>S. No.</td>
<td>DESCRIPTION</td>
<td>UNIT</td>
<td>Qty</td>
<td>RATE</td>
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<tr>
<td>9.13</td>
<td>Providing and laying Nitobond or equivalent at construction joints complete as per manufacturer specification.</td>
<td>Sqm</td>
<td>130</td>
<td></td>
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</tr>
<tr>
<td>9.14</td>
<td>Providing and fixing of 6mm thick chequered plates over trenches, channels complete as per drawing.</td>
<td>KG</td>
<td>500</td>
<td></td>
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</tr>
<tr>
<td>9.15</td>
<td>Providing and marking 100mm wide lines in parking area with yellow colour fluorescent paint as directed by Project Manager.</td>
<td>Rmt</td>
<td>1000</td>
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<td>9.16</td>
<td>Providing and fixing Expanded metal at corners, column heads, junction of brick and RCC works, as directed including fixing with nails etc. prior to plastering (weight of expanded metal not less than 2Kg/Sqm).</td>
<td>Sqm</td>
<td>200</td>
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<tr>
<td>9.17</td>
<td>Providing and fixing 2 nos.150 mm dia. perforated pipe for a depth of 15m. from base level of sump in a bore of 400 mm with a packing of 100mm pea gravel all around pipe with a bottom seal and perforated pipes raised 600mm free in the pit with a cover cap at top with sealing all around pipes in the pit all as per detail drawing complete.</td>
<td>Each</td>
<td>4</td>
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<tr>
<td>9.18</td>
<td>a) Providing and fixing 1050mm high railing Consisting of first class Beech wood hand rail of size 85x35mm as per design fixed to SS flat welded to 36x10x80mm S.S brushed finish L section of balusters at every third step. SS balusters shall consist of 50x10mm thk two flats jointed together with 50mmx10mmx55mm plate and jointed with 50mmx10mmx65mm plate with 36x60x10mm plate fixed to step/welded to inserted plate in RCC including cutting RCC &amp; making good the same. Six numbers SS brushed finish mid rail of size 30x4mm welded to SS balusters running along the railing. The item including S.S. railing in brushed finish, polyurethane polishing and silicone coating over wooden handrail in desired shade and finish, necessary hardware, fixing arrangement etc complete as per drawing.</td>
<td>Rmt</td>
<td>80</td>
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<td></td>
<td>b) same as above using MS with necessary primer and duco paint in place of SS</td>
<td>Rmt</td>
<td>126</td>
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<tr>
<td>9.19</td>
<td>a) Providing and fixing railing Consisting of first class Beech wood hand rail of size 85x35mm as per design fixed to SS flat welded to 19mm dia S.S. brushed finish pipe with 40x6mm flat plate fixed to Wall/welded to inserted plate in wall including cutting &amp; making good the same. The item including S.S. railing in brushed finish, polyurethane polishing and silicone coating over wooden handrail in desired shade and finish, necessary hardware, fixing arrangement etc complete as per drawing.</td>
<td>Rmt</td>
<td>115</td>
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<td></td>
<td>b) same as above using MS with necessary primer and duco paint in place of SS</td>
<td>Rmt</td>
<td>100</td>
<td></td>
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<td>9.20</td>
<td>Barrication of Back side Periphery of B2 Block as per specification and drawings approved (Verticals 65 mm dia 3.0m Height @3m spacing - 18.1 Kg /20 feet, Horizontal 65 mm dia -3 nos -19.96 Kg /20 feet, Bracket alternate posts of ISMC 75 (6 Kg/mtr) 1 mtr long at bottom and 65 mm dia on 45 degree slope. GI sheet 22 gauge -12.5 Kg/ Sheet)</td>
<td>Rmt</td>
<td>100</td>
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<tr>
<td>9.20.1</td>
<td>Barrication of Back side Periphery of B2 Block as per specification and drawings approved (Verticals 65 mm dia 3.46 m Height 4 nos -19.96 Kg /20 feet, Horizontal 40 mm dia -2 nos -92 Kg / Mtr , G.I. sheet 22 gauge - 12.5 kg /sheet)</td>
<td>Rmt</td>
<td>20</td>
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<td>S. No.</td>
<td>DESCRIPTION</td>
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<td>9.20.2</td>
<td>Providing and Painting 2 coat synthetic enamel painting over one coat primer with spray machine on erected GI sheet surface as per approved sample and design.</td>
<td>Sqm</td>
<td>300</td>
<td>2</td>
<td>600</td>
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<tr>
<td>9.21</td>
<td>Dewatering and removal of slush from existing excavated area using 3/5 HP pumping motor with piping and other accessories for pumping out water &amp; slush outside boundary periphery.</td>
<td>Job</td>
<td>1</td>
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<tr>
<td>9.22</td>
<td>Dismantling of RCC wall including all tool &amp; tackles, staging and disposal of disposal of debris outside boundary wall as per instruction of engineer-in-charge</td>
<td>Cum</td>
<td>10</td>
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<td>9.23</td>
<td>Dismantling of Brick work, Lean conc up to M20 wall including all tool &amp; tackles, staging and disposal of disposal of debris outside boundary wall as per instruction of engineer-in-charge</td>
<td>Cum</td>
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<tr>
<td>9.24</td>
<td>Providing &amp; laying CC Coping including centring &amp; shuttering, staging &amp; all other tool &amp; tackles complet as per design &amp; drawing &amp; instruction of engineering-in-charge</td>
<td>Cum</td>
<td>10</td>
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</table>
| 9.25 | Grouting of Boreholes using waterproofing compound of appd make as per manufacturer's specification including supply of all materials, labour, tools and tackles complete all as directed by Engineer-in-charge |  |  | a) | 100mm dia Each 2  
b) | 150mm dia Each 4  
c) | 200mm dia Each 2  
d) | 250mm dia Each 1  |
| 9.26 | Packing of cutouts in slab, wall & shaft with M25 grade concrete including shuttering, staging, straightening, cutting, welding of reinforcement etc complete in all respect with smooth finish with existing surface as per instruction of engineer-in-charge | Sqm | 40 | | |

**EXTERNAL FINISHING WORK**

**10.1** Providing and fixing 40mm thick Sand stone as approved sample in cladding/ dado/ bands/ coping/ strips/ cill/ soffits/ jambs in specified sizes as per drawing of approved colour and quality for external walls/ columns and wherever specified with DRY cladding using 40x40x5mm S.S angle and stainless steel clamps of 5mm thick of grade 304 of approved make, anchors bolts / dash fasteners, necessary adhesive for grouting of clamps in stone, maintaining grooves in stone slabs as per the drawing and filling the same with non-staining, non-streaking silicon joint sealents (Elastosil 355 of Wacker / Dow Corning 991 or approved equivalent) including baker rod, drilling, anchoring, grouting, scaffolding, edge polishing, chamfering etc., complete (Tenderer shall submit the dry cladding fixing details for approval.) (External Facade) Only exposed surface will be measured for payment.

<p>| | Bansi Paharpur stone (FEATURE WALL) | Sqm | 280 | | |</p>
<table>
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<tr>
<th>S. No.</th>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>Qty</th>
<th>RATE</th>
<th>AMOUNT</th>
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<tr>
<td>10.2</td>
<td>Providing and fixing 30mm thick Granite stone in cladding/ dado/bands/ architraves/ strips/ cill/ soffits/ jamb in specified sizes as per drawing of approved colour and quality for external walls/columns and wherever specified with DRY cladding using 40x40x5mm S.S angle and stainless steel clamps of 5mm thick of grade 304 of approved make, anchors bolts / dash fasteners, necessary adhesive for grouting of clamps in stone, maintaining grooves in stone slabs as per the drawing and filling the same with non-staining, non-streaking silicon joint sealants (Elastosil 355 of Wacker / Dow Corning 991 or approved equivalent) including baker rod, drilling, anchoring, grouting, scaffolding, edge polishing, chamfering to received tapered stone etc., complete as per design and drawing. (Tenderer shall submit the dry cladding fixing details for approval.) Only exposed surface will be measured for payment. Rosey/ chima pink granite with flamed finish granite bands</td>
<td>Sqm</td>
<td>385</td>
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<td>10.3</td>
<td>Providing and applying silicone coating consisting of silane and siloxane based dilutable with Solvent (Orthoxylene) 1:16 (1Silicon : 16 Orthoxylene) water repellent coating of Wacker Silicone Product code no BS-290 or approved equivalent on the external surface by spraying complete in all respect at all levels and heights complete. Over Dry Stone cladding</td>
<td>Sqm</td>
<td>665</td>
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<td>10.4</td>
<td>Providing and fixing 30mm thick granite cladding at plinth over required thickness of cement mortar 1:4 (1 cement : 4 coarse sand). The surface of finished cladding shall be in line of dry cladding stone including edge polishing, chamfering and all wastages complete as per drawings. Rosey pink granite</td>
<td>Sqm</td>
<td>50</td>
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<tr>
<td>10.5</td>
<td>Providing and applying Texture Paint of approved colour and texture (Bansi-Paharpur stone shade in non-pigmented and using natural stone chips) trowel finish in two layers over one coat of primer on external wall as per manufacturer's specifications including surface preparation etc. complete. The rate are inclusive of cost of self supporting steel pipe scaffolding arrangement. - Spectrum Make-Permasan</td>
<td>Sqm</td>
<td>2200</td>
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<td><strong>Total</strong></td>
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<td></td>
<td>a) Address of The Company</td>
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<td>b) Contact Numbers</td>
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<td>Contact Person and Mob.</td>
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<td>d) E-Mail</td>
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<td>e) Web-Site</td>
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<td>g) TIN No.</td>
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<td>h) Service Tax no.</td>
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<td>i) PF No.</td>
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<td>j) ESI No</td>
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<tr>
<td>1</td>
<td>Copy of memorandum and article of the company along with certificate of incorporation</td>
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<td>2</td>
<td>Annual turnover of the company for past 3 years</td>
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<td>2007-2008 (Rs. -Lacs)</td>
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<td>2008-2009 (Rs. -Lacs)</td>
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<td>2009-2010 (Rs. -Lacs)</td>
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<td>3</td>
<td>Details about projects having total value in excess of Rs. 100 Lac completed during past 3 years.</td>
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<td><strong>4</strong></td>
<td>Does your company have local presence in Jaipur? Who is the person who heads the local team in Jaipur? Please give details of staff.</td>
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<td><strong>5</strong></td>
<td>Indicate AT LEAST 6 client references with address / phone nos, for whom your company has executed work with value in excess of Rs. 50 Lac during one single financial year or one contract having value in excess of Rs. 100 Lac.</td>
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<td><strong>6</strong></td>
<td>Indicate AT LEAST 6 Architect/Consultants with address / phone nos, whose designed projects your company has executed in last 5 years with value in excess of 100 Lacs.</td>
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<td><strong>7</strong></td>
<td>Maximum value of contract handled in the past 5 years (Rs. In Lacs)</td>
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<td><strong>8</strong></td>
<td>Quality benchmarks and acceptance criteria will be comparable to international levels.</td>
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<td><strong>i)</strong></td>
<td>What are the quality assurance standards you propose for this project?</td>
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<td><strong>ii)</strong></td>
<td>What are the quality standards achieved by your company?</td>
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<td><strong>iii)</strong></td>
<td>Do you have any systems procedures standards in place?</td>
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<td><strong>9</strong></td>
<td>If you are awarded the project, what site staff organization you propose? Submit org chart.</td>
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<td><strong>10</strong></td>
<td>What will be the qualification of the PM?</td>
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<tr>
<td><strong>11</strong></td>
<td>Time and quality is the essence of this project! Are you willing to work with a stiff penalty clause in the contract document?</td>
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<td><strong>12</strong></td>
<td>Do you have any Minimum Value of contract, which will be acceptable to you?</td>
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<td><strong>13</strong></td>
<td>Please enclose the following documentation as given below:</td>
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<tr>
<td>a)</td>
<td>Copy of Power of Attorney of the Signatory</td>
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<td>b)</td>
<td>Latest Income Tax Clearance Certificate</td>
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<td>c)</td>
<td>Sales Tax Clearance Certificate</td>
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<td>d)</td>
<td>Certified Copy of memorandum and article of the company along with certificate of incorporation</td>
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<td>e)</td>
<td>Plant and Equipment</td>
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<td>f)</td>
<td>Organisation Chart</td>
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<td>g)</td>
<td>Quality assurance manual/procedures</td>
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<td>h)</td>
<td>List of ongoing Projects with photograph during and after completion</td>
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<tr>
<td>i)</td>
<td>List of Projects executed in last 5 years</td>
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<td>j)</td>
<td>Solvency Certificate from a Scheduled Bank.(Rs. In Lacs)</td>
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<td>k)</td>
<td>Bankers</td>
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<td>Registration number/documents for Statutory Requirements (ESI, PF labour license etc).</td>
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<td>Major Works in Hand with value in excess of 100 Lacs.</td>
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