Tender invited for construction of Amphitheatre

Sealed tender are invited from approved and enlisted contractors engaged with University of Delhi/Central Government Department/Organisations for undertaking the following work.

Name of work: Construction of amphitheatre of Ramjas College, Delhi., Earnest money: Rs. 60,000/- (Sixty thousand) Time of completion of work: 75 days Tender cost: Rs. 3000/- (Three thousand) Last date of submission: 21-07-2014 till 3:00 p.m.

Opening of the tender quotation: 22-07-2014 at 4:00 p.m. Tender forms and other details can be downloaded from the college website www.ramjascollege.edu. The College reserves the right to reject any tender without assigning any reason whatsoever.

Copy to:
1. The Director, Computer Center
2. College Website
3. Off. Caretaker
4. College Notice Board.
TENDER FOR
AMPHITHEATRE
Ramjas College
University Enclave,
Delhi-110007, India

TENDER ISSUED TO
DATE

CONSULTANTS
IS∆P Architects

Isa Project Consulting Pvt Ltd
RP-12, Sector-132, Noida, India
tel: +91-120-6402546 / 47 / 48
e-mail: admin@isaprojects.com
web: http://www.isaprojects.com
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NOTICE INVITING TENDER

M/S____________________

Dear Sir’s,

TENDER FOR CONSTRUCTION OF AMPHITHEATRE NEAR CANTEEN BLOCK AT RAMJAS COLLEGE, NORTH CAMPUS, DELHI

Sealed tenders are invited for construction of AMPHITHEATRE at Ramjas College from contractors who are eligible to tender as per pre-qualification criteria mentioned in the tender document.

1. Contract documents consisting of Pro-forma for Pre-qualification, detailed plans, technical specifications, schedule of quantities of the various classes of work to be done, and the set of 'conditions of contract' to be complied with by the person whose tender may be accepted can be purchased with the payment of Rs. 3000/- (Rupees Three thousand only) (Non-Refundable) from the Architect during the period from 30.6.2014 to 21.7.2014. (Except Sundays and Bank Holidays) or the documents can be downloaded from our website www.ramjascollege.edu. If downloaded from the web site, cost of tender form of Rs.3000/- in the form of demand draft shall be submitted at the time of submission of tender.

2. Tenders which should always be placed in two envelopes, with the name of the project written on the envelopes will be received till 21.7. 2014 up to 3.00 PM in the office of Principal , Ramjas College, North Campus, Delhi University. Envelope-1 should contain Cost of the tender document if downloaded from the website, Earnest Money Deposit, Pre-qualification forms, conditions of contract and technical specifications. Envelope-2 should contain Price bid. The envelope-1 will be opened on 22.7.2013 at 4.00 PM. The committee constituted for the purpose shall scrutinize the documents furnished in envelope–1, and pre-qualify suitable contractors. The price bid of the pre-qualified contractors shall alone be opened and the date and time shall be intimated separately. The decision of the committee regarding pre-qualification of contractors shall be final.

3. The contractors should quote in figures as well as in the words the rates, and amount tendered by them. The amount for each item should be worked out and the requisite totals given. Rates quoted by the contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates, figures and words. However, if a discrepancy is found the rates, which correspond with the amount worked out by the contractor shall be taken as correct. If the contractor does not work out the amount of an item or it does not correspond with the rate written either in figure or in words then the rate quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally but the amount is not worked out correctly the rates quoted by the contractor will be taken as correct and not the amount.

4. The tender documents must be filled in English and all the entries must be made by the hand and Written in ink. If any of the documents are missing or un-signed. The tender shall be considered invalid.

5. Earnest money amounting to Rs. 60,000/- (Rupees sixty thousand thousand only), is to be deposited with the tender in the form of Demand Draft/ Banker's Cheque payable at Delhi and drawn in favor of PRINCIPAL RAMJAS COLLEGE otherwise the tender is liable for rejection.

6. The successful tender will have to pay as the amount of initial security deposit which shall be 2% of the accepted value of the tender including the EMD, by means of D.D in favor of the PRINCIPAL RAMJAS COLLEGE The initial security deposit is to be paid by the Contractor to
Bank within 14 days of intimation to him of the acceptance of the tender. The initial security deposit will be invested with the bank for the duration of the contract period and will be refunded to the contractor with out any interest, after issue of the virtual completion certificate. No interest is allowed on the retention money.

7. The acceptance of a tender, will rest with the Competent Authority, who does not bind himself to accept the lowest tender, and reserves to himself the authority to reject any or all of the tenders received, without assigning any reasons. All tenders in which any of the prescribed conditions are not fulfilled, or are incomplete in any respect are liable to be rejected.

8. All compensation or other sums of money payable by the Contractor to our Clients under the terms of this contract may be deducted from the security Deposit, or from any sum that may be or may become due to the Contractor on any account whatsoever and in the event of the Security Deposit being reduced by reasons of any such deductions, the Contractor shall within 15 days of being asked to do make good in cash or by cheque any sum which have been deducted from his security deposit.

9. Tender containing any condition leading to unknown/ indefinite liability, are liable to be summarily rejected.If at all any rebate(s) is/are to be offered the tenderer shall first quote his rates strictly on the terms and conditions stipulated in tender document and then show separately rebate(s) offered specifying the conditions for such rebate(s). Failure to follow this procedure will render the tender liable to summarily rejection.

10. Canvassing in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable to rejection.

11. **The tenderer should quote their own rates for undertaking the work.**

12. All taxes & Cess including Sales Tax, VAT, WCT, Service Tax or any other tax on material or on finished works, in respect of this contract shall be payable by the contractor and Ramjas College will not entertain any claim whatsoever in this respect.

13. Time is the essence of the contract. The work should be completed in **75 Days** from the date of the work order issued to the contractor to commence the work. The successful Contractor will have to give CPM/PERT chart of various activities of work to be done so that the work gets completed within the stipulated time. The chart shall be submitted within 15 days from the date of acceptance of the tender.

14. Tenders for works shall remain open for acceptance for a period of 90 days from the date of opening of tenders. If the tenderer withdraws his tender before the expiry of the said period or makes any modifications in terms and condition of the tender which are not acceptable to the Bank, then the bank without prejudice to any other right or remedy be at liberty to forfeit the earnest money.

15. It will be obligatory on the part of the tenderer to tender and sign the tender documents for all the component parts and that, after the work is awarded, he will have to enter into an agreement for each component with the competent authority in the Bank.

16. The tenderer, apart from being a competent contractor must associate himself with the agencies of appropriate class who are eligible to tender for (I) Electrical (ii) Sanitary and water supply installations (iii) AUDIO & VIDEO.

17. The tenderer should visit the site to ascertain the working conditions and local authority regulations/restrictions if any and other information required for the proper execution of the work.

18. The quantities of various items given in the schedule of quantities are approximate. The quantities of work may vary at time of allotment/execution of work. Ramjas College reserves the right to omit/delete any item(s) of work from the schedule at the time of allotment/before
the commencement of work without assigning any reason whatsoever. Contractor will be paid for the actual work done at the site duly verified by the concerned official of the Bank.

19. The unit price shall be deemed to be fixed price. In case of extra items, a record of labor charges paid shall be maintained and shall be presented regularly to the Employer’s for checking. The settlement will be made based on figures arrived at jointly and taking unit price given in the contract assigned to the successful Tenderer. In case, of extra items where similar or comparable items are quoted in the tender, extra rates shall be based on tender rates.

20. If the rate quoted by the contractor for any item/ items are not workable or abnormally lower than the market rate, the bank may demand Bank guarantee from the contractor for satisfactory completion of these work. The bank guarantee amount will be not less than 50% of the estimated amount of the items for which the rates are not workable or abnormally low. This bank guarantee will be released after completion of these works (unworkable and abnormally low rated items) to the satisfaction of the bank.

22. Sealed tenders in prescribed form in two envelopes along with the EMD (Envelope-1 should contain cost of tender document, if downloaded from website, Earnest Money Deposit, Pre-qualification forms, conditions of contract and technical specifications. Envelope-2 should contain Price bid) are to be addressed and sent to Principal Ramjas College

23. Estimated cost 60 Lacs (DSR)

Principal

Ramjas College
Delhi University.
CRITERIA FOR PRE-QUALIFICATION

The eligibility criteria for pre-qualification of contractors are as under:

average annual financial turnover during the last 3 years ending 31st March 2013, should be at least Rs. Fifty Lacs (one crore)

and

experience of having successfully completed similar works during the last three years ending 31-03-2013, should be either of the following:

i. two similar completed works costing not less than Rs. Forty Lacs
ii. one similar completed work costing not less than Rs Fifty Five lacs
iii. The contractors should provide proper documentary proof in support of satisfactory completion of similar works.
iv. The Contractors should provide Annual report (balance sheet and (profit and loss account) of last 3 years.
v. The Contractors should be having adequate manpower, equipment, etc. manufacturing facility.
vi. The contractors having any added certification from any competent authority for the products quoted will have added advantage.
vii. Proposed shop drawings Truss, Lighting, Electrical, Audio, Visual submission will be part of technical Submission
## PRE-QUALIFICATION – PROFORMA-I

### PARTICULARS OF THE CONTRACTORS TO BE FURNISHED FOR THE PURPOSE OF PRE-QUALIFICATION

<p>| | |</p>
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<tbody>
<tr>
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<td>Name of Organization/firm/company</td>
</tr>
<tr>
<td>2.</td>
<td>Address</td>
</tr>
<tr>
<td>3.</td>
<td>Year of establishment</td>
</tr>
<tr>
<td>4.</td>
<td>Status of the firm (Company/Firm/Proprietary)</td>
</tr>
<tr>
<td>5.</td>
<td>Name of Directors/Partners/Proprietor i) ii) iii)</td>
</tr>
<tr>
<td>6.</td>
<td>Whether registered with the registrar of companies/registrar of firms. If so, mention number and date.</td>
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<tr>
<td>7.</td>
<td>a) Name of Directors/Partners/Proprietor i) ii) iii)</td>
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<td>b) Enclosed Solvency Certificate from the bankers</td>
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<td>8.</td>
<td>Whether registered for sales tax purposes. If so, mention number and date. Furnish also copies of sales tax clearance certificate.</td>
</tr>
<tr>
<td>9.</td>
<td>Whether an assessee of income tax. If so, mention permanent account number. Furnish copies of income tax clearance certificate.</td>
</tr>
<tr>
<td>10.</td>
<td>State Annual turnover of the company. Furnish copies of audited balance sheet and profit &amp; loss account (audited) for the last three years.</td>
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<tr>
<td>11.</td>
<td>Specify the maximum value of single work executed in the year in the country.</td>
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<tr>
<td>12.</td>
<td>Status and details of disputes/litigation/arbitration, if any. i) ii) iii)</td>
</tr>
</tbody>
</table>

**Note:** Where copies are required to be furnished these are to be certified copies Preferably by the concerned agencies or a Government Officer.

Place:

Date: Signature of the Contractor
PRE-QUALIFICATION PROFORMA – II

PARTICULARS IN RESPECT OF 3 MAJOR WORKS EXECUTED IN LAST 3 YEARS

<table>
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<th>S.No.</th>
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<th>Short Description of work executed</th>
<th>Name and address of owner</th>
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Place:  
Date:

Signature of the contractor
FORM OF SUBMISSION OF TENDER
(To be filled by the tenderer)

Principal
Ramjas College
North Campus
Delhi University

Dear Sir/s,

Ref: TENDER FOR RENNOVATION & INTERIOR WORKS OF STAFF ROOM

I / We the undersigned have carefully gone through and clearly understood after visiting the site, the Tender drawings and Tender documents comprising of the tender form, Notice of Contractors, Agreement and Conditions of building contract, Special Conditions, Specifications and Schedule of Probable Quantities prepared by your Architects M/s ISAP Architects (Isa project consulting Pvt Ltd). I / We do here by undertake to execute and complete the whole or part of the work (as desired by you) at the respective rates quoted. I / We are depositing as Earnest Money of sum of Rs. 60000/- by demand draft in favour of PRINCIPAL RAMJAS COLLEGE along with this tender for due execution of the work at my / our tendered rates together with any variations which shall be adjusted at prices based by the Architects / Employer on our tendered rates.

In the event of this Tender being accepted I / We agree to enter into an agreement as and when required and executed the contract according to your form of Agreement, in default whereof, I / We do hereby bind my-self / ourselves to forfeit the aforesaid deposit.

I / We further agree to complete the work included in the said Schedule of Quantities within 75 days from the date of the work order issued to commence the same.

Date of commencement shall be either one week, from the date, the acceptance letter is issued to the contractor or the day on which the contractor is instructed to take possession of site whichever is latter.

I / We agree not to employ sub-contractors other than those that may be approved by Architects / Employer.

I / We agree to pay Government, General and Sales Tax (State and Central), Excise and Octroi duties, for insurance and all other taxes including works contract tax, turnover tax, VAT etc as prevailing for time to time, on such items for whom same is to be levied, and the rates quoted by me / us are inclusive of the same.

Yours Faithfully,

Contractor’s Signature __________________
Designation __________________
Address __________________

1.

2.

3.
GENERAL NOTES

1. PROCEDURE OF FILLING AND SUBMISSION OF TENDER

i) The tenderers should quote their rates in figures and words where the quantities have been indicated in the relevant items of the schedule of quantities. Failure to do so may invalidate the tender. Erasing or over writing shall not be allowed. Corrections in the tender should be avoided if this becomes unavoidable, the entire rate (and not a portion only) shall be scored out and signed (not simply initialed) by the tenderer as token of such cancellation. A fresh rate in specified manner shall then be correctly written.

ii) In the event of the tender being submitted by a firm, it must be signed by a member or members of the firm having legal authority to do so, and if called for, the legal documents in support thereof must be produced for inspection and the same in the case of the firm carried out by one member of a joint family. It must disclose, that the firm is duly registered under the INDIA Partnership Act. Any tender signed by a member not holding a power of attorney shall be treated as informal.

iii) All corrections are to be initialed.

iv) The tenderer is to quote this rate in ink both in words and figures in English. In case of any variation, the rates quoted in the words in the “Original” copy of the tender shall only be valid. The tender shall be clearly and legibly written and whole writing must be by the hand of the person signing the tender and with the same pen and ink. Failure to do so may invalidate the tender. The employer reserves to itself the right to accept the lowest or any tender or split up and distribute any items of work to any specialist firm or firms without assigning any reason. The employer reserves the right to split up and distribute the work to more than one tenderer, if necessary. Person tendering shall submit and return together with his tender, this conditions of contract, specifications and the priced schedule of quantities and all set of papers signed on all the pages in a sealed cover. Signature will be deemed to be the acceptance of the contents of these tender papers by the tenderer. All enclosures to the tender shall be in duplicate.

Tenderer shall note that their tenders shall remain open for acceptance for a minimum period of three months from the date of opening the tenders. The tender must be unconditional. Conditional tenders may be summarily rejected.

Submission of tenders:
The tenders are to be submitted along with the copy of “General Clause of Contract and Technical Specifications” duly signed by the tenderer in a sealed cover at the office as mentioned in the tender notice. The authorised representatives of the tenderer are present during opening of the tender.

2. RATES TO INCLUDE:

While quoting their rates the tenderer should include the following if otherwise not stated herein before.

a) Necessary cost of taking samples of materials supplied by them for construction including cement and steel, wood/tiles etc., testing of the same at Govt.’s / Approved laboratory including transportation, cost of the samples, as and when required.

b) Submission of test reports of other materials as may be specified by Architects or RAMJAS COLLEGE.

3. WORKING HOURS:

Since the site is a Functional College the Contractor has to execute the work even after working hours, nights & on holidays. No extra payments will be made for the work being done
during odd hours. The site will be handed over to the contractor in phased manner and the contractor has to schedule his activities accordingly. No extra payment shall be made on this account.

4. **STORAGE OF MATERIALS:**

The contractor shall not store their materials and debris within the premises other than the work site handed over to him.

5. **LABOUR HUTMENT:**

Shelter or stay for the labourers has to be arranged by the contractor at his own expense and responsibility. No Space shall be provided within the Campus

6. **IDLE LABOUR:**

In case the construction work is held up for any site conditions not attributable to the contractors or for any decisions/instructions/wants of details from the Employer / Architects or for any of the conditions as per Article 30 shall be allowed reasonable extension of time by the employer but any claim for idle labour shall lie under the above conditions. Contractor’s quoted rates should include for all such contingencies.

7. The contractor shall engage one competent person at site who shall take the instructions from the Architects. The work should not suffer due to lack of supervision, manpower and materials.

8. The Contractor is required to co-ordinate his works along with other agencies working at site. He has to reimburse any of the damage made by him or any of his representatives for any of the other agency or owner at site.

9. The contractor is required to fabricate a sample where required, or any item so installed for approved. Any changes made by the Architect's/Employers, in the sample to the specifications as mentioned in the tender, shall not be deducted or paid extra. The bulk production of the furniture can only be taken up after the final approval of the sample of the item.

12. All measurements given in the schedule hereunder are for the purpose of tender only. Payment will be made on actual measurement of the work done.

14. All measurements shall be as per relevant I.S.I. standards.
GENERAL CONDITIONS OF CONTRACT

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

1. INTERPRETATION

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

i) **Employer**: The term employer shall denote Ramjas college.

ii) **Architects / Consultants**: The term Architects shall mean M/s. Isa Project Consulting Pvt Ltd. or in the event of his / their ceasing to be the Architects for the purpose of this contract such other persons as the employer shall nominate for the purpose.

iii) **Contractor**: The term contractor shall mean _____________________ (Name and address of the contractor) and his/ their heirs, legal representative, assigns and successors.

iv) **Site**: the site shall mean the site where the works are to be executed i.e Amphitheatre at Ramjas College.

V) **Site Engineer**: Any other Engineer appointed from time to time by the Employer and certified in writing to the Architects and the Contractor, to act as Engineer for the purpose of the Contract.

vi) **Drawings**: The work is to be carried out in accordance with ‘Good for Construction’ GFC drawings, specifications, the schedule of quantities and any further GFC drawings which may be supplied or any other instruction, which may be given by the Employer during the execution of the work.

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

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

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

vii) “**The Works**” shall mean the work or works to be executed or done under this contract.

viii) “**Act Of Insolvency**” shall mean any act as such as defined by the Presidency Towns Insolvency Act or in Provincial Insolvency act or any amending status.

ix) “**The Schedule Of Quantities**” shall mean the schedule of quantities as specified and forming part of this contract.

x) “**Priced Schedule Of Quantities**” shall mean the schedule of quantities duly priced with the accepted quoted rates of the contractor.
‘Contract’ shall mean the Articles of Agreement, the general conditions special conditions, the appendix, the schedule of quantities, specifications and drawings attached here to and duly signed.

‘Contract Price’ shall mean the sum named in the Tender subject to such additions thereto or deductions their from as may be made under the provisions hereafter contained.

‘Notice in Writing’ or written notice shall mean a notice in writing, type or printed characters sent (unless delivered personally or otherwise provided to have been received) by registered post to the last known private or business address or registered office of the addressee and shall be deemed to have been received when in the ordinary course of post it would have been delivered.

‘Net Prices’ any arriving at the Contract amount the Contractor shall have added to or deducted from the total of the items if the Tender any sum, either as a percentage or otherwise, then the next price of any item in the tender shall be the sum arrived at by adding to or deducting from the actual figure appearing in the tender as the price of that item a similar percentage or proportionate sum. Providing always that in determining the percentage or proportion of the sum so added or deducted by the contractor, the total amount of any Prime Cost items and provisional sums of money shall be deducted from the total amount of the Tender. The expression ‘net rates’ or ‘net prices’ when used with reference to the contract or account shall be hold to mean rates or prices so arrived it.

‘Virtual Completion’ shall mean the premises is in the position of the Employer fit for occupation.

Words importing persons include firms and corporations. Words importing the singular only, also include the plural and vice verse where the Context requires.

2. SCOPE OF CONTRACT

The Contractor shall carry out and complete the said work in every respect in accordance with this Contract and with the directions of and to the satisfaction of the Architect and Employer. The architect with approval of Employer issue further drawings and / or written instructions, details directions and explanations which hereafter collectively referred to as ‘Architect’s Instructions’. In regard to:

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

b) Any discrepancy in the drawings or between the schedule of quantities and / or drawings and / or specification.

c) The removal from the site of any defective material brought thereon by the contractor and the substitution of any other material thereof.

d) The demolition removal and / or re-execution of any work executed by the contractor/s.

e) The dismissal from the work of any persons employed there upon.

f) The opening up for inspection of any work covered up.

g) The rectification and making good of any defects under clauses hereinafter mentioned and those arising during the maintenance period (Defect Liability Period).

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

Regarding all factory made products for which ISI marked products are available, only products bearing ISI marking shall be used in the work.

3. **TENDERS SHALL VISIT THE SITE**

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

4. **TENDERS**

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

(Also see general rules and instructions for the guidance of Tenderers)

The schedule of quantities shall be filled in as follows:

i) The “Rate” column to be legibly filled in ink in both English figures and English words.

ii) Amount column to be filled in for each item and the amount for each sub head as detailed in the “Schedule Of Quantities”.

iii) All corrections are to be initialed.

iv) In case of any errors / omissions in the quoted rates, the rates given in the tender marked “original” shall be taken as correct rates.

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

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

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

The works will be paid for as “measured work” on the basis of actual work done and not as “lumpsum” contract, unless otherwise specified.
All items of work described in the schedule of quantities are to be deemed and paid as complete works in all respects and details including preparatory and finishing works involved, directly related to and reasonably detectable from the drawings, specifications and schedule of quantities and no further extra charges will be allowed in this connection. In the case of lump-sum charges in the tender in respect of any items of work will be made for the actual work done on the basis of lump-sum charges as will be assessed to be payable by the Employer / Architects. The employer has power to add to, omit from any work as shown in drawings or described in specifications or include in schedule of quantities and intimate the same in writing but no addition, omission or variation shall be made by the contractor without authorization from the Employer. No variation shall vitiate the contract.

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

Tenders will be submitted in two envelops 1) Technical Qualifications 2) Financial Quotes

Financial quotes will be opened only for candidates whose proposals are selected and complete by the selection committee. No reason will be given for non-selection to any candidate in this matter.

5. AGREEMENT

The successful contractor will be required to sign agreement in accordance with the draft agreement form enclosed and the schedule conditions. The contractor shall pay for all stamps and legal expenses, incidental thereto. However, the written acceptance by the employer of a tender will constitute a binding contract between the employer and the person so tendering whether such formal agreement is or is not subsequently executed.

6. AUTHORITIES, NOTICES, PATENT RIGHTS AND ROYALTIES:

The Contractor shall confirm to the provisions of the statutes relating to the works, and so to the regulation and bylaws of any local authority, and of any water, lighting and other companies as authorities with whose systems the structures are proposed to be connected and shall before making any variation from the drawings or specifications, that may be necessitated by so conforming given to the Architect’s written notice, specifying the variations proposed to be made and the reason for making it and apply for instruction thereon. In case, the Contractor shall not within the 10 days receive such instruction, he shall proceed with the work conforming with the provisions, regulations or bylaws in question.

The Contractor shall bring to the attention of the Architect all notices required by the said acts, regulations or bylaws to be given to any Authority, and pay to such authority or to any Public Officer all fees that may be properly chargeable in respect of the works, and lodge the receipts with the Architect / Employer.

The Contractor shall identify the Employer against all claims in respect of patent rights, designs, trade marks or name or the protected rights in respect of any constructional plant, machine, work or material used for or in connection with the works or temporary works and from and against all claims, demands, proceedings, damages, costs, charges, and expenses whatsoever in respect thereof or in relation thereto. The Contractor shall defend all actions arising from such claims, unless he has informed the Architects, before any such infringement and received their permission to proceed and shall himself pay all royalties, license fees, damages, coat and charges of all and every sort that may be legally incurred in respect thereof.

7. TAXES AND DUTIES

The tenderers must include in their tender prices quoted for all duties royalties, cess and sales tax, works contract tax, VAT or any other taxes or local charges if applicable. No extra claim on this account will in any case be entertained.
8. NOTICES AND STATUTORY REGULATIONS:

The Contractor shall give all notices and pay all fees and shall comply all Acts and Regulations for the successful completion of the contract works. The whole of the work is to be complied with as per the requirements and bylaws of the relevant statutory authorities including contract labour (Regulation and Abolition) Act 1970 and Contract labour (Regulation and Abolition) Central Rules, 1971.

9. QUANTITY OF WORK TO BE EXECUTED

The Schedule of Quantities unless otherwise stated shall be deemed to have been prepared in accordance with the Standard Procedure of the Architects shall be considered to be approximate and no liability shall attach to the Architect for any error may be discovered therein. The Employer reserves the right to execute only a part or the whole or any excess thereof without assigning any reason therefore.

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

10. OTHER PERSONS ENGAGED BY THE EMPLOYER

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

11. EARNEST MONEY AND SECURITY DEPOSITS

The tenderer will have to deposit an amount of Rs 60000/- (Rupees sixty thousand) at the time of submission of tender as an Earnest money. The employer is not liable to pay any interest on the earnest money. The Earnest money of the unsuccessful tenderers will be refunded without any interest soon after the decision to award the work is taken after the expiry of the validity period of the tender.

The successful tenderer to whom the contract is awarded will have to deposit as initial security deposit a further sum to make up 2% of the value of the accepted tender including the Earnest Money. The initial security deposit will have to be made within 14 days from the date of acceptance of tender, failing which the employer at his discretion may revoke the letter of acceptance and forfeit the earnest money deposit furnished along with the tender. It shall be refunded to the contractor within 14 days on completion of the entire works and after the certificate of virtual completion is issued by the architect.

Apart from the initial security deposit made as above, retention money shall be deducted from progressive running bills @ 8% of the gross value of each running bill until the total security deposit, i.e., the initial security deposit plus the retention money equals:

a) 10.00% on the first Rs. 5,00,000 of the cost of work.
b) 7.5% on the next Rs. 10,00,000 of the cost of work.
c) 5.0% on the next amount ie. Balance amount
d) Total Security Deposit EMD (2%) + FSD (8%)

EMD will be refunded after completion of work and on issue of virtual completion certificate by the Architect/Bank. FSD will be refunded on completion of the defects.
liability period of 12 months within 14 days.

12. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY

The contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantities and specifications taken together whether the same may or may not be particularly shown or described therein provide that the same can reasonably be inferred there from and if the contractor finds any discrepancies therein he shall immediately and in writing, refer the same to the Employer / Architects whose decision shall be final and binding.

13. TIME OF COMPLETION, EXTENSION OF TIME & PROGRESS CHART

The Contractor shall be allowed admittance to the site on the 'Date of Commencement' stated in the Appendix, and he shall thereupon and forthwith begin the works and shall regularly proceed with the complete the same (except such painting or other decorative work as the Architect may desire to delay). On or before the 'Day of Completion' stated in the Appendix subject nevertheless the provision for extension of time hereinafter contained.

If in the opinion of the Architect the works be delayed:

a. by force major or
b. by reason of any exceptionally inclement weather or
c. By reason of proceedings taken or threatened by or dispute with adjoining or neighboring owners of public authorities arising, than through the Contractor’s won default or
d. By the works or delays of the contractors tradesmen engaged or nominated by the Employer / Architect and not referred in the Schedule of Quantities and / or specifications or
e. By reason of civil, commotion, local combination of workmen or strike or lock-out effecting any of the buildings traders or
f. By reason of the Architect's instructions as per clause 2, or
g. In consequence of the Contractor not having in due time, necessary instructions from the architect for which he shall have specifically applied in writing ahead of time, giving the Architect reasonable time to prepare such instructions, the Architects shall make a fair and reasonable extension of time for completion of the Contract works

In case of such strike or lock-out, the Contractor shall as soon as possible, give written notice thereof the Architect, but the Contractor shall nevertheless constantly use his endeavors to prevent delay and shall do all they may reasonably be required, to the satisfaction of the Architect to proceed with the work.

The Contractor on starting the works shall furnish to the Employer / Architect a PERT / CPM Programme for carrying out the work stage in the stipulated time fore the approval of Architect / Employer and follow strictly the approved time schedule incorporating charges if any, to ensure the completion of the work in stipulated time. A graph or chart on individual work shall be maintained showing the proportionate progress of work week by week by Architect a weekly progress report stating the number of skilled and unskilled laborers employed on the work, working hours done, place, type, and quantity of work done during the period.
The Contractor must inform the Architect within 10 days in advance of all drawings and details required by him from time to time. The Contractor shall adhere to the approved program and arrange for the materials and labour etc accordingly.

Despite repeated instructions, if the Contractor fails to show proportionate progress of the work, the Architect / Employer may take suitable action and deemed fit without prejudice to any terms and conditions of the contract.

14. LIQUIDATED DAMAGES

Should the work be not completed to the satisfaction of the Employer / Architects within the stipulated period, the contractor shall be bound to pay to the Employer a sum calculated as given below by way of liquidated damages and not as penalty during which the work remains uncommented or unfinished after the expiry of the completion date.

If the contractor fails to complete the work by the Scheduled date of completion or within any sanctioned extended time, he will have to pay liquidated damages at 1% of contract amount for each week beyond the date that the work remains incomplete subject to maximum of 10% of the contract value (without extra items).

15. NOTICE AND PATENTS OF APPROPRIATE AUTHORITY AND OWNERS

The contractor shall conform to the provisions of any Acts of the Legislature relating to the work, and to the Regulations and Bye-Laws of any authorities, and/or any water, lighting and other companies, and/or authorities with whose systems the structures were proposed to have connection and shall before making any variations from the drawings or specifications that may be associated to so conform, give the Employer / Architects written notices specifying the variations proposed to be made and reasons for making them and apply for instruction thereon. The Employer/Architects on receipt of such intimation, shall give a decision within a reasonable time.

The contractor/s shall arrange to give all notices required for by the said Acts, Regulations or Bye-laws to be given to any authority, and to pay to such authority or to any public officer all fees that may be properly chargeable in respect of the work and lodge the receipts with the Employer.

The contractor shall indemnify the Employer against all claims in respect of patent rights, royalties, damages to buildings, roads or members of public in course of execution of work and shall defend all actions arising from such claims and shall keep the Employer saved harmless and indemnified in all respects from such actions, costs and expenses.

16. MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS.

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

All mandatory tests shall be carried out as per CPWD specifications. If required by the Employer/ Architects, the contractor shall have to carry out tests on materials and workmanship in approved materials testing laboratories or as prescribed by the Employer/ Architects at his own cost to prove that the materials etc., under test conform to the relevant I.S. Standards or as specified in the specifications. The necessary charges for preparation of mould (in case of concrete cube), transporting, testing etc., shall have to be borne by the contractor. No extra payment on this account should in any case be entertained.
All the materials (except where otherwise described) stores and equipment required for the full performance of the work under the contract must be provided through normal channels and must include charges for import duties, sales tax, octroi and other charges and must be the best of their kind available and the contractors must be entirely responsible for the proper and efficient carrying out of the work. The work must be done in the best workmanlike manner. **Samples of all materials to be used must be submitted to the Employer / Architects when so directed by the Engineer/ Architects and written approval from Employer/ Architects must be obtained prior to placement of order.**

Any damage (during constructions) to any part of the work for any reasons due to rain, storm, or neglect of contractor shall be rectified by the contractor in an approved manner at no extra cost. Should the work be suspended by reason of rain, strike, lock-outs or any other cause, the contractor shall take all precautions necessary for the protection of work and at his own expenses shall make good any damage arising from any of these causes. The contractor shall cover up and protect from damage, from any cause, all new work and supply all temporary doors, protection to windows, and any other requisite protection for the execution of the work whether by himself or special tradesmen or sub-contractor and any damage caused must be made good by the contractor at his own expenses.

### 17. REMOVAL OF IMPROPER WORK

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

### 18. SITE ENGINEER

The Employer may appoint a Site Engineer or clerk of works who shall be representative of the Employer and also of the Architect. The duties of the Employer representative are to watch and supervise the works and to test any materials to be used of workmanship employed in connection with the works. He shall have no authority either to relieve the Contractor of any of his duties or obligations under the Contract, or except those expressly provided hereunder, to order any work involving delay or any extra payment by the Employer or any variation of or in the works.

The contractor shall afford the Employer’s representative every facility and assistance for examining the works and materials and checking the measuring time and materials. Neither the Employer’s representative nor any assistant to the Architect shall have power to revoke, alter enlarge or relax the requirements of this Contract, or toSanction any day-work, additions, alterations, deviations or omissions unless such an authority may be specially conferred by a written order of the Architect / Employer.

The Employer’s Representative shall have to give notice to the Contractor or his foreman about the non-approval of any work or materials and such works shall be suspended or the use of such material should be discontinued until the decision of the Architect is obtained, the work will from time to time be examined by the Architect or the Employer’s representative but such examinations shall not in any way exonerate the Contractor from the obligation to remedy defects which may be found to exist at any stage of the work of after the same is completed. Subject to the limitations of this cause, the Contractor shall take instruction from the Architect / Employer.
19. **CONTRACTOR’S EMPLOYEES**

The contractor shall employ technically qualified and competent supervisors for the work who shall be available (by turn) throughout the working hours to receive and comply with instructions of the Employer/Architects. The contractor shall engage at least one experienced Engineer as site-in-charge for execution of the work. The contractor shall employ in connection with the work persons having the appropriate skill or ability to perform their job efficiently.

The contractor shall employ local labourers on the work as far as possible. No labourer below the age of sixteen years and who is not an Indian National shall be employed on the work.

Any labourer supplied by the contractor to be engaged on the work on day work basis either wholly or partly under the direct order or control of the Employer or his representative shall be deemed to be a person employed by the contractor.

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

- a) The payment of Wages Act.
- b) Employer’s Liability Act
- c) Workmen’s Compensation Act.
- e) Apprentices Act. 1961
- f) Minimum Wages Act
- g) Any other Act or enactment relating thereto and rules framed there under from time to time.

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

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

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

20. **DISMISSAL OF WORKMEN**

The contractor shall on the request of the Employer immediately dismiss from works any person employed thereon by him, who may in the opinion of the Employer be unsuitable or incompetent or who may misconduct him. Such discharges shall not be the basis of any claim for compensation or damages against the Employer or any of their officer or employee.

21. **ASSIGNMENT**
The whole of the works included in the contract shall be executed by the contractor and the contractor shall not directly or indirectly transfer, assign or underlet the contract or any part, share or interest therein nor, shall take a new partner, without written consent of the Employer and no subletting shall relieve the contractor from the full and entire responsibility of the contract or from active superintendence of the work during their progress.

22. **DAMAGE TO PERSONS AND PROPERTY INSURANCE ETC.**

The contractor shall be responsible for all injury to the work or workmen to persons, animals or things and for all damages to the structural and/or decorative part of property which may arise from the operations or neglect of himself or of any sub-contractor or of any of his or a sub-contractor’s employees, whether such injury or damage arise from carelessness, accident or any other cause whatsoever in any way connected with the carrying out of this contract. The clause shall be held to include inter-alia, any damage to buildings whether immediately adjacent or otherwise, and any damage to roads, streets, foot paths or ways as well as damages caused to the buildings and the works forming the subject of this contract by rain, wind or other inclemency of the weather. The contractor shall indemnify the Employer and hold harmless in respect of all and any expenses arising from any such injury or damages to the person or property as aforesaid and also in respect of any claim made in respect of injury of damage under any acts or compensation or damage consequent upon such claim. The contractor shall reinstate all damages of every sort mentioned in this clause so as to deliver the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damages to the property of third parties.

The contractor shall affect the insurance necessary and indemnify the Employer entirely from all responsibility in this respect. The insurance must be placed with a company approved by the Employer and must be effected jointly in the name of the Employer and contractor and the policy lodged with the Employer. The scope of insurance is to include damage or loss to the contract itself till this is made over in a complete state. Insurance is compulsory and must be affected from the very initial stage. The contractor shall also be responsible for any thing, which may be excluded from damage to any property arising out of incidents, negligence or defective carrying out of this contract. The Employer shall be at liberty and is hereby empowered to deduct the amount of any damages, compensations, costs, charges and expenses arising or accruing from or in respect of any such claim or damages from any sums due or to become due to the contractor. Contractor have to obtain the Insurance for the contract of work from the very initial stage before starting the work up to completion of the work plus one month.

23. **MEASUREMENTS**

Before taking any measurement of any work the Site Engineer or a subordinate deputed by him shall give reasonable notice to the contractor. If the contractor fails to attend at the measurements after such notice or fails to countersign or to record the difference within a week from the date of measurement in the manner required by the Site Engineer then in any such event the measurements taken by the Site Engineer or by the subordinate deputed by him as the case may be is final and binding on the contractor and contractor shall have no right to dispute the same.

24. **PAYMENTS**

All bills shall be prepared by the contractor in the form prescribed by the Employer’s / Architects. Normally one interim bill shall be prepared each month subject to minimum value for interim certificate as stated in these documents. The bills in proper forms must be duly accompanied by detailed measurements in support of the quantities of work done and must show deductions for all previous payments, retention money, etc.

The Employer / Architect shall issue a certificate after due scrutiny of the contractor’s bill
stating the amount due to the contractor from the Employer and the contractor shall beentitled to payment thereof, within the period of honouring certificates named in these
documents. The Employer will deduct retention money as described in clause 11 of these
conditions. The refund of retention money will be made as specified in the said clause. If the
Employer has supplied any materials or goods to the contractor, the cost of any such
materials or goods will be progressively deducted from the amount due to the contractor in
accordance with the quantities consumed in the work.

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

Final Payment

The final bill shall be accompanied by a certificate of completion from the Employer /
Architects. Payments of final bill shall be made after deduction of Retention Money as
specified in clause 11 of these conditions, which shall be refunded after the completion of the
Defects Liability Period after receiving the Employer's/ Architect's certificate that the
contractor has rectified all defects to the satisfaction of the Employer/Architects. The
acceptance of the payment of the final bill by the contractor would indicate that he have no
further claim in respect of the work executed.

25. VARIATION/ DEVIATION

The tender rates shall be applicable for any increase in the tendered quantities up to
variations of +100%. If the quantity of work to be executed varies beyond +100%, the rate for
the quantity beyond +100% of such items will be derived as per standard method of rate
analysis based on prevalent fair price of labour, material and other components as required
(market rate analysis). In case the quantity decreases or item/s omitted/deleted at the time of
allotment/ commencement/ execution, the contractor will be paid for the actual work done at
the site duly verified by project engineer. Nothing extra will be paid by the college on account
of omission/deletion of items or decrease in the quantity of items. The college shall not
entertain any claim whatsoever from the contractor on this account. The price of all additional
items/ non-tendered items will be worked out on the basis of rates quoted for similar items in
the contract wherever existing. If similar items are not available, the rates for such items will
be derived as per standard method of rate analysis based on prevalent fair price of labour,
material and other components as required with 15% towards contractor's profit and
overheads.

26. SUBSTITUTION

Should be contractor desire to substitute any materials and workmanship, he/they must obtain
the approval of the Employer/ Architects in writing for any such substitution well in advance.
Materials designated in this specification indefinitely by such term as “Equal” or “ Other
approved” etc. specific approval of the Employer/ Architect has to be obtained in writing.

27. CLEARING SITE ON COMPLETION

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

The contractor shall make good at his own cost and to the satisfaction of the Employer all defects, shrinkage, settlements or other faults, which may appear within 12 months after completion of the work. In the default, the Employer may employ and pay other persons to amend and make good such damages, losses and expenses consequent thereon or incidental thereto shall be made good and borne by the contractor and such damages, loss and expenses shall be recoverable from him by the Employer or may be deducted by the employer, in lieu of such amending and making good by the contractor, deduct from any money due to the contractor a sum equivalent to the cost of amending such work and in the event of the amount retained being insufficient recover that balance from the contractor from the amount retained under clause no. 11 together with any expenses the Employer may have incurred in connection therewith.

29. **CONCEALED WORK**

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

30. **IDLE LABOUR**

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

31. **SUSPENSION OF WORKS**

If the contractor except on account of any legal restraint upon the Employer preventing the continuance of the work or in the opinion of the Employer shall neglect or fail to proceed with due diligence in the performance of his part of the contract or if he shall more than once make default, the Employer shall have the power to give notice in writing to the contractor requiring the work to be proceeded within a reasonable manner and with reasonable dispatch, such notice purport to be a notice under this clause. After such notice shall have been given, the contractor shall not be at liberty to remove from the site of the works or from any ground contiguous thereto any plant or materials to subsist from the date of such notice being given until the notice shall have been complied with. If the contractor fails to start the work within seven days after such notice has been given to proceed with the works as therein prescribed, the employer may proceed as provided in clause 43. (Termination of Contract by Employer)

32. **TERMINATION OF CONTRACT BY EMPLOYER**

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

33. **ARBITRATION**

All disputed or differences of any kind whatsoever which shall at any time arise between the parities hereto touching or concerning the works or the execution or maintenance thereof this contract or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after determination foreclosure or breach of the contract (other than those in respect of which the decision of any person is by the contract expressed to be final and binding) shall after written notice by either party to the contract to the other of them and to the Employer hereinafter mentioned be referred for adjudication to a sole Arbitrator to be appointed as hereinafter provided.

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

a. Retired High Court/Supreme Court Judge who have experienced in handling Arbitration Cases.

b. Member of Council of Arbitrators

c. Fellow of the Institution of Engineers

d. Eminent Retired Chief Engineer from State/Central PWD/Public sector undertaking of good reputation and integrity

e. Fellow of Council of Architecture

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

If the Employer fails to send to the contractor the panel of three names as aforesaid within the period specified, the contractor shall send to the Employer a panel of three names of persons who shall all be unconnected with either party. The Employer shall on receipt appoint him as the Sole Arbitrator. If the Employer fails to select the person and appoint him as the Sole Arbitrator within 30 days of receipt of the panel and inform the contractor accordingly, the contractor shall be entitled to appoint one of the persons from the panel as the Sole Arbitrator and communicate his name to the Employer. If the Arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another Sole Arbitrator shall be appointed as aforesaid. The work under the Contract shall, however, continue during the arbitration proceedings and no payment due or payable to the contractor shall be withheld on account of such proceedings. The Arbitrator shall be deemed to have entered on the reference on the date he issued notice to both the parties fixing the date of the first hearing.

The Arbitrator may from time to time, with the consent of the parties, enlarge the time for making and publishing the award. The arbitrator shall give a separate award in respect of each dispute or difference referred to him. The Arbitrator shall decide each dispute in accordance with the terms of the contract and give a reasoned award. The venue of arbitration shall be such place as may be fixed by the Arbitrator in his sole discretion.

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

The award of the Arbitrator shall be final and binding on both the parties.

Subject to aforesaid the provisions to the Arbitration Act. 1992 or any statutory modification or re-enactment thereof and the rules made thereunder, and for the time being in force, shall apply to the arbitration proceeding under this clause.

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

1. DRAWINGS AND SPECIFICATIONS

The works shall be carried out to the entire satisfaction of the EMPLOYER and the ARCHITECT, in accordance with the signed drawings and specifications and such further drawings and details as may be provided by the Architect, and in accordance with such written instructions, directions and explanations as may from time to be given by the Architect, whose decision as to the sufficiency and quality of the work and materials shall be final and binding upon all parties. If the work shown on any such further drawings or work that may be necessary to comply with any such instructions directions or explanations, be in the opinion of the contractor extraction that comprised in or reasonably to be inferred from the contract he shall before proceedings with such work, give notice in writing to this effect to Architect, and in the event of the Architects agree to the same in writing the contractor shall be entitled to an allowance in respect of such extra work as on authorized extra. If the Architect and the contractor fail to agree as to whether or not there is an extra, then, if the Architect decided that the contractor is to carry out the said work, the contractor shall do so, and the question whether or not there is any extra, and it so the amount thereof, shall failing agreement, be settled by Arbitration as hereinafter provided, but such references shall in no way delay the fulfillment of this contract.

No drawings shall be taken as in itself on order for variation unless, in addition to the Architect’s signature, it bears express words stating that is intended to be such an order or bears a remark ‘GOOD FOR CONSTRUCTION’. No claim for payment for extra work shall be allowed unless the said work shall have been executed under the provisions of clause 6 (Authorities notices, patent right and royalties) or by the Authorities of directions in drawing of the Architect as herein mentioned.

One complete set of the signed drawings and specification and scheduled of quantities shall be furnished by the Architect to the Contractor. The Architect shall furnish within such time, as he may consider reasonable, one copy of any additional drawing, which is his opinion, may be necessary for the execution of any part of work. Such copies shall be kept at the works, and the architect or his representatives shall, at all reasonable times have access to the same and shall be return to the Architect by the contractor before the issue of the Final certificate. The contract shall remain in the custody of the Architect, and shall be produced by him at his office as and when required by the Employer or by the contractor.

2. INSPECTION OF DRAWINGS

Before filling in the tender, the contractor will have to check up all drawings and schedule of quantities, and will have to get an immediate clarification from the Architect on any point that he feels is vague or uncertain. No claim of damages or compensation will be entertained on this account.

3. EXECUTION OF WORK (PRICES TO INCLUDE)

The whole of the work is described in the contract (including the schedule of Quantities, the specifications and all drawing pertaining there to) an as advised by Employer / Architect from time to time is to carried out and completed in all its parts to the entire satisfaction of the Employer / Architect. Any minor details of the work which may not have been definitely referred to in this contract, but which are usual in practice and essential to the work, are deemed to be include in this contract. Rates quoted in the Schedule shall be inclusive of all freights, taxes, such as octroi, sales tax, Royalties duties, excise, turnover tax, sales tax on works contract, VAT etc., as well as transportation, so as to execute the contractor as per the rules and regulations of Local Bodies, State Government and Government of India.

The rates quoted in the tender should include all charges for:

a. Labor, maintenance fixing, carrying, cleaning, making good, hauling, watering etc
b. Plant, machinery, scaffolding, framework, English ladders, ropes, nails, spikes, tools, materials and workmanship protection from weather, shuttering, temporary supports, platform and maintenance of the same.

c. Covering for the walling and other works during inclement weather or skirting or whenever directed as necessary.

4. SITE SUPERVISION

The contractor shall appoint at his own cost competent an adequate number of qualified Engineers at site, for (1) joint measurements and preparations of bills, (2) for testing materials at site and outside laboratory, (3) for other general supervision. Their appointment shall be approved by the Employer / Architect. The site Engineers shall not be removed from the site without the written consent of the Employer / Architect.

5. DIMENSIONS

Figures, dimensions, are in all case to be accepted preferences to scaled sizes. Large scale details take precedence over small scale drawings. In case of discrepancy, the contractor is to ask for a clarification before proceeding with the work. Accordingly if any work is executed without prior clarification it is liable to be rejected and shall not be paid for.

6. PROGRAMME OF WORKS

Contractor shall have to prepare and submit the CPM/PERT charges for Architect’s approval immediately after issue of the work order and display the approved charts in the site office. He shall also make bar charts indicating individual items and during the progress of work he shall update the bar charts showing the proportionate progress of work every week.

He shall to strictly adhere to the programme of works as per CPM/PERT charts and show the proportionate progress of work.

7. PROCUREMENT OF MATERIALS

Contractor shall procure all the materials for the work from the open market. Time is the essence of the contract. Acceptance of the completion date by the contractor shall mean that he has taken into consideration the availability of all material of approved make and quality in sufficient quantities at site to enable him to complete the entire work in the stipulated period.

Contractor will get sample of all materials approved by the Employer / Architect before placing order / purchase / procurement. They shall conform to I.S. codes and or tender specification as applicable. For all materials the contractor shall quote for the best quality of the materials of best make / source or supply and it will be got approved by Employer / Architect before procurement. In case sufficient quantities of approved quality materials from approved source are not available in time, contractor may have to procure the same for neighboring area with longer leads as required and directed at no extra cost. The material will be, however as per relevant I.S code as and wherever applicable.

8. UNFIXED MATERIALS

When any materials intended for the works shall have been placed at site by the Contract, such material shall not be removed there from (except for the purposes of being used on the works) without the written authority of the Employer / Architect and when the contractor shall have received payment in respect of any certificate in which the architect shall have stated that he has taken into account to value of such unfixed materials on the works such material shall become the property of the Employer and the contractor shall be liable for any loss or damage to any such materials.
9. CUSTODY AND SECURITY OF MATERIALS

The contractors shall be responsible for the custody and security of all materials and equipment at site and he will provide full time watchman / watchmen to lock after his materials, stores equipments etc.

10. RATES

Contractor shall quote all the rates both in figures and in words and any alterations shall have to be initiated by the contractor. Rates quoted by the contractor for the same item in different schedules will be same and in case different rates are quoted, the lowest will be taken as correct and the schedule corrected accordingly. Incase of discrepancy between figures and the words the rate quoted in words shall be taken as correct one. All quoted rates should be inclusive of sales tax on works contract. Rates quoted by the contractor shall hold good for all the work carried out to any height and depth as shown in detailed drawings and as required and directed by the Architect.

Rates quoted by the contractor shall also hold good for any small work at any place at site.

11. PRICES FOR EXTRAS ETC., ASCERTAINMENT OF

Should it be found after the completion of the works from measurements taken (in accordance with the previous paragraph) that any of the quantities or amounts of the work thus ascertained are less or greater than the amounts specified for the works in the priced schedule of quantities and / or tender or that any variations, is made, the valuation of such quantities, amounts or variations, unless previously or otherwise agreed upon, shall be made accordance with the following rules

a. The net rates or prices in the original tender shall determine the valuation of the extra work, where extra work is of a similar character and executed under similar conditions the work priced therein.

b. The net prices the original tender shall determine the value of the item omitted, provided if omissions vary the conditions under which any remaining items of work are carried out, the prices for the same shall be valued under thereof.

c. Where extra works are not of similar character and / or executed under similar conditions as aforesaid or where the omissions vary, the conditions under which any remaining items of work are carried out of it the amount of any omission or additions relative to the amount of the whole of the contract works or to be any part thereof shall be such that in the opinion of the Architects the net rate or price contained in the priced schedule of quantities or tender or for any item of work involves loss or expenses beyond that reasonably contemplated by the contractor or is by reason of such omission or addition rendered unreasonable or in-applicable, the Architect shall fix in consultation with the Employer such other rate or prices as in the circumstances he shall think reasonable and proper, which shall be final and binding on the contractor.

d. Where extra work cannot be properly measured or valued, the contractor shall be allowed any work prices at the net rates stated in the tender or the priced schedule of quantities, or if not so stated, then in accordance with the local day work rates and wages for the district, provided that in either case vouchers specifying the daily time (and if required by the architect, the workmen's name) and materials employed at or before the end of the week following that in which the work has been executed.

The measurements and valuations in respect of the extra items of contract shall be completed within the ‘period of final measurement’ or with in three months of the completion of the contract works as defined under clause no 16 (Certificate of Virtual Completion)
12. EXTRA ITEMS RATES

The work on extra items shall be started only after the approval of extra items rates by client / Architect. Rates for additional or extra items of construction work which can be derived from the contract item rates and are not covered in the contract, shall be calculated on the basis of actual cost plus 15% for profit.

13. ARCHITECT’S DRAWINGS AND INSTRUCTIONS

A set of major drawings along with the contract documents shall be provided to the contractor. For any clarifications or further drawings are required by the contract, during or before the start of construction work, the Contractor shall inform the Architects in writing to provide the same. Working details will be given to the contractor from time to time during the progress of work as and when required. Incase of other drawing is required by the contractor he will give a minimum ten days notice to the Employer / Architect.

14. FAILURE BY CONTRACTOR COMPLY WITH ARCHITECTS / EMPLOYER’S INSTRUCTIONS

If the contractor after receipt of written notice from the architect requiring compliance with such further drawings and / or Architects instruction, fails within seven days to comply with the same, the Employer / Architect may employ and pay other persons to execute any such work whatsoever as may be necessary to give effect thereto and all cost incurred in connection there with shall be recoverable from the contractors by the Employer on a Certificate by the Architect as a debit or may be deducted by him from any money due or which become due to the Contractors.

15. INFORMATION TO BE SUPPLIED BY THE CONTRACTOR

The contractor shall furnish the Employer / Architect the following:

a. Detailed industrial statistics regarding the labor employed by him etc

b. The Power of Attorney, name and signature of his authorized representative who will be in charges for the execution of work

c. The list of technically qualified persons employed by him for the execution of this work.

d. The total quantity and quality of materials used for the works.

e. The list of plant and machinery employed for this work

16. ARCHITECT’S DELAY IN PROGRESS

The Architect may delay the progress of the works in case of rains or otherwise, without vitiating the contract and grant such extension of time with the approval of the employer for the completion of the contract as he may think proper and sufficient in consequences of such delay, and the contractor shall not make any claim for compensation or damage in relation thereto.

17. CERTIFICATE AND PAYMENTS

The contractor shall be paid by the Employer from time to time, by installments under interim Certificates to be issued by the Architect to the contractor on account of the works executed by the contractor when in the opinion of the Architect, work to the approximate value, named in the Appendix as ‘Value of work for interim Certificates’ (or less at the reasonable discretion of the Employer / Architect) has been executed in accordance with this contract, subject however, to a retention of the percentage of such value need in the Appendix hereto.
mentioned as ‘retention percentage for interim Certificates’ until the total amount retained shall reach the sum named in the appendix as Total Retention money after which time the installments shall be up to the full value of the work subsequently so executed in the interim Certificate, such amount as he may consider proper on account materials delivered upon the site by the Contractor for use in the work.

And when the works have been virtually completed and the Architect shall have certified in writing that they have been completed, the contractor shall be paid in accordance with the Certificate issued by the Architect the sum of money named in the Appendix after satisfying themselves as ‘Installment after Virtual Completion’ being a part of the said ‘Total Retention Money’. The Contractor shall be entitled to the payment of the final balance in accordance with the final Certificate to be issued in writing by the Architect at the expiration of the period refer to as ‘The Defect Liability Period’ in the Appendix hereto, from the date of Virtual completion or as soon as after the expiration of such period as the work shall have been finally completed and all defect made good according to the true intent and meaning hereof, whichever shall happen, provided always that the issue by the Architect of any certificate during the progress of the works or after the completion shall not relieve the Contract from his liabilities in cases of fraud, dishonesty or fraudulent concealment relating to the works of materials or any matter dealt within the certificate, and in case of all defects and insufficiency in the works or materials which reasonable examination would have disclosed. No certificate of the Architect shall of itself be conclusive evidence that any works and materials to which it relates are in accordance with the contract.

The Architect shall have power to withhold any certificate if the works or any part thereof are not being carried out to his / employer satisfaction.

The Architect may by any Certificate make any correction in any previous Certificate, which shall have been issued by him.

Payment upon the Architect’s Certificates shall be made within a period named in the Appendix as ‘Period of honoring of Certificates’ after such Certificates have been delivered to Employer

18. DELAYED PAYMENTS

Any amounts payable by the Employer to the contractor in pursuance of any Certificate given by the Architect hereunder shall, if not paid within the ‘Period of honoring of Certificate’ no interest paid by the Employer.

19. FORCE MAJEURE

Neither party shall be held responsible by the other for breach of any condition of this agreement attributable to any ‘Act of God’ Act of state, lock-out or control or any other reason, beyond the control of the parties and any breach of clauses arising from much force majeure conditions as aforesaid shall not be regarded as a breach of the provision of this Agreement.

20. INCOME-TAX AND WORKS CONTRACT TAX

Income Tax and Works Contract Tax shall be deducted at source by the client from the contractor’ interim and final bill payments as per Statutory Regulations.

21. SITE MEETINGS

A senior representative of the contractor shall attend weekly meetings at works site and in addition meetings as and when arranged by employer / Architect to discuss the progress of the work and sort out problems, if any and ensure that the work is completed in the stipulated time.
22. WORKING HOURS

Since the site is Working Branch, the Contractor has to execute the work after working hours, nights & on holidays. No extra payments will be made for the work being done during odd hours.

The site will be handed over to the contractor in phased manner and the contractor has to schedule his activities accordingly. No extra payment shall be made on this account.

23. ACTION WHERE THERE IS NO SPECIFICATION

In case of any class of work for which is there is no specification mentioned, the same will be carried out in accordance with the Indian Standards Specifications subject to the approval of the Employer / Architect.

24. REPORTING OF ACCIDENT TO

The contractor shall be responsible for the safety of persons employed by him on the works and shall report serious accidents to any of them whenever and wherever occurring on the work to employer who shall make every arrangement to render all possible assistance. This shall be without prejudice to the responsibility of the contractor under the Insurance Clause of the general conditions. Contractor shall take all precaution detailed in the safety code attached separately.

25. TYPOGRAPHICAL CLERICAL ERRORS

The Employer / Architect clarification regarding partially omitted particulars of typographical or Clericals errors shall be final and binding on the contractors.

26. WORK PERFORMED AT CONTRACTOR’S RISK

The contractor shall take all precautions necessary and shall be responsible for the safety of the work and shall maintain all lights, goods, signs, temporary passages or other protection necessary for the purpose. All works shall be done by the contractor’s risk and if any loss or damage shall result from fire or from others cause, the contractor shall promptly repair or replace such loss or damage free from all expenses to the employer.

The contractor shall be responsible for any loss or damage to materials, tools or other articles used held for use in connection with the work. The work shall be carried on to completion without damage to any work or property of the Employer or of others and without interferences with the operations of existing machinery or equipment, if any.

27. SPECIAL CONDITIONS OF CONTRACT

In the event of any discrepancy with clauses mentioned anywhere else in the tender with the clauses mentioned within special conditions of contract, the clauses mentioned within the special conditions of contract shall supersede those mentioned elsewhere.
FORM OF AGREEMENT

ARTICLES of AGREEMENT made this _________ day of ________ year 2013 between the
Principal Ramjas College (Hereinafter referred to as the “Employer/Owner” which expression shall,
unless excluded by or repugnant to the context, includes its successors and assigns) of the ONE
PART and

___________________ (Hereinafter referred to as “Contractor” unless excluded by or repugnant to the context, includes its successors and assigns) of the OTHER
PART.

WHEREAS the Employer intends to carry out Construction of Amphitheatre at the Ramjas campus,
Delhi University (Herein referred to as “Project”).

AND WHEREAS the Employer in order to effectively carry out the said works has engaged M/s. Isa
Project Consulting Pvt Ltd (Hereinafter referred to as “Architects”) to prepare plans, drawings and
specifications describing the works to be executed by the contractors, namely, Interior etc. for the
project, to open tenders received at the office of the Employer, to scrutinize and recommend to the
Employer the name(s) of the Contractor(s) from whom tenders were received and recommended to
the Employer for the issue of work order to the contractor.

AND WHEREAS for the purpose of the said project, the Employer invited sealed tenders from
experienced, resourceful and bonafide contractors vide his Notice Inviting Tender (No. __________
dated.___________).

WHEREAS the contractor submitted his Tender along with the Tender Documents containing General
Notes, General Conditions of the Contract, Technical Specifications and Schedule of Quantities etc.
for the works, prepared with the assistance of Consultants (Hereinafter collectively referred to as the
“said conditions”), duly signed on each page as a token of his acceptance of the same, along with
requisite Earnest Money Deposit of Rs.____________(Copy enclosed Vide Annexure-I).

AND WHEREAS out of the Tenders received, the Tender of the contractor was found to be most
suitable for the project.

AND WHEREAS the Employer/Architect has accordingly issued the work order (No. _____dt.
__________) to the contractor subject to his furnishing the requisite Security Deposit (Copy
enclosed Vide Annexure-II).

AND WHEREAS the Contractor has accepted the aforesaid Work Order vide his letter of acceptance
No. __________ dt. __________ (Copy enclosed Vide Annexure-III) and has also deposited with the
Employer a sum of Rs.____________ which with the Earnest Money of Rs.__________ forms the
requisite Security Deposit @ 2% of the accepted Tender Value of Rs.____________.

AND WHEREAS the Employer has caused the plans, drawings, specifications, schedule of quantities
etc. relating to the project at the work site at _____________ to be issued to the Contractor.

NOW, therefore, it is hereby agreed to and between the parties as follows:

1. Contract documents

The following documents shall constitute the Contract Documents.

i). This Article of Agreement.

ii). Tender submitted by the Contractor included the N.I.T and Tender Documents (Vide
Annexure-I).

iii). All correspondence between the College/Architects and the Contractor from the date of
issue of N.I.T and the date of issue of work order.
iv). Work order No.__________ dt.__________(Vide Annexure-II).

2. In consideration of the payments to be made to the Contractor as hereinafter provided the Contractor shall upon and subject to the said conditions, execute and complete the contracted works shown upon the said drawings etc. and such further detailed drawings as may be furnished to the contractor by the said Owner/Employer through the Architects and described in the said Specifications and the said Schedule of Quantities.

3. Notwithstanding what are stated in the N.I.T conditions of Tendering, Conditions of Contract of herein before stated by the Employer through the Architects, reserves itself the right of altering the drawings and the nature of the work and addition to or omitting any items of work or of having portions of the same carried out departmentally or otherwise and such alterations or variations shall be carried out without prejudice to this contract.

4. As mentioned in Article 1 above, the said conditions shall be read and be treated as forming part of this agreement and parties hereto will respectively be bound thereby and to abide by and submit themselves to the conditions and stipulations and perform the same on their parts to be respectively observed and preferred.

5. Any dispute arising under this agreement shall be referred to the Arbitration in a manner specified in the General Conditions of the Contract and all legal disputes shall be limited within the territorial jurisdiction of the State of Delhi. The decision of the arbitration shall be final and binding on both the parties.

IN WITNESS WHEREOF THE PARTIES to there presents have hereunder set and subscribed their hands, the day, month and year first above written.

Signed and delivered for and on behalf of
RAMJAS COLLEGE
Shri._____________
Its duly authorised official

In the presence of –

1. (Name and Address)

2. (Name and Address)

Signed and delivered for and on behalf of
The Contractor ____________ by
Shri ________________ his
Duly authorised official

In the presence of –

1. (Name and Address)

2. (Name and Address)
SCHEDULE OF APPROXIMATE QUANTITIES AND RATES

1. The quantities given herein are those upon which the lumpsum cost of the work is based. They are subjected to alterations omissions, deductions or additions as provided for in the conditions of this contract and do not necessarily show the actual quantities of the work to be done. The unit rate noted below are those governing payment of extras or deductions for omissions, according to the conditions of the contract as set forth in the preliminary specifications of the Andhra pradesh detailed standard specifications and other conditions or specifications of this contract.

2. It is to be expressly understood that the measured work is to be taken net (notwithstanding) any custom or practice to the contrary according to the actual quantities when in place and finished according to the drawings or as may be directed from time to time by the Architects, and the cost calculated by measurements or weight, at the respective prices, without any additional charge for any necessary or contingent works connected there with. The rates quoted are for work in site and complete in every respects.

3. If any operation of work, which is specified in the respective items mentioned in the schedule of quantities, is not executed by the contractor then proportionately the rate quoted in the schedule shall be refixed.
GENERAL INSTRUCTIONS TO THE CONTRACTORS

M A K E S

UNLESS SPECIFIED OTHERWISE, THE CONTRACTORS SHALL ADHERE TO THE FOLLOWING GUIDELINES/SPECIFICATIONS FOR DIFFERENT ITEMS OF WORKS

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<td>1</td>
<td>30mm Gangsaw cut Agra Stone</td>
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<td>8 hole pressed brick as approved by Architect (Jindal Mechno bricks) or equivalent</td>
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<td>The site being a working premises, work shall be carried out in a phased manner, after the office hours and on holidays. The premises shall be left clean for the daily functioning. No additional cost shall be considered for this factor.</td>
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<td>AKEMI stone sealer for stone &amp; Bricks</td>
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<td>5</td>
<td>HRFR Wires &amp; cables (Finoex, RR, HAVELLS, polycab) of equivalent</td>
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<td>6</td>
<td>MCCB, MCB, ELCB, DB, IP67 (HATELLS, ABB, SIEMENS) or equivalent</td>
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<td>7</td>
<td>GROUTS (FAIRMATE, LATICRETE)</td>
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<td>8</td>
<td>Steel from reputed IS manufacturers</td>
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<td>Cement Grade 53 from JK, Birla or equivalent</td>
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<td>PREAMBLE TO SPECIFICATIONS</td>
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CHAPTER I

PREAMBLE TO SPECIFICATIONS
1.0 GENERAL

1.01 The condition of the contract, Schedule of Quantities and the Drawings shall be read in conjunctions with these Specifications and matters referred to, shown or described in any of the former are not necessarily repeated in the latter. The work under the contract shall be carried out in accordance with the General Conditions of the Contract, Special Conditions of the Contract, Specifications, Drawings, Schedule of Quantities forming part of this contract and the latest Indian standard Specifications and Codes of Practice referred in these Specifications.

1.02 DESCRPICENCY BETWEEN DRAWINGS AND SPECIFICATIONS AND SCHEDULE OF QUANTITIES

1.02.1 In the event of any discrepancy between these Specifications and the latest Indian Standard Specifications/codes of Practice and Provisions in these Specifications shall take precedence over the other Specifications.

1.02.2 In case of any discrepancy between Specifications, Schedule of Quantities and Contract Drawings or such other drawings as may be issued during progress of works, the matter shall be referred to the Architect/Engineer for clarification and decision. The contractor shall execute the work in accordance with the decision of the Architect/Engineer and under no circumstances shall the contractor carry out the works on the basis of his own interpretation and understanding of the apparent discrepancy. It will however be deemed that the contractor has quoted on the basis of the description of the BOQ including preamble.

1.02.3 PROTECTION TO WORK FROM WEATHER

The contractor shall cover up and protect all the works from the weather and shall suspend all operations during a weather which, in the opinion of the Architect/Engineer will be detrimental to the work.

1.02.4 DIMENSION IN DRAWINGS

Figured dimensions are to be followed in all cases and in no case shall they be scaled. Large scale details take precedence over small scale details and small scale details over small scale drawings. In general, drawings shall indicate dimensions, positions and type of construction: the specifications shall indicate the quality, standard and methodology of work and the schedule of quantities shall indicate the estimated approximate quantities and brief description of item.

1.02.5 METHOD OF MEASUREMENT

Unless otherwise described in the Preamble to the Schedule of Quantities, the method of measurement shall be as described in method of measurement of building and civil engineering works (IS: 1200 Part – I to XXV) latest edition of bureau of Indian Standards

1.03 MATERIAL

1.03.1 All materials / fittings / equipments supplied and incorporated in the work shall comply with the requirements of relevant Indian Standards (latest applicable standards) and also shall meet approval of Architect / Engineer

1.03.2 The contractor shall produce samples of all building materials / fittings of sizes as required by the Architect / Engineer before incorporating of these materials / fittings in the work for prior approval of the Architect / Engineer and the Owner. The approved samples shall remain in custody of Architect / Engineer till expiry of defect liability period and returned thereafter. Sample of consumables, tiles, sand aggregate will however, not be returned. Bulk procurement of material shall not be commenced until the samples are duly approved in writing. The materials / fittings to be provided by the contractor shall conform to or shall be superior to the samples approved

1.04 CONTRACT PRICE
The contract price quoted by the contractor shall be deemed to include for any details of Construction which are obviously and fairly intended and which are incidental to the item but may not have been clearly shown or specified.

1.05 NOTICE OF OPERATION

No important operation shall be commenced nor shall work outside the usual working hours be carried out without the consent in writing of the Architect / Engineer nor without full and complete notice.

1.06 SEQUENCE OF WORKS

The sequence in which the Works are to be carried out shall be to the approval of the Architect / Engineer and shall be such as to suit the detailed method of construction adopted by the contractor. The works shall also be carried out so as to enable the other contractor to work concurrently for early completion of the works.

1.07 SETTING OUT WORKS

The contractor shall, set out and measure up all the works in accordance with the contract documents and for this purpose, he shall appoint technical and other category staff and also to provide all necessary assistance needed.

1.07.1 The contractor shall be entirely responsible for the accurate and perfect setting out of all works, whether such setting out, be executed by his own staff or not, and notwithstanding that the Architect / Engineer may furnish bench marks and set out or give the necessary directions for setting out the work, the contractor must satisfy himself as to the accuracy of these and he shall at his own cost rectify and make good any and all the defects which may arise from errors in the lines and levels, and no inaccuracy in the setting out and in the construction of the works shall be founded on by the contractor as a reason for any claim against the owner by the contractor.

1.07.2 DATUM FOR CONTRACT LEVELS

The levels, dimensions and general construction of the work shown on the drawings are supposed to be correct and in agreement with one another, but the contractor must verify the same before ordering of materials or commencing the work.

1.07.3 INSTRUMENT FORE SETTING OUT AND MEASUREMENT TESTING OF WORKS

The Contractor shall also provide and maintain at his own cost and keep in good order as required by and for the use of Architect / Engineer for the duration of the contract, a modern and accurate theodolite and a precision level, both of the approved type and make, complete with accessories and all instruments, poles, pegs, staging, moulds, templates, profiles and all the other requisites for the setting out and measuring up of all the works, as well as the services of an experienced person.

1.08 SURVEYS AND LEVELS TO BE AGREED

Before the works or any part thereof have commenced the contractors agent and the Architect / Engineer shall together survey and take levels of the site of the works and agree all particulars on which the survey is to be made, and on which the measurement of the works are to be verified.

1.09 RESPONSIBILITIES FOR CARRYING OUT WORKS

The responsibilities for carrying out the works and the methods to be adopted under this contract shall rest solely with the contractor subject always to the approval by the Architect / Engineer of the contractors proposals. Such approvals shall not, however, relieve the contractor in any way of the responsibilities for the proper execution of works in accordance with the contract.

1.10.1 CONSTRUCTION EQUIPMENT, WORK, BUILDING MATERIALS ETC.
1.10.2 The contractors attention is specially directed to the fact the requirements of the specifications are general and applicable to all the works.

1.10.3 In addition the following general requirements given in sub- paras 1.10.3.1 and 1.10.3.7 shall also be held to apply to every part of the works where applicable.

1.10.3.1 USE OF PLANT, MATERIALS ETC FOR SAFE CONSTRUCTION

All the labour, constructional plant, machinery, tools instruments, tackle and equipments, temporary offices, workmen sanitary and welfare arrangements and other buildings, temporary structures, works services and operations, materials, samples of various works as required by the Architect / Engineer, stores and things of whatever description necessary to construct, complete and maintain at his own cost, the whole of the works, temporary and permanent, or to fulfill the requirements specified in the contract shall be provided and used by the contractor, and the construction plant, equipment, materials temporary building, works, services etc. shall be of a type, capacity, power or quantity, strength, design and construction and erected in such position or used or executed at such times and in such manner as are specified in the contract and are most efficient and suitable for the proper and safe execution of the works to be undertaken under this contract.

1.10.3.2 SAFETY MEASURES FOR PLANT AND MATERIALS

The contractor at his own cost shall be solely responsible for the provisions, sufficient, stability, safety, protection, construction demolition transport, maintenance and insurance against all risks of all the aforesaid constructional plant, tools, equipment, temporary buildings, structures, works, services and operations, materials, stores and things etc. and shall except where otherwise stated in the contract, replace or reconstruct them or reexecute them in the event of their being lost or damaged or being inaccurate and on completion of the contract the contractor shall remove from this site all constructional plant, temporary offices and structures and unused material and stores and debris and shall leave the site in a tidy condition all to the approval of the Architect/Engineer.

1.10.3.3 UTILITIES TO BE PROVIDED BY CONTRACTOR

The contractor shall make at his own cost all arrangements except where otherwise indicated, shall at all points where they are required, such supplies of water, fuel, light and power as he may require for all the operations under the contract and shall also provide and use all the necessary appliances, works, services and other things necessary to distribute the supplies to the various parts of the works.

1.10.3.4 PROPER ACCESS TO SITE

The contractor will be deemed to have satisfied himself as to means of access to the site of the works and transport of labour, materials and plant to and from and over the works, the relative positions, lines and levels of any existing tracks, roads, sewers, drains, pipes, wires, cables, buildings and all the other works and other relative contingencies, and he shall, where necessary provide and maintain all requisite temporary gang way, ladders, stagings, roads, and footpaths to and about the site of the works, as may be necessary for the construction of the works or transport of labour, plant and materials.

1.10.3.5 USES OF SERVICES ETC BY ARCHITECT/ENGINEER/OWNER

All of the before mentioned works which may be constructed and in use for the works generally shall be available for the reasonable use of the owner, Architect/Engineer without charge and the contractor shall carry out the instructions of the Architect/Engineer in this matter.

1.10.3.6 FURNISHING INFORMATION TO ENGINEER

The contractors shall when required by the Architect/Engineer furnish all information as to quality, weight, constituent substances, dimensions, levels, strength and description of the materials and works and give the Architect/Engineer such other particulars as may be required.
1.10.3.7 All testing, provisions of weights, appliances, materials labour and everything necessary for testing of any work or material, as required and directed by the Architect/Engineer shall be carried out by the contractor at the contractor's own expense. The contractor shall also include the cost of retesting of any materials or works to replace those which have failed to pass the special requirements. All such testing shall be carried out at the site or as directed by the Architect/Engineer to be tested in approved laboratories.

1.11 NAMES OF MANUFACTURERS AND COPIES OF ORDERS

Before ordering any material of any description for the permanent works the contractor shall submit for the approval of the Architect/Engineer the names of the makers and suppliers proposed and any other detail required by the Architect/Engineer and shall afterwards send to the Architect/Engineer copies, of the supply orders given by the contractor for the materials. All materials shall be suitable for local climatic conditions.

1.12 MANUFACTURERS TECHNICAL DATA

1.12.1 Manufacturer’s performance data, certified factory drawings of apparatus giving full information as to capacity, dimensions, materials and all information pertinent to the adequacy of the submitted equipment shall be submitted for approval. Manufacturer’s names, catalogue numbers and / or samples of all materials shall be submitted for approval.

Submittals and drawings should as far as possible be complementary so that drawings and submittals can be cross checked.

1.12.2 Requirements for equipment submitted for approval must be accompanied by relevant drawings, technical data, catalogue and samples. Where data, certified drawings or other required information is not available until after orders have been placed, the Architect/Engineer will give provisional approval until all required drawings and information have been supplied to the Architect/Engineer and approved by him. It is contractor’s responsibility to ensure that all necessary information is supplied to the Architect/Engineer in accordance with the progress of the work.

1.13 PROPRIETORY MATERIALS

Proprietary materials to be used in the works, shall, when brought to site, be inspected by the Architect/Engineer. The contractor shall on demand, produce to the Architect/Engineer original receipts/ vouchers/ invoices in respect of the supplies.

1.14 TEST CERTIFICATES

All manufacturers’ certificates of test, proof sheets etc showing that the material has been tested in accordance with the requirements of the appropriate Indian standards and other relevant standard specifications or to this specification, are to be supplied free of charges, on request, to the Architect/Engineer.

1.15 REJECTION OF MATERIALS

Materials shall be tested before leaving the manufacturers’ premises where possible. Materials shall also be tested on the site and they may be rejected if found not to be suitable or not in accordance with the specifications notwithstanding the results of tests at the manufacturer’s works or else where or of test certificates.

1.16 STORAGE OF MATERIALS

All materials used in the permanent work shall be stored on racks, supports, in bins undercover etc. as per relevant I.S Codes as appropriate to prevent deterioration or damage from any cause what so ever to the entire satisfaction of the Architect/Engineer and as amplified in the succeeding clauses.
1.17 RECORD AND USAGE OF MATERIALS
The contractor shall maintain a detailed record of all materials received on the site or in his stores or storage and working areas in the vicinity of the site and shall make such records available to the Architect/Engineer at such times as the latter may reasonably require.

1.18 FILLING IN HOLES AND TRENCHES
The Contractor immediately upon completion of work under the contract shall at his own expense fill up all holes or trenches which have been made and dug, level or remove mounds of earth that may have been dumped and clear away all the rubbish occasioned in the execution of the work or temporary works. Dug up trenches should be properly protected by day and night providing red lights.

1.19 FORMING HOLES AND MAKING GOOD
All holes shall be left or provided in concrete including reinforced cement concrete, brick work, floors and in any other situations as required for or directed by the Architect/Engineer and shall be made good, in the same mortar/mix as specified for that portion of the work. No extra payment on this account will be made to the contractor.

1.20 CLEANING DOWN
The contractor shall wash and clean all the floors remove cement/lime/paint drops etc. clean the joinery, glass panes etc. touch up all painters work and carry out all other necessary items of work in connection therewith and leave the whole premises clean and tidy before handing over the building without extra cost to the owner.

1.21 KEEPING THE SITE CLEAN
The contractor shall at all times keep the site free from all unserviceable and surplus excavated materials, rubbish and offensive matter which shall be disposed off in a manner to be approved by the Architect/Engineer.

1.22 SAFETY PRECAUTIONS
The contractor shall take all necessary safety precautions to prevent the possibility of accidents which may be caused mechanically, electrically or otherwise during the course of the works. The works shall include the provisions and fixing of detachable guards of approved design to cover all the moving machine parts wherever they may be located and whether they are intended to be permanent or temporary and in such a manner as to comply with the appropriate statutory requirements. It shall also include such step down transformers as to be used for portable electric tools.

1.23 SUPERVISION OF MECHANICAL
All electrical and mechanical works/ installation of equipment shall be considered to be the duty accredited to the representative of the contractor, empowered to take instructions from the Architect/Engineer and shall attend at all the premises until the whole of the works have been completed and passed by the Architect/Engineer and shall inform and give all information regarding the plant and/or equipment to the Architect/Engineer. The works shall be carried out in best workman like manner by experienced persons and licensed on the trade(s). Particulars of experience along with relevant certificate shall be furnished to the Architect/Engineer prior to the commencement of the work for approval.

1.24 MAINTENANCE OF FINISHES
The contractor shall cover up and project the various works and portions thereof from all damages due to unconsidered or rough treatment, dust, grit or damage in other ways. All bright part of fittings shall be covered with transparent polyethylene sheeting and shall be cleaned and polished before being handed over whenever required.
1.25 PRECOMMISSIONING PROCEDURE

Before final commissioning of any equipment referred to herein, the contractor shall check for tightness of clamps screwed and bottled connections, regardless of whether the original connection were made before delivery of the equipment to site or not. The contractor also shall ensure that all fusible links and trip settings are correctly calibrated to give discrimination and protection to the circuits and final sub – circuits forming the installation.

1.26 DEMONSTARTION FOR TESTING OF EQUIPMENT

The contractor shall satisfy the Architect/Engineer by the means of suitable test, as detailed hereinafter in the specification: during the erection and final test of completion, that the whole of this work is carried out in accordance with the rules and regulations applicable to the work and shall provide at his own expense all the testing instruments, apparatus etc and shall provide all labour as required. The accuracy of the test must be to the satisfaction of the Architect/Engineer, whose decision will be final. The contractor shall also notify the supplier/ statutory authorities and demonstrate such tests as may require.

1.27 MARKING AND LABELS

1.27.1 Label shall provide for every unit, i.e. Fuse switches, isolators, circuit breakers, starters, bus bar chambers and the like, mounted externally by means of nickel screws, to describe the duty of each unit and / or identified and point of potential danger. These labels shall be ivorine with engraved letters and numbers in black.

1.27.2 MARKING AND LABELS FOR EQUIPMENT

Each electrical circuit and final circuit shall be clearly labeled in approved method, indicating accurately the equipment, apparatus or area of supply to this purpose, neatly typed schedules in English, mounted in clear transparent envelopes, indicating the outgoing final sub circuits, their rating and the points they supply shall be required to be fixed inside SDB’s and MOB’s.

1.27.3 The contractor shall provide and fix adjacent to the electric panels and instruction chart, and notices relating to the procedure for dealing with cases of electric shock. Electric shock Charts are to be fixed in substations and plant rooms.

1.27.4 All plant and equipment shall be provided with name plate, bearing the maker’s name, shop or reference number, rated capacity, type, test and working pressure, speed and any other relevant particulars

1.27.5 Identification labels shall be fitted to all valves and cocks with suitable spring clips or Chains

1.27.6 A suitable valve chart and diagrammatic layout of plant and pipe work, indicating valve positions, shall be provided by the contractor and these shall be framed, glazed and hung in suitable positions as directed by the Architect/Engineer.

1.27.7 ALIGNMENT OF ACCESSORIES

1.27.7.1 The contractor shall pay particular attention to the method of fixing all conduit boxes, switch boxes and socket outlet boxes, etc, so that these shall, when completed, be in and exact position relative to the finished plaster and permit all the cover plates being fixed accurately.

1.27.7.2 The contractor shall take full responsibility for the alignment of all such boxes and must ascertain to obtain neat surfaces.

1.27.7.3 For any such faults or inaccuracies in this respect, the contractor shall be held fully responsible and will be required to carry out any necessary revisions without extra charge.
1.28 OIL AND GREASE

The contractor shall provide any necessary oil and grease for the first filling of starters oil wells on bearings and the like and for the maintenance period specified.

1.29 PAINTING

1.29.1 All steel works, steel tubes, tanks, brackets, support, sheeting, castings and the like not otherwise protected shall be treated on site during erection and after completion of works.

1.29.2 In respect of mild steel tubing, sheeting, tanks, brackets, support and castings, traces of rust, dirt grease oil mill, scale and fluxing materials used for soldering, brazing or welding. Special attention must be given to cleaning of all corners, crevices, bolts and rivet heads. When quite dry and clean, these surfaces must be painted immediately with best quality rust inhibiting metallic lead primer. The primer shall be vigorously applied particularly to crevices, bolts and rivet heads. Edges and corners shall be primered first, allowed to dry, then the whole surface painted. Surfaces must be thoroughly examined on arrival at site and any damages to the primer suffered during the transit made good by cleaning and re-painting.

1.29.3 Galvanized surfaces need to be treated before despatch, except in special cases where the coating has to be distributed as a part of the manufacturing process. (Generally, galvanizing shall be carried out after the manufacture.)

1.30 FOUNDATION BOLTS ETC.

The contractor shall provide all clips, brackets foundation bolts, fixing bolts, assembly bolts, including nuts anchor plates, washer and plugs and the like for all equipment and materials supplied under this contract.

1.31 COORDINATION OF BUILDERS WORK

The contractor shall coordinate with the requirement for holes, inserts, fittings and other similar builder’s works in correlation with each trade of work. The contractor shall ensure that such builder’s work is in accordance with the specialist sub contractors / suppliers requirements. Details of holes inserted, access, fixing etc. which are not shown on Engineers drawings but are required by the Contractors or by sub-Contractors shall be forwarded to the Architect/Engineer for his written approval at least three weeks before work proceeds in respect of such items.

1.32 QUANTUM OF MATERIALS TO BE ORDERED

The schedule of quantities shall not be used as a basis of ascertaining the quantum of materials to be ordered. The Contractor shall use his own resources to access the quantities to be ordered and shall be entirely responsible for the same.
CHAPTER 2:
STANDARD TRADE SPECIFICATION
FOR EARTH WORK IN EXCAVATION
FOR CIVIL WORK
1.0 EARTH WORK IN EXCAVATION - SCOPE

This specification deals with earthwork for civil work and includes the following:

a. cleaning and grubbing
b. grading
c. excavation
d. filling & back filling
e. removal & disposal of surplus material

2.0 GENERAL

2.1 excavation will have to be carried out in all types of soils including clay, sand and sand with admixture rock etc.

2.2 excavation works shall be commenced and carried out as per programme of work front to be approved by the architects.

3.0 SETTING OUT

3.1 the contractor shall be responsible for the true and proper setting out of the work in relation to original points, lines and levels of references and for the correctness of the levels, dimensions and alignment of all parts of the work and for the provisions of all necessary instruments, appliances and labour in connection therewith. if at any time during the progress of the work any error appears or arises in the position of the levels, dimensions or alignment of any part of the work the contractor on being required to make good shall at his own expenses rectify such errors to the satisfaction of the architects / engineer in-charge, the checking of any line or level by the architects / engineer in-charge. shall not any way relieve the contractor of his responsibilities.

3.2 the contractor shall lay out one or more permanent bench marks in some central place before the start of the work, from which all important levels for the excavations will be set. the contractor shall provide all labour and materials for setting levels at his own cost.

3.3 these permanent bench mark shall consist of masonry pillars with top neatly plastered and horizontal as per the approval of the architect/ engineer in-charge. bench marks shall be well connected with gts or any other bench mark approved by architects / engineer in-charge.

4.0 EXCAVATION

4.1 excavation shall be carried out in any material met at the site to the lines, levels and contours shown on the detailed drawings and the contractor shall remove all excavated materials to soil heaps on site or transport for use as filling on the site or stack them for refuse as directed.

4.2 excavated material shall not be deposited within 1.5m from the top edge of the excavation or within a distance equal to the depth of excavation whichever is higher.

4.3 the sides of the excavation may be cut sloping or shored and strutted to hold the face of earth as per site requirements and as directed by the architect / engineer in-charge.

4.4 foundation pits shall not be excavated to the full depth unless construction is imminent. the last fifteen (15) cm depth of the excavation shall not be removed until concreting work is imminent. the full depth may at the discretion of the architects be excavated and the bed covered with a seventy five (75) mm (minimum) thick (or as indicated on drawing) layer of lean concrete or as specified in schedule of rates, after dewatering, if required and consolidating the bed.

4.5 the contractor shall provide suitable drainage arrangements to prevent surface water from any source, entering the foundation pits, at his own costs.

4.6 if the bottom of any excavation has been left exposed by the contractor and that in the opinion of the architects / engineer-in-charge, it has become badly affected by the atmosphere or by water, then the contractor shall remove such portions of the
deteriorated foundations material as the architects/ engineer in-charge may direct, and shall made good with lean concrete 1:5:10 mix (1 cement: 5 sand: 10 aggregate). all expenses for such additional concrete and excavation shall be borne by the contractor.

the cement used for making good the above shall be taken into account for reconciliation purposes only.

4.7 excavation made in excess of the depth required, the contractor shall at his own expenses, fill up to required level with lean concrete of mix 1:5:10 (1 cement: 5 coarse sand: 10 aggregate) or decided by architects / engineer in-charge.

4.8 the contractor at his own expenses without extra charges shall make provisions for pumping or bailing out rain water and / or sub-soil water accumulated in the excavated pit/trench.

4.9 pumping out water accumulated due to springs, tidal or river seepage, broken water mains or drains shall be paid separately against specific provision made for this purpose under the item of dewatering.

4.10 lowering of water table by well-point pumping and the like shall also be paid separately against specific provision made for this purpose in the schedule of rates.

4.11 the contractor shall make necessary arrangements for barricading, lighting and other suitable measures for protection against risk of accidents due to open excavation at his own expenses without any extra charges.

4.12 where the excavation is to be carried out below the foundation level of adjacent structure, the precautions to be taken such as under pinning, shoring and strutting etc. shall be determined by architects. no excavation shall be done unless such precautionary measures are carried out as per directions of the architects. the payment for such precautionary measures shall, however, be made separately unless the rates for such measures are specifically included in the rates for items of excavation.

4.13 loose or soft, bed ground encountered in excavation at the required depth shall, on architect's instructions, be excavated to a firm bed and the difference made up to the required level by methods described in 4.7 or as the architects may decide.

4.14 in case where during excavation side slips occur for reasons not attributable to contractor (e.g. side slips which take place on their own but not due to surcharge of earth kept near the edge of excavation, cracking of excavation top strata due to clay dry out leading to collapse of excavation sides) architects shall admit payment at his discretion.

4.15 any obstacle encountered during excavation shall be reported immediately to the engineer incharge and shall be dealt with as instructed by him. removal of buried piping or cables shall not be done without prior permission of the architects and contractor shall provide all measures to protect such lines. cost of such protective measures is deemed to be included in the rates for various items of excavation.

4.16 the contractor shall not undertake any concreting in foundation until the excavation pit is approved by the architects/ engineer incharge.

4.17 the specification for earth-work shall also apply to excavation in rock in general. the excavation in rock shall be done such that extra excavation beyond the required width and depth as shown in drawings is not made. if any extra excavations, particularly in depths are made by the contractor during the excavation operation, the contractor shall make up such extra excavations with concrete of mix 1:5:10 (1 cement, 5 coarse sand: 10 aggregate) to the required levels and shape at no extra cost to the owner.

5.0 EXCAVATION IN ROCK

5.1 The specification for earth work shall apply to excavation in rock in general. The cutting in rock shall either be by blasting or chiseling, wedging or any other method of the required width and depths as directed by the Architects. The measurement of rock when made from stacks which shall be made with the spoils shall be reduced by 50% for voids for payment as excavation. The rock spoil shall remain the property of the Employer. The stacks will be made by the contractor at his own cost and nothing extra shall be paid on this account.

5.2 Classification of Soils: If soils of any classification other than specified in the Schedule of Quantities is met with during excavation, no work shall be done until the decision of
the Architects as to the Classification of soil, level or the strata of different classification and their location is obtained in writing.
The materials to be excavated shall be classified as follows unless otherwise specified:-

a. Soft, Loose Soil:
   Such as vegetable or organic soil, turf, gravel, sand, silt, loam, clay, peat, etc. which yields to the ordinary application of pick and shovel, or the PHAWRA or other ordinary digging implements.

b. Hard Dense Soil:
   Such as stiff clay, gravel (smaller than 80mm in any direction) and cobbles (rock fragment usually rounded for semi rounded having maximum diameter between 80 to 30mm) which require the close application of picks or jumpers or scarifies to loosen.

c. Soft Disintegrated Rock:
   Rock or boulders, which do not require chiseling but can be quarried or split with crow bars such as laterite and hard conglomerate.

d. Hard Rock:
   Any rock or boulder which require chiseling.

Where levels for different soil strata cannot be clearly marked and defined the contractor shall stack different soils of various classifications separately for measurement purposes and then disposing off as directed.

NOTE: For excavation of rock no blasting shall be permitted.

The measurement from stacks in case where excavation is of soil, mixed with moorum and soft rock and where levels of various strata cannot be fixed, the total quantity shall be computed from the trench measurement of stacks after reducing by 1/7th and that of moorum stack measurement after reducing 1/13 shall be paid as excavation and deducted from the total quantity computed from trench measurement and the balance shall be accounted as ordinary earth or soil excavation.

5.3 PAYMENT

5.3.1 All measurements shall be carried out in accordance with FS-1200 (Part I)-1992 Payment for earthwork in excavation shall be made on Cubic Metre (M³) basis on the measurement of volume of pit/trench of excavation with working space as per IS: 1200 and slopes/steppings as permitted by the Architects. The rate shall include pumping and bailing out rain water and / or surface water accumulated in the excavated soil with a lead of 500m, unless otherwise specified in the schedule or items. The rate shall also include setting out and line work required for the excavation. Provision for shoring and strutting, disposal of soil as desired by Engineer in charge/ Architects are deemed to be included in the rates for excavation quoted by the contractor. However, in provision of shoring and strutting as required under clause 4.12 shall be paid extra.

5.3.2 Contractor shall intimate the Architects as soon as different classifications of soil are met with. Joint levels shall be taken as to the levels of different soil classification and volumes shall be worked out on the basis of levels only. Where levels of different strata cannot be clearly marked and defined, the contractor shall stack different soils of various classifications separately for measurement purpose and then dispose it off as directed. If soil of any classification other than that specified in the schedule of rates is met with during excavation the decision of the Architects/ Engineer In- Charge as to the classification of soil, levels of the strata of different classification and their location shall be binding.

In above case the total quantity of excavation shall be computed from the measurement of the pit/trench excavated. The hard rock and soft rock shall be measured separately from the relevant stacks and each shall be reduced by fifty per cent for voids and paid under the relevant items.

The balance that is the total quantity of excavation minus the reduced (for voids) quantity of excavation for rocks shall be paid as soil as per the discretion of the Architects.
However, the maximum payment shall be limited to the volume of the excavation pit/trench as approved by Architects / Engineer in charge.

5.3.3 Dewatering for rain water and surface water by pumping out shall be deemed to be included in the cost of excavation.

6.0 SHORING AND STRUTTING

6.1 The shoring and strutting of the sides to withhold the face of Excavation pits/trenches shall be done when approved or directed by the Architects / Engineer In- Charge.

6.2 The shoring shall be of closed or open timbering type depending upon the site requirements and as directed by the Architects / Engineer In- Charge, whose decision shall be final and binding as to the type of shoring to be used.

6.3 The decision and arrangement of the shoring and strutting shall be sound shall be got approved from the Architects before installation. The approval shall not absolve the contractor of his responsibilities of safety and any other requirements of the contract.

6.4 The shoring and strutting shall be kept in position till all the relevant work in the excavation is completed and approved. It shall be dismantled and removed only after the permission to do so is obtained.

6.5 PAYMENT

Payment for shoring and strutting by closed and open timbering shall be deemed to be included in excavation except for arrangements as specified under clause 4.12. The rate shall include all labour, materials, erection of the poling boards, wales, ballies etc. keeping the same in position as required and dismantling and removing the same after the work is over, as directed.

7.0 BACK FILLING AROUND FOUNDATIONS AND PLINTH AND TRENCHES.

7.1 Back filling around completed foundations shall be done to the lines and levels shown on the drawings including any trimming of the surfaces, as may be necessary. This will be done with selected and approved earth from excavation or otherwise with the materials as directed by the Architects. Where sufficient suitable material is not available from the excavation, the Architects may direct to import suitable earth from different sources. The refilling shall be done in horizontal layers of thickness not exceeding 15cm free from pockets with careful watering, ramming and rolling etc. to obtain 90% or as specified in schedule of rates of dry density.

7.2 The contractor shall not fill around any work, until it has been approved by the Architects / Engineer In- Charge.

7.3 Back filling around liquid retaining structures and pipes shall be done only after testing of structures against leakage is done and approval of Architects is taken.

7.4 PAYMENT

Payment for backfilling with earth shall be based on volume of consolidated fill. This volume shall be derived from the difference between the volume of excavation and the structure of trenches as the case may be. The rate shall include cost of extracting suitable approved earth from excavated soil, carriage up to 100M lead, placing, watering, compacting in layers trimming and dressing finished surface. However, back filling done with materials other than earth shall be paid separately under relevant.

8. TRANSPORTATION OF EARTH

8.1 Surplus soil shall be property of the contractor and he may dispose it off any place that he desires provided the same is not objectionable to the civic / municipal authorities.

8.2 PAYMENT
8.2.1 The rates for excavation also includes for disposal of surplus soil to any distance / destination that the contractor desires and there is no objection to the civic / municipal authorities.
CHAPTER 3

STANDARD TRADE SPECIFICATION FOR

PLAIN & REINFORCED CEMENT CONCRETE
1.0 GENERAL

1.1 SCOPE
This specification establishes the materials, mixing, placing, curing etc. of all types of cast in situ, pre-cast concrete used in foundations, underground and over ground structures, floors etc. Any special requirements as shown or noted on the drawing shall govern over the provisions of this specification.

1.2 CODES
All design and construction shall be performed in accordance with the Indian Standard Code of practice for “Plain and Reinforced Concrete” IS: 456 (2000) and other relevant codes mentioned therein.

2.0 GRADE OF CONCRETE
Unless otherwise specified on drawings or called for in the schedule of rates, the grades of concrete shall generally be selected from table No. 1

<table>
<thead>
<tr>
<th>Grade Designation</th>
<th>Specified characteristic compressive strength of 15 cm. Cube at 28 days (for work cubes only) N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-15</td>
<td>15</td>
</tr>
<tr>
<td>M-20</td>
<td>20</td>
</tr>
<tr>
<td>M-25</td>
<td>25</td>
</tr>
<tr>
<td>M-30</td>
<td>30</td>
</tr>
<tr>
<td>M-35</td>
<td>35</td>
</tr>
</tbody>
</table>

The characteristics strength is defined as the strength of material below which not more than five (5) per cent of the test results are expected to fall.

3.0 TYPE OF CONCRETE MIX

3.1 The concrete shall be either nominal mix concrete or design mix concrete as defined in IS:456(2000) unless otherwise specified or given in schedule of rates. All lean and structural concrete shall be nominal mix and design mix types respectively.

3.2 Nominal Mix-Concrete
This concrete shall be made without preliminary tests by adopting nominal concrete mix specified in volumetric mix and the aggregates shall be measured by Volume, Cement by weight, mixing water shall be measured in graduated litre cans. All the relevant requirements for this concrete as given in IS:456(2000) shall apply.

3.3 Design Mix Concrete
The mix shall be designed to produce the grade of concrete having the required workability and characteristics strength not less than the appropriate values given in Table-1. The contractor shall design mixes for each class of concrete indicating that the concrete ingredients and proportions will result in concrete mix meeting requirements specified. The mix shall generally be designed in accordance with IS:10262 and SP:23. The contractor shall submit the mix design report from all approved laboratory for the approval of the Architect within 35 days from the letter of intent. No concreting shall commence without the approval of the Architect.

4.0 PROPORTIONING OF CONCRETE
Proportioning, as used in this specification, shall mean the process of determining the proportions of the various ingredients to be used to produce concrete of the required strength, workability, durability and other proportions. The Architects shall verify the strength of the concrete mix, before giving his sanctions of its use. However, this does not absolve the contractor of his responsibility as regards achieving the prescribed strength of the mix. If during the execution of the work cube tests show lower strengths than the required one, the Architects shall order fresh trial mixes to be made by the contractor. No claim to alter the rates of concrete work shall be entertained due to such changes in mix variations. Any variation in cement consumption shall be taken into
consideration for material reconciliation. Preliminary mix designs should be established well ahead of start of work.

4.1 Maximum Density
Suitable proportions of sand and the several sizes of coarse aggregates for each grade of concrete shall be selected to give as nearly as practicable the maximum density. This is to be determined by mathematical means, laboratory tests, field trials and suitable changes in aggregate gradation.

4.2 Proportioning by W/C Ratio
Once a mix including its w/c ratio, has been determined and specified for use by the Architects then w/c ratio shall be maintained. The contractor will determine the water content of the aggregate frequently as the work progresses and the amount of mixing water entered at the mixer shall be changed as directed by the Architects so as to maintain the specified w/c ratio.

4.3 Consistency
The concrete shall have a consistency such that it will be workable in the required position. It shall be of such consistency that when properly vibrated it will flow around reinforcing steel and embedded parts.

4.4 Slump
The slump for concrete as given in IS 456 (2000) and as determined by slump tests as per IS: 1199 shall not exceed maximum slump as indicated in Table-2 below:

<table>
<thead>
<tr>
<th>Degree of Workability</th>
<th>Slump in mm</th>
<th>Type of construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Medium</td>
<td>40-80</td>
<td>Reinforced foundation walls and footings</td>
</tr>
<tr>
<td>2. Medium</td>
<td>25-75</td>
<td>Plain footings, substructure walls etc.</td>
</tr>
<tr>
<td>3. Medium</td>
<td>50-100</td>
<td>Reinforced Beams, Columns, Walls etc.</td>
</tr>
</tbody>
</table>

The concrete, mix proportions so chosen, should be such that the concrete is of adequate workability for the placing condition of the concrete and can be properly compacted with the means available for workability of concrete.

The contractor shall not place concrete having a slump outside the limits specified without the approval of the Architects / Engineer in-Charge.

5.0 BATCHING
In proportioning concrete, the quantity of both cement and aggregate should be determined by weight. Where the weight of cement is determined on the basis of weight of cement per bag, a reasonable number of bags should be weighed periodically to check the net weight. Where the cement is weighed at the site and not in bags it should be weighed periodically to check the net weight. Where the cement is weighed at the site and not in bags, it should be weighed separately from the aggregates. Water should be either measured by volume in calibrated tanks or weighed. Any solid admixture that may be added, may be measured by weight; liquid and paste admixtures by volume or weight. Batching plant where used should conform to IS:4925-1968. All measuring equipment should be maintained in a clean serviceable condition, and their accuracy periodically checked.

5.1 Except where it can be shown to the satisfaction of the Architects that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by the obtaining the coarse aggregate in different sizes stacked in separate stock piles. The grading of coarse and fine aggregate should be checked frequently for a given job being determined by the Architects / Engineer Incharge to ensure that the specified grading is maintained.

5.2 Under special circumstances, change from weight batching to volume may be permitted by Architects on specific request from the contractor. However this shall be rarely exercised.

5.3 The amount of the added water shall be adjusted to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregate, IS:2386 (Part-III) may be referred to. To allow for the variation in weight of aggregate due to variation in their moisture contents, suitable adjustments in the weights of aggregate shall also be made. In the absence of exact data, only in the case of nominal mixes, the amount of surface water may be estimated from the values given in Table-3 below.
Table-3

<table>
<thead>
<tr>
<th>Surface Water Carried by Aggregate</th>
<th>Approximate Qty. of per cent by Mass</th>
<th>Surface water Litre/M³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Wet Sand</td>
<td>7.5</td>
<td>120</td>
</tr>
<tr>
<td>Moderately Wet Sand</td>
<td>5.0</td>
<td>80</td>
</tr>
<tr>
<td>Moist Sand</td>
<td>2.5</td>
<td>40</td>
</tr>
<tr>
<td>Moist Gravel or Crushed Rock</td>
<td>1.25 – 2.5</td>
<td>20-40</td>
</tr>
</tbody>
</table>

5.4 No substitutions in materials used on the work or alterations in the established proportions except as permitted in 5.2 and 5.3 shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

6.0 CONCRETE MIXING

6.1 The mixing of concrete shall be strictly carried out in an approved type of mechanical concrete mixer. The mixer equipment shall be capable of combining the aggregates, cement and water within the specified time into a thoroughly mixed and uniform mass and of discharging the mixer without separation. The entire batch shall be discharged before recharging. Mixing periods shall be measured from the time when all of the solid materials are in the mixing water drum provided that all of mixing water shall be introduced before one fourth of the mixing time has elapsed.

6.2 Mixer

6.2.1 Mixers may be stationary mixers of either the tilting or non-tilting type, or truck, mixers of approved design. The mixers shall be maintained in satisfactory operating condition and mixer drums shall be kept free of hardened concrete. Mixer blades shall be replaced when worn down more than ten percent (10%) of their depth. Should any mixer at any time produce unsatisfactory results, leak mortar or cause wastage of materials, its use shall be promptly discontinued until it is repaired.

6.2.2 Mixing Time

Mixing time shall be as indicated in following table. Excessive mixing requiring additions of water will not be permitted. Time shall start when all solid materials before one fourth of the mixing time has elapsed. The Architects / Engineer Incharge may, however, direct change in mixing time, if he in his opinion considers such change necessary.

<table>
<thead>
<tr>
<th>Capacity of Mixer</th>
<th>Min. Mixing Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 CuM or Less</td>
<td>1½ Minutes</td>
</tr>
<tr>
<td>2-3 Cu.M</td>
<td>2½ Minutes</td>
</tr>
<tr>
<td>4 Cu.M</td>
<td>3 Minutes</td>
</tr>
</tbody>
</table>

Stationary mixers shall be provided with a suitable device to lock the discharge mechanism until the required mixing time has elapsed. Provision shall also be made to ensure that each batch is discharged completely before the mixer is recharged. The complete plant assembly shall include provisions to facilitate the inspection at all times. All records and charts for the batching and mixing operations shall be prepared as specified herein and as per the instructions of the Architects and promptly turned over to the Architects.

6.3 Admixtures

Admixtures such as CICO Grade – 1 or Puddlo or equivalent may be used in concrete only with the approval of Engineer in Charge / Architects.

6.4 Hand Mixing

Normally, hand mixing of concrete shall not be permitted. However, this may be allowed by the Architects in special cases (such as far away, isolated places). Ten per cent
(10%) extra cement shall have to be added to the normal mixes when mixed by hand. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. No extra payment shall be made to the contractor for mixing by hand or for using extra cement due to hand mixing. However, cement consumed extra shall be considered for reconciliation purposes.

6.5 READY MIX CONCRETE FROM RMC PRODUCER

a. The contractor shall be allowed to arrange Ready Mix Concrete (RMC) from the RMC producing plants (located within a distance of 50 km from the site of work) supplying concrete in Delhi.

b. The contractor shall, within 15 days of award of the work, submit list of at least three RMC producers of repute along with details of such plants including details and number of transit mixers and pumps etc. to be deployed indicating name of owner/ company, its location, capacity, technical establishment, past experience and text of MOU proposed to be entered between purchaser (the contractor) and supplier (RMC producer) to the Architect/Engineer in – Charge. Architect/Engineer in-Charge shall give approval in writing (subject to drawl of MOU) failing which the contractor shall give other RMC producers of repute along with required details for approval of Architect/Engineer in-Charge. The contractor shall draw the MOU with approved RMC producer and submit to Architect/Engineer in-Charge within a week of such approval. The contractor will not be allowed to use ready mixed concrete without completion of above stated formalities.

c. Notwithstanding the approval granted by Architect/Engineer-in-Charge in aforesaid manner or provisions in CPWD specification 2002, the contractor shall be fully responsible for quality of concrete including input control, transportation and placement etc. The contractor shall also arrange to submit mix design reports for RMC concrete from an approved laboratory before the use is permitted by the Architect / Engineer in- Charge.

d. For all purposes the contractor shall carry out fully, responsibilities of the “placement contractor” and “manufacturer of concrete”.

e. The Architect/Engineer in-Charge shall reserve the right to inspect at any such stage and reject the concrete if he is not satisfied about quality of product and the user’s end.

f. The Architect/Engineer in-Charge reserves the right to exercise control over the:

   (i) Ingredients, water and admixtures purchased, stored and to be used in the concrete including conducting of tests for checking quality of materials, recordings of test results and declaring the materials fit or unfit for use in production of mix.

   (ii) Calibration check of the RMC plant.

   (iii) Weight and quantity check on the ingredients, water and admixtures added for batch mixing.

   (iv) Time of mixing of concrete.

   (v) Testing of fresh concrete, recordings of results and declaring the mix fit or unfit for use. This will include continuous control on the workability during production and taking corrective action, if required.

   (vi) For exercising such control, the Architect/Engineer in-Charge shall periodically depute his authorized representative at the RMC plant. It shall be the responsibility of the contractor to ensure that all necessary equipment, manpower and facilities are made available to Architect/Engineer in-charge and/ or his authorized representative at the RMC plant.

g. The contractor should therefore draw MOU/agreement with RMC producer very carefully keeping in view all terms and conditions/ specifications forming part of this tender document.
h. All required relevant records of RMC shall be made available to the Architect/Engineer in Charge or his authorized representative. The Architect/Engineer in-Charge shall, as required, specify guidelines and additional procedures for quality control and other parameters in respect of materials, production and transportation of concrete mix which shall be binding on the contractor and the RMC plant. Only concrete as approved in design mix by Architect/Engineer in Charge shall be produced in RMC plant and transported to site.

i. 43 grade OPC (Conforming to IS - 8112) of brand/make/source as approved by the Architect/Engineer in-Charge shall only be used for production of concrete.

6.6 Minimum Cement Content: From the point of view of durability, the minimum cement content for various grade of concrete shall be as under

<table>
<thead>
<tr>
<th>S. No</th>
<th>GRADE OF CONCRETE</th>
<th>MINIMUM QUANTITY OF CEMENT PER CUBIC METER OF CONCRETE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M20 and Below</td>
<td>360 Kg</td>
</tr>
<tr>
<td>2</td>
<td>M25 and Above</td>
<td>400 Kg</td>
</tr>
</tbody>
</table>

7.0 PLACING AND COMPACTION OF CONCRETE

7.1 Architect/Engineer's approval for equipment & methods
Before any concrete is placed, the entire placing programme consisting of equipment, layout, proposed procedures and methods shall be submitted in writing to the Architect/Engineer in-Charge 24 hrs. prior to concreting for approval and no concrete shall be placed until his approval has been received. Architects approval for pouring concrete shall be taken as conveyed when the concrete pour card is signed.

7.2 Transportation before Placing
All concrete shall be conveyed from the mixer to the place of final deposit in suitable buckets, dumpers, containers or conveyors which shall be mortar leak tight. During hot or cold weather, concrete shall be transported in deep containers. Other suitable methods to reduce the loss of water by evaporating in hot weather and heat loss in cold weather may also be adopted.

The concrete shall be deposited nearly as practicable in its final position to avoid handling again and again. Concrete shall be placed and compacted in its final position within the initial setting time for the particular cement used or as directed by the Architect/Engineer in-Charge after the addition of water to the cement and aggregate. In hot weather or conditions that contribute to quick stiffening of the concrete, maximum allowable time may be reduced by the Architects.

Concrete that has been left standing and which has become stiffened so that it cannot be placed in satisfactory conditions shall not be deposited in the work.

All equipment used for transporting and placing of concrete shall be maintained in clean condition. All buckets, hoppers, chutes, dumpers and other equipments shall be thoroughly cleaned after each period of placement.

7.3 Placing

7.3.1 The concrete shall in no case be dropped from a height of over 1.5M and it shall be carefully laid in position. Before depositing the concrete, all debris and dirt shall be removed from the space to be occupied by the concrete. Concreting shall not be done unless the form work conforms to the shape, lines and dimensions as shown in the drawings. The form work shall be sufficiently rigid. During the placing and compaction of
concrete, care shall be taken to ensure that there is no loss of liquid from concrete and no segregation of aggregates takes places.

7.3.2 To ensure bond and water tightness between old concrete surface and the concrete to be placed, the surface should be cleaned and roughened by "initial green cut" by wire brushing or chipping. The initial green cutting may be done after 6 hours of placing concrete in order to facilitate the work. Before plastering, the surface shall be thoroughly hacked. The bonding of old and new concrete should be done by applying the cement slurry after thorough watering of the old concrete surface and removing all free particles.

7.3.3 Unless otherwise approved, concrete shall be placed in single operation to the full thickness of slabs, beams and similar members and shall be placed in horizontal layers not exceeding 0.5M deep in walls, columns and similar members. Concrete shall be placed continuously until completion of the part of the work between construction joints as directed by architects/engineer in-charge.

7.4 Items embedded in Concrete

7.4.1 Concreting shall not be started unless the electrical conduits or any other piping wherever required are laid by the concerned agency. The civil contractor shall afford all the facilities and maintain co-ordination of work with other agencies engaged in electrical, plumbing and such other work as directed by the Architects.

7.4.2 Before concreting, the contractor shall provide, fabricate and lay in proper position all metal inserts, anchor bolts, pipe etc. (which are required to be embedded in concrete members) as per relevant drawings and directions of Architects/Engineer in-Charge.

7.4.3 The control of placing shall begin at the mixer discharge. Concrete shall be discharged by the vertical drop into the middle of the bucket dumper or hopper and this principle of vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in form struts, stays and braces serving temporarily to hold the forms in correct shape and alignment, pending the placing of concrete at their locations, shall be removed when the concrete placing has reached an elevation rendering their service unnecessary. These temporary members shall be entirely removed from forms and not buried in the concrete.

7.5 Chuting

Concrete shall be placed so as to avoid segregation of the materials and the displacement of the reinforcement and embedment. The use of long troughs, chutes and pipes for conveying concrete from the mixer to the forms shall be permitted only on written authorization from the Architects/Engineer in-Charge. In case an inferior quality of concrete is produced by the use of such conveyors, the Architects / Engineer in-Charge may order discontinuance of their use and the substitution of a satisfactory method of placing. Open troughs and chutes shall be equipped with baffles or be in short lengths that reverse the directions of movement. The addition of water at any point in the system of transportation, to facilitate the movement of concrete shall not be permitted. All chutes, troughs and pipes shall be kept clean and free from coatings of hardened concrete by thoroughly flushing them with water after each run; water used for flushing shall be discharged clear of the structure. Concrete shall neither be permitted to fall freely from a height of more than 1.5M nor to strike the forms at an angle. Where drop chutes are used, sufficient numbers must be provided so that the concrete discharged from the chute is not required to flow laterally more than 1.0M. Where a drop chute is swung from the vertical, the bottom two sections must be maintained in a vertical position to avoid segregation.

7.6 Preparation of Earth and Clean-up

All soil surfaces upon which or against which concrete is to be placed shall be well compacted and free from standing water, mud or debris. Soft or yielding soil shall be
removed and replaced, with concrete or selected soils and compacted to the same
density as directed by Architects/Engineer in-Charge. The surface of absorptive soil
against which concrete is to be placed shall be moistened thoroughly so that moisture
will not be drawn from the freshly placed concrete.

Concrete shall not be placed until the forms, the cleaning of rock or concrete surfaces,
and the placement of reinforcing steel and embedded parts have been inspected and
approved by the Architects/Engineer. Storm water or water from the concrete which may
accumulate on the surface of the bedding layer shall be removed by suitable means
before start of placement. No concrete shall be placed on a water covered surface.

7.7 Bonding Mortar
Immediately before concrete placement, the areas of prepared rock surfaces or
previously placed concrete which will be in contact with the concrete to be placed shall
be covered with a bonding mortar or grout. The bonding medium shall have the same
cement sand content as the concrete which will be placed on it. The water cement ratio
shall be determined by conditions of place to be concreted and as approved by the
Architects/Engineer in-Charge.

7.8 Thickness of Layers
Concrete shall be placed in successive horizontal layers ranging in thickness not
exceeding 500mm or as directed by the Architects. The bucket loads, or other deposit
shall be spotted progressively along the face of layer with such overlap as will facilitate
spreading the layer of uniform depth and texture with a minimum of hand shoveling. Any
tendency to segregation shall be corrected by shoveling stones into mortar rather than
mortar on the stones. Such a condition shall be corrected by redesign of mix. Change in
process or other means, as directed by the Architects.

7.9 Bedding planes shall be approximately horizontal.

7.10 Each layer of concrete shall be thoroughly compacted and fully worked around the
reinforcement, around embedded fixtures and into corners of the form work with suitable
type of equipment until the concrete has been consolidated to the maximum practicable
density.

7.11 Type of Vibrators
Concrete shall be compacted with mechanical vibrating equipment supplemented, if
necessary to obtain consolidation by hand spading and tamping. The vibrators shall be
the internal or immersion type high frequency vibrators with speeds of not less than 700
r.p.m. when immersed in the concrete. Vibrators shall be used in sufficient number of
units and power to properly consolidate the concrete.

Internal vibrators shall be inserted in a vertical position at intervals of about 600mm,
depending upon the mix the equipment used, and continued experience on work. The
vibrators shall be withdrawn slowly. The spacing shall provide some overlapping of the
area vibrated at each insertion. In no case shall vibrators be used to transport concrete
inside the forms. Over vibration shall not be permitted. Hand tamping in some cases may
be allowed subject to the approval of the Architects.

In placing concrete in layers which are advancing horizontally as the work progresses,
great care shall be exercised to ensure adequate vibration, bonding and moulding of the
concrete between the succeeding batches. The vibrator shall penetrate the layer being
placed and also penetrate the layer below while the under layer is still plastic to ensure
good bond and homogeneity between the two layers and prevent the formation of cold
joints. The use of form attached vibrators shall not be permitted without specific
authorization of the Architects. Care shall be taken to prevent contact of vibrators
against reinforcement steel. Vibrators shall not be allowed to come in contact with forms
of finished surfaces. The use of surface vibrators will not be permitted for consolidation of
concrete under ordinary conditions. However, for thin slabs surface vibration by specially
designed vibrators may be permitted, upon approval of the Architects / Engineer in-Charge.

7.12 Stone pockets and Mortar Bondages

The formation of stone pockets or mortar bondage in corners and against face forms shall be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for through bonding as directed by the Architects/ Engineer in-Charge. Concrete that is of excessive slump, segregate or unworkable shall not be placed in the forms or if placed, shall be removed as directed by the Architects/ Engineer in-Charge.

8.0 CONSTRUCTION JOINTS AND KEYS

When the work is to be interrupted, horizontal and vertical construction joints and bonding keys shall be located and shall conform in details to the requirements of the plans unless otherwise directed by the Architects/ Engineer in-Charge. Construction joints shall be provided in position as shown or described on the drawings. Where it is not described the joints shall be in accordance with the following.

In a column, the joint shall be formed about 75mm below the lowest soffit of the beams framing into it. Concrete in a beam shall be placed throughout without a joint but if the provision of a joint is unavoidable, the joint shall be vertical and at the middle of the span. Before fresh concrete is placed, the cement skin of any loose or porous material of partially hardened concrete shall be thoroughly removed and cut back until the solid face is exposed and surface made rough by backing or any other method as directed by the Architects. The rough surface shall be dried and coated with 1:1 freshly mixed cement sand slurry immediately before placing the new concrete. Special care shall be taken to see that the first layer of concrete placed after a construction joint is thoroughly rammed against the existing layer, before the slurry sets.

9.0 TREATMENT ON SUSPENSION OF WORK

9.1 When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean and thoroughly wetted. For vertical joints neat cement slurry shall be applied on the surface before it is dry. For horizontal joints the surface shall be covered with a layer of mortar about 10 to 15mm thick composed of cement sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing the concrete.

9.2 Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surface, a layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work, particular attention being paid to corners and close spots, work thereafter shall proceed in normal way.

10.0 SEPARATION JOINT

Separation Joint shall be obtained by using a tough polythene sheet 1mm thick or equivalent as approved by Architects stuck on the surface against which concrete will be placed. Adequate care should be taken to cause no damage to the sheet.

11.0 EXPANSION JOINTS

Permanent expansion joints in structures shall be formed in the position and to the shapes shown in the relevant drawings. When joints are to be filled with joint filling
material as stipulated in the drawings the permanently exposed edges of joints shall be sealed with an approved sealing compound.

12.0 WATER STOPS

The water stops shall be G.I. or PVC as called on drawings. In case of G.I. they shall be fabricated as per drawings. The water stops shall be located and embedded at expansion / construction joints as indicated in the drawings and as per manufacturer's recommendations. Water stops shall be accurately cut, fitted and integrally joined at sectional joints and angular junctions to provide a continuous, watertight diaphragm at all points as per manufacturer's specifications.

Adequate provisions shall be made for the support and protection of water stops during the progress of the work. Damaged stops shall be replaced and/or repaired as required.

The contractor shall be responsible for getting the water stop material approved from the Architects prior to fabricating or obtaining it for incorporation in the concrete.

13.0 WASH WATER

Wash water shall be removed in a manner to prevent running down and staining of concrete surface which will be exposed at the completion of work. Should wash water streaks develop on the exposed surfaces, they shall be removed to a uniform colour and texture as approved by the Architect/Engineer in-Charge.

14.0 CURING

14.1 Curing of concrete shall be in accordance with IS: 456(2000). Concrete shall be cured by keeping it moist for the period of time specified herein to ensure that complete hydration and hardening take place.

All concrete shall be cured by use of water which shall be continuously (not periodically) maintained on all exposed surfaces.

Curing shall be assured by use of an ample water supply under pressure in pipes with all necessary appliances of hose, sprinklers and spraying devices. Continuous fine-mist spraying or sprinkling shall be used, unless otherwise specified or approved by the Architects/Engineer.

Whenever, in the judgment of the Architects or Engineer in-Charge it may be necessary that continuous spray method may be omitted and a covering or other approved material such as burlap which will hold moisture for long periods and prevent loss of moisture from the concrete shall be used. Type of covering which would stain, disfigure or damage the concrete during and after the curing period will not be used. Only approved covering shall be used and approved be kept continuously wet during the specified curing period.

Concrete shall be maintained in moist condition for at least the first 7 days after placing except that high early strength concrete shall so be maintained for at least the first 3 days. Other curing period may be used with the permission of the Architects/Engineer in-Charge, if the specified strength is obtained.

The contractor shall have all equipment and materials required for curing on hand and ready to use before concrete is placed.

For curing of concrete in pavements, side walls, floors, flat roofs or other level surface, the ponding method of curing is preferred. The method of containing the ponded water shall be approved by the Architect/Engineer in-Charge. Special attention shall be given to edge and corners of the slabs to ensure complete and proper protection to those
areas. The ponded areas shall be kept continuously filled with water and leaks shall be promptly repaired.

14.2 Commencement of Curing

Curing of concrete shall start after 8 hours of placement and in hot weather within 4 hours of placement for exposed face. During the first 24 hours, the concrete shall be cured by use of wet burlap or such other means to cover the concrete surfaces. In very hot weather precaution shall be taken to see that the temperature of wet concrete does not exceed 38 deg. C while placing. Newly placed concrete shall be protected by approved means from rain, sun and wind. Concrete placed below the ground level shall be protected from falling earth during and after placing, surfaces shall be kept free from contact with such ground or with water draining from such ground during placing of concrete for a period of at least 3 days unless otherwise directed by the Architects. The ground water around newly poured concrete shall be kept to an approved level by pumping or other approved means of drainage and adequate steps shall be taken to prevent floatation and flooding. Steps shall be taken to protect immature concrete from damage by debris, loading, vibration, abrasion, mixing with deleterious materials that may in the opinion of the Architects/ Engineer in-Charge impair the strength and/or durability of the concrete.

Approved curing compounds may be used in lieu of moist curing with the permission of Architects/ Engineer in-Charge. Such compounds shall be applicable to all exposed surfaces of the concrete as soon as possible after the concrete has set.

15.0 FIELD TESTS

15.1 Grading Test
Grading test on coarse and fine aggregates shall be carried out at intervals specified by the Architects/ Engineer in-Charge.

15.2 Slump Test of Concrete
At least one slump test shall be made for every compressive strength test carried out. More frequent test shall be made if there is a distinct change in work conditions, or if required by the Architects/ Engineer in-Charge.

15.3 Strength Test of Concrete
15.3.1 Samples from fresh concrete shall be taken as per IS:1199 and cubes shall be made, cured and tested at 7 & 28 days in accordance with IS:516.

In order to get a relatively quicker idea of the quality of concrete, optional tests on beams for modules of rupture at \( 72 \pm 2 \) hours or, at 7 days, or compressive strength test at 7 days may be carried out in addition to 28 days compressive strength tests. For this purpose, the values given in Table-4 may be taken for general guidance in the case of concrete made with ordinary portland cement. In all cases, the 28 days compressive strength specified in Table-I shall alone be the criterion for acceptance or rejection of the concrete, if, however, from tests carried out in a particular work over a reasonably long period, it has been established to the satisfaction of Architects/ Engineer in-Charge that a suitable ratio between 28 days compressive strength and the modulus of rupture at \( 72 \pm 2 \) hours or compressive strength at 7 days may be accepted. The Architects/ Engineer in-Charge may suitably relax the frequency of 28 days compressive strength specified in CI.15.3.4 provided the expected strength values at the specified early age are consistently met.
Table-4

OPTIONAL TESTS REQUIREMENT OF CONCRETE

<table>
<thead>
<tr>
<th>Grade of Concrete</th>
<th>Compressive Strength on 15cm. Cubes Min. at 7 days</th>
<th>Modulus of Rupture by Beam Tests, Minimum at 72+2 hr</th>
<th>Modulus of Rupture by Beam Tests, Minimum at 7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/mm²</td>
<td>N/mm²</td>
<td>N/mm²</td>
</tr>
<tr>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
</tr>
<tr>
<td>M-10</td>
<td>7.0</td>
<td>1.2</td>
<td>1.7</td>
</tr>
<tr>
<td>M-15</td>
<td>10.0</td>
<td>1.5</td>
<td>2.1</td>
</tr>
<tr>
<td>M-20</td>
<td>13.5</td>
<td>1.7</td>
<td>2.4</td>
</tr>
<tr>
<td>M-25</td>
<td>17.0</td>
<td>1.9</td>
<td>2.7</td>
</tr>
<tr>
<td>M-30</td>
<td>20.0</td>
<td>2.1</td>
<td>3.0</td>
</tr>
</tbody>
</table>

15.3.2 Procedure-A random sampling procedure shall be adopted to ensure that each concrete batch shall have reasonable chance of being tested. The sampling should be spread over the entire period of concreting and cover all mixing units.

15.3.3 Frequency of sampling – The minimum frequency of sampling of concrete for each grade shall be in accordance of the following:

<table>
<thead>
<tr>
<th>Quantity of Concrete in the Work M³</th>
<th>Number of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-5</td>
<td>1</td>
</tr>
<tr>
<td>6-15</td>
<td>2</td>
</tr>
<tr>
<td>16-30</td>
<td>3</td>
</tr>
<tr>
<td>31-50</td>
<td>4</td>
</tr>
<tr>
<td>51 and above</td>
<td>4</td>
</tr>
<tr>
<td>Plus one additional sample for each additional 50M³ or part thereof.</td>
<td></td>
</tr>
</tbody>
</table>

15.3.4 Test specimen-three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for various purposes such as to determine the strength of concrete at 7 days or at the time of striking the form work or to determine the duration of curing or to check the testing error. Additional cubes may also be required for testing cubes cured by accelerated methods as described in IS:9013. The specimen shall be tested as described in IS:516.

15.3.5 Test Strength of Sample – The test strength of the sample shall be the average of the strength of three specimens. The individual variation should not be more than ±15 per cent of the average.

15.3.6 Standard Deviation

Standard Deviation based on Test Results:

(a) Number of Test Result – The total number of test results required to constitute an acceptable record of standard deviation shall be not less than 30. Attempts should be made to obtain the 30 test results as early as possible when a mix is used for the first time.

(b) Standard deviations: Calculation of standard deviation shall be brought up to date after every change of mix design and at least once a month.
Determination of Standard Deviation

(a) Concrete of each grade shall be analyzed separately to determine its standard deviation.

(b) The standard deviation of concrete of a given grade shall be calculated using the following formula from the results of individual tests of concrete of that grade obtained as specified in 15.3.4.

\[
\text{Estimated standard deviation} = \sqrt{\frac{\Delta^2}{n-1}}
\]

Where \( \Delta \) = deviation of the individual test strength from the average strength on \( n \) samples.
And \( n \) = number of sample test results.

(c) When significant changes are made in the production of concrete batches (for example changes in the materials used, mix design, equipment or technical control), the standard deviation values shall be separately calculated for such batches of concrete.

Assumed Standard Deviation – Where sufficient test results for a particular grade of concrete are not available, the value of standard deviation given in Table 5 may be assumed.

**TABLE-5**

**Assumed Standard Deviation**

<table>
<thead>
<tr>
<th>Grade of Concrete</th>
<th>Assumed Standard Deviation</th>
<th>N/mm²</th>
</tr>
</thead>
<tbody>
<tr>
<td>M-10</td>
<td>2-3</td>
<td></td>
</tr>
<tr>
<td>M-15</td>
<td>3-5</td>
<td></td>
</tr>
<tr>
<td>M-20</td>
<td>4.6</td>
<td></td>
</tr>
<tr>
<td>M-25</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>M-30</td>
<td>6.0</td>
<td></td>
</tr>
</tbody>
</table>

However, when adequate past records for a similar grade exist and justify to the designer a value of standard deviation different from that shown in Table – 5, it shall be permissible to use that value.

15.3.7 Acceptance Criteria

The concrete shall be deemed to comply with the strength requirements if:

(a) Every sample has test strength not less than the characteristic value: or

(b) The strength of one or more samples though less than the characteristic value, is in each case not less than the greater of:

(1) the characteristics strength minus 1.35 times the standard deviation and

(2) 0.80 times the characteristic strength and the average strength of all the samples is not less than the characteristics strength plus

\[
\left\{ 1.65 - \frac{1.65}{\text{No. of Samples}} \right\} \times \text{standard deviation}
\]

- 64 -
15.3.7.2 The concrete shall be deemed not to comply with the strength requirements if:

(a) The strength of any sample is less than the greater of:

1. The characteristic strength minus 1.35 times the standard deviation and
2. 0.80 times the characteristic strength.

(b) The average strength of all the samples is less than the characteristic strength plus
\[
\frac{3}{1.65 - \sqrt{\text{No. of Samples}}}
\]

If the concrete is deemed not to comply pursuant to 15.3.7.2, the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately.

Concrete shall be assessed daily for compliance.

Concrete is liable to be rejected if it is porous or honey-combed, its placing has been interrupted without providing a proper construction joint; the reinforcement has been displaced beyond the tolerances specified or construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Architects/Engineer in-Charge.

15.3.7.3 Concrete is liable to be rejected under following conditions:

1. The work site made concrete test-cube failing to attain the specified strength.
2. Suspected overloading during construction of the structure under review.
3. Shuttering being prematurely removed and not as per the specifications.
4. The concrete being improperly cured.
5. There being a reasonable doubt by the Architects/Engineer as to the adequacy of the strength of the structure.

If the results of the load test be unsatisfactory, the Architects may instruct the contractor to demolish and reconstruct the structure or part thereof at the contractor’s cost.

15.3.7.4 The load test of structures shall be carried out as given below:

Load test should be carried out as soon as possible after expiry of 28 days from the time of placing of concrete.

The structure should be subjected to a load equal to full dead load of the structure plus 1.25 times the imposed load for a period of 24 hours and then the imposed load shall be removed.

The deflection due to imposed load only shall be recorded. If within 24 hours of removal of the imposed load, the structure does not recover at least 75 per cent of deflection under super imposed load, the test may be repeated after a lapse of 72 hours. Structure shall be deemed to be unacceptable:

If the maximum deflection in mm, shown during 24 hours under load is less than \(40\times l^2/D\), where \(l\) is the effective span in m, and \(D\) the overall depth of the section in mm, it is not necessary for the recovery to be measured and the recovery provisions, given above will not apply.
TENDER DOCUMENT FOR AMPHITHEATRE AT RAMJAS COLLEGE

Other non-destructive test methods may be adopted, in which case the acceptance criteria shall be agreed upon between the Architects and the contractor and the tests shall be done under expert guidance.

16.0 FINISHING OF CONCRETE

16.1 On striking the form work, all blow holes and honey-combing observed shall be brought to the notice of the Architects/Engineer in-Charge. The Architects may at his discretion allow such honey combing or blowholes to be rectified by necessary chipping and packing or grouting with concrete or cement mortar. If mortar is used, it shall be 1:3 mix or as specified by the Architects. However, if honey-combing or blow holes are of such extent as being undesirable, the Architects/Engineer in-Charge may reject the work totally and his decision shall be binding. No extra payment shall be made for rectifying these defects. All burrs and uneven faces shall be rubbed smooth with the help of carborandum stone. The surface of non-shuttered faces shall be smoothened with a wooden float to give a finish equal to that of the rubbed down shuttered faces. Concealed concrete faces shall be left as from the shuttering except that honey-combed surface shall be made good as detailed above. The top faces of slabs not intended to be surfaced shall be leveled and floated to a smooth finish and the levels or fails shown on the drawings or elsewhere. The floating shall not be executed to the extent of bringing excess materials to the surface. The top faces of slabs intended to be covered with screed, granolithic or similar faces shall be left with a rough finish.

16.2 Repair and Replacement of Unsatisfactory Concrete

Concrete which is unsatisfactory shall be repaired by cutting out the unsatisfactory material and by replacing it with new concrete. Voids to be so filled shall be provided with anchors, keys or dovetails slots, wherever necessary, to attach the new material securely in place. Surface of prepared voids shall be wetted for 24 hours immediately before the patching material is placed. Repair of concrete shall be made by skilled workmen. Repairs shall be made as soon as practicable after removal of the forms and in a manner to meet the requirements for the finished specified for the particular location.

16.3 The use of an epoxy for bonding fresh concrete used for repairs will be permitted on written approval of the Architects. Epoxies shall be applied in strict accordance with the instruction of the manufacturer.

16.4 Method of Repair

"Dry-pack" filling shall be used for small size holes having surface dimension nearly equal to the depth of the hole, left after removal of form tie, grout insert holes and slots cut for repair of cracks. Mortar filling by cement gun shall be used for repair of areas and holes too large for dry-pack, and to shallow for concrete filling. For holes extending entirely through the concrete section, for areas greater than 0.1 sq.m and deeper than 100mm and holes in reinforced concrete which are greater in area than 0.05 sq.m and which extend beyond the reinforcement, the repair shall be made by making a complete filling of the void with broken stones and liquid portland cement grout shall be placed through filler pipes under pressure, pipe nipples shall be placed through the forms at bottom of the void so that the grout rises upward through the aggregate to spill through a vent at the edge of the void.

16.5 Matching of Patch Surface

Filling material used in repair of surfaces which will be exposed after completion of the project shall be made with cement from the same source as the used in concrete and blended with a sufficient amount of white portland cement to produce the same colour as in the adjoining concrete. Patched surfaces shall be given a final treatment as required to make the texture of the patch to match with that of the surrounding material.

16.6 Curing of Patched Work

Immediately after patching is completed, the patched area shall be covered with an approved non-staining, water saturated material which shall be kept wet and protected.
against sun and wind for a period of 12 hours. Thereafter, the patched area shall be kept continuously wet by a fine spray or sprinkling for not less than 10 days.

All materials, procedures and operations used in the repair of concrete and also the finished work shall be subject to the approval of the Architects / Engineer In-Charge. All filling shall be tightly bonded to the concrete and shall be sound free from shrinkage cracks or dummy areas after the filling have been cured and dried.

17.0 FORM WORK

17.1 Form for concrete shall be plywood of steel as directed by the Architects and give smooth and even surface after removal thereof.

If it is desired by the Architects, the contractor shall prepare, before commencement of actual work, design and drawings for form work and centering and get them approved by the Architects / Engineer In-Charge. The form work shall conform to the shapes, lines and dimensions as shown on the drawings within the tolerances given below:

(a) Deviation from specified dimensions

<table>
<thead>
<tr>
<th>Specification</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>of cross section of columns and beam</td>
<td>-06mm</td>
</tr>
<tr>
<td></td>
<td>+12mm</td>
</tr>
</tbody>
</table>

(b) Deviation from dimensions of footings

(see Note)

1. Dimension in plan

<table>
<thead>
<tr>
<th>Specification</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-12mm</td>
</tr>
<tr>
<td></td>
<td>+50mm</td>
</tr>
</tbody>
</table>

2. Eccentricity

0.02 times the width of the footing in the direction of deviation but not more than 50mm.

3. Thickness

+0.05 times the specified thickness

Note: Tolerances apply to concrete dimensions only, and not to positioning of vertical reinforcing steel or dowels.

17.2 Form Requirement

The centering shall be true and rigid and adequately braced both horizontally and diagonally. The form shall be sufficiently strong to carry, without deformation, the dead weight of the concrete, the working load and wind loads etc. Where the concrete is vibrated, the form work shall be strong enough to withstand the effect of vibrations practically without any deflection, bulging, distortion or loosening of its components. Form work shall be of plywood or as of specified finish. Form work for removable batch ways and plugs shall be installed in place wherever possible. All floor and beam centering shall be crowned not less than 8mm in all directions for every 5 metre span.

Unless prior approval in writing has been received from the Architects all vertical wall forms may be constructed for the following minimum pressure. The pressures listed in Table 6 are intended as guide only and the contractor shall ensure that the construction of the forms are adequate for all concrete.

**TABLE – 6**

<table>
<thead>
<tr>
<th>Rate of pour in Cubic Meter Per hour</th>
<th>Pressuring Kg/Sq.m</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 10°C</td>
</tr>
<tr>
<td>0.6</td>
<td>3600</td>
</tr>
<tr>
<td>0.9</td>
<td>4000</td>
</tr>
<tr>
<td>1.2</td>
<td>4400</td>
</tr>
<tr>
<td>1.5</td>
<td>4600</td>
</tr>
</tbody>
</table>
All horizontal forms shall be constructed for pressures from the dead load of the concrete and embedment and a minimum live load of 200 Kg/Sq.M

17.3 Inspection of Forms
Temporary openings shall be provided at the base of columns and wall forms and other places necessary to facilitate cleaning and inspection. Immediately before concrete is placed all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, thoroughly cleaned, properly treated and free from foreign material. When forms appear to be unsatisfactory in any way, either before or during the placing of concrete, the Architects/Engineer In-Charge shall order at work stop the work until the defects have been corrected.

17.4 Cleaning and Treatment of Forms
All rubbish, particularly chippings, shavings and sawdust, shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with approved shuttering oil. Care shall be taken that shuttering oil is kept out of contact with the reinforcement.

17.5 Tie Rods
Metal tie rods shall be used for supporting all forms. Provision shall be made for removal of a section of each rod at surface of the concrete to a depth of approximately 50mm. All holes left by the removal of conical nuts or other removable fixtures embedded in the face of the concrete shall be filled and finished with cement mortar in a manner specified in the sections on “finishing” Threaded inserts embedded on each face of the wall shall be used for attaching the forms to previously placed concrete.

17.6 Tie Wires
Wire ties will be permitted only upon approval of the Architects / Engineer In-Charge and when permitted shall be cut off flush with the face of the concrete, or counter-sunk, filled and finished, as required by the Architects in the manner specified under the sections of “Finishing”.

17.7 Chamfers and Fillets
All corners and angles shall be formed with 45 deg. mouldings to form chamfers or fillets on the finished concrete. The standard dimensions of chamfers and fillets, unless otherwise detailed or specified, shall be 25x50mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the moulding shall be planed or surfaced to the same texture as the forms to which it is attached. Unit rates quoted shall include providing the chamfers as specified or as shown on the drawings.

17.8 Construction Joint Chamfers
Vertical construction joints on faces which will be exposed at the completion of the project shall be chamfered as above except where not permitted by the Architects / Engineer In-Charge.

17.9 Joints
Joints in forms shall be horizontal or vertical unless otherwise specified and shall be sufficiently tight to prevent any leakage. Suitable devices shall be used to hold adjacent edges together in accurate alignment. All forms shall be such that they can be removed without hammering or playing against the concrete.

17.10 Re-use of Forms
Before reuse, all forms shall be thoroughly scrapped, cleaned, examined and when necessary repaired and re-oiled before resetting. Form work shall not be used / reused, if declared unfit or un-serviceable by the Architects / Engineer In-Charge.

17.11 Clean out Provisions
Forms with limited working space within shall be provided with temporary cleanout doors or opening for cleaning, washing, blowing and removal of waste wood chips, dirt, trash etc.

17.12 Removal of Forms
In the determination of time for removal of forms, consideration shall be given to the location and character of the structures, the weather and other conditions including the setting and curing of the concrete and material used in the mix. Forms and their support shall not be removed without the approval of the Architects / Engineer In-Charge. Methods of form removal likely to cause overstressing or damage to the concrete shall not be used. Supports shall be removed in such a manner as to permit the
concrete to uniformly and gradually take the stresses due to its own weight. In normal circumstances (generally where temperatures are above 20 Degree Centigrade) and where ordinary portland cement is used, forms may be struck after expiry of following periods.

<table>
<thead>
<tr>
<th>S.No</th>
<th>LOCATION OF SHUTTERING</th>
<th>TIME PERIOD FOR REMOVAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
<td>Walls, columns and vertical:</td>
<td>24 to 48 hours or may be decided by the Architect/Engineer in charge for the faces of structural members</td>
</tr>
<tr>
<td>(b)</td>
<td>Slabs (props left under):</td>
<td>3 days</td>
</tr>
<tr>
<td>(c)</td>
<td>Beam Soffits (props left under):</td>
<td>7 days</td>
</tr>
<tr>
<td>(d)</td>
<td>Removal of props under slabs:</td>
<td>7 days&lt;br&gt;14 days</td>
</tr>
<tr>
<td></td>
<td>1. Spanning up to 4.5M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Spanning over 4.5M</td>
<td></td>
</tr>
<tr>
<td>(e)</td>
<td>Removal of props under beams and arches</td>
<td>14 days&lt;br&gt;21 days</td>
</tr>
<tr>
<td></td>
<td>1. Spanning up to 6 M</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Spanning over 6 m</td>
<td></td>
</tr>
<tr>
<td>(f)</td>
<td>Cantilever construction</td>
<td>Not until adequate fixity is developed subject to minimum of 10 days</td>
</tr>
</tbody>
</table>

The number of props, their size and disposition shall be such as to be able to safely carry the full dead load of the slab, beam or arch as the case may be. Where the shapes of the element is such that the formwork has reentrant angles, the form work shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

**18.0 EXPOSED CONCRETE WORK**

**18.1 FORM WORK**
Other things remaining same as per clause 17.0, formwork shall be plywood or steel only. Care shall be taken to arrange the shutters so that the joints between shutter boards correspond with the pattern indicated in the drawing. The shuttering boards shall be butting with each other in straight lines, the corners of the boards being truly at right angles. The joints between the boards shall cross in the two directions at right angles. The size of boards shall be so selected as to exactly match with the pattern of shuttering impression on the concrete face indicated in the drawings. Maximum care shall be taken to make the form work watertight. Burnt oil shall not be used. The Contractor shall be permitted reuse of concrete shuttering brought new on the work for exposed concrete work as per the following table. Such reuses shall be permitted only if forms are properly cared for, stored, and repaired after each use.

(a) **Plywood shuttering** - 6 Reuses
(b) **Steel Shuttering** - 10 Reuses

The Contractor shall not be permitted to reuse any old shuttering, already used in work other than those covered under this contract, for the purpose of exposed.

**18.2 FINISHING**
On striking the formwork, the exposed surface shall be cleaned of extra mortar, grit etc. by carefully chipping or rubbing by carbonadum stone. Uniform texture and smooth surface shall
be ensured. In case of honey-comb, the same shall be immediately brought to the notice of the Architects / Engineer In-Charge. If it is allowed to be notified, concrete in the affected areas shall be carefully chipped off up to the depth of the concrete cover. The chipped off area shall be in rectangular shape enclosing the affected part. Cement concrete grout of 1:1½:3 or as specified as by Architects shall be used to patch up the chipped off area carefully using metal trowel to rub down the finishing surface. Care shall be taken to use the same colour of cement as was used for the rest of the work; so that the repaired work merges with the rest of the concrete surface. If necessary white cement in the ratio of 1:8 or as directed by the Architect/Engineer-in Charge be mixed with the cement to obtain the matching colour. The repaired patch shall be kept wet by covering with a piece of gunny bag from 2 hours after the work up to 14 days, ensuring gunny bag piece remaining wet throughout the period. Rendering or plastering the exposed concrete surface shall not be done.

19.0 CEMENT WASH
If so desired by the Architects, the Contractor shall provide one coat of cement wash over the concrete surfaces of foundations, pipe racks, columns, walls etc. which are not covered. Cement used by the contractor for providing the cement wash shall be taken into account for material reconciliation. Cost of providing cement wash is deemed to have been included in the rates of various items of concreting in the schedule of rates.

20.0 REINFORCEMENT: FABRICATION, BENDING & SPlicing
Bent bar reinforcement shall be cold bent gradually by machine or other approved means without the use of heat to the shapes shown on the drawing except, in case of bars larger in diameter than 28mm. If approved by the Architect/Engineer-in-charge, bars can be bent hot by heating the bar gradually. Bars bent hot shall not be heated beyond cherry red colour and after bending allowed to cool gradually without quenching. Bars which develop high strength due to cold working shall not be hot bend. Bars having cracks or splits on the bends shall be rejected. All bars shall be bent in accordance with the drawings and bends shall be made in accordance with the “Standard Bending Details for Reinforcing Steel” as issued by the Architects. In normal course bar bending schedule shall be supplied to the Contractor. However, in case bar bending schedule is not provided, Contractor shall develop the bar bending schedule for the approval of Architects / Engineer In-Charge. Such preparation of bar bending schedule is deemed to have been included in the rate for reinforcement item. Bars shall be properly tagged for easy identification. All reinforcement shall be furnished in the full length indicated on the drawing. Splicing of the bars except where shown on the drawings will not be permitted without the written permission of the Architects / Engineer In-Charge. For splice in tensile zone, the minimum clear distance between bars shall be maintained. Splices in adjacent bars carrying tension shall be staggered. At a compression splice each pair of lapped bars may be in contact but the minimum clear spacing between the splice and the adjacent splice shall be that specified for adjacent single bars. In no case shall the clear distance between bars may be less than the diameter of the bar nor less than one third of the max. size of coarse aggregate. Reinforcement shall be bent in accordance with the procedure specified in IS: 2502 code of practice for “Bending and Fixing of Bars for Concrete Reinforcement” and shall not be straightened in a manner that will injure the material. Exposed portions of reinforcement bars must not be subjected to impact or rough handling and workmen will not be permitted to climb on bar extensions until the concrete has sufficient strength so that no movement of the bar in the concrete is possible. Where reinforcement bars are bent aside at construction joints and after wards bent back into their original positions, care should be taken to ensure that at no time is the radius of the bend shall not be less than 4X bar diameter for plain mild steel and 6X bar diameters for deformed bars. Care shall also be taken when bending back bars, to ensure that the concrete around the bar is not damaged.

20.1 WELDING
Field welding of reinforcing bars will not be permitted without the written consent of the Architects. Where welding is permitted it must be at suitable staggered locations. Tests shall be made to prove that joints are of the full strength of the bars connected. Welding of reinforcement shall be done in accordance with the recommendation of IS: 2751 and IS 9417.
These clauses apply to main and distribution steel only.

20.2 MISCELLANEOUS REINFORCEMENT WELDING
In places where welded reinforcement chairs, spacer, trusses etc. are necessary like chimney raft, deep raft etc. and have been detailed in the drawing, any welding necessary for fabrication of such trusses, chair etc. is deemed to have been covered under the rates for reinforcement and such spacer, chairs, trusses etc. shall be measured and paid under the relevant reinforcement item. If any steel plates are used as gussets in fabrication of these chairs, trusses, the same shall be payable under insert item.

20.3 CLEANING, PLACING AND FASTENING
All reinforcement shall be cleaned to ensure that it is free from loose scale, loose rust, oil and greases or other harmful matter immediately before placing the concrete. Dowel bars will be provided where shown on drawings or where required. All steel reinforcement shall be accurately placed in position as shown in the drawing and firmly held during placing and setting on concrete. Bars shall be tied with annealed iron wire at all intersections except where spacing is less than 300mm in each direction, these alternate inter-sections shall be tied.

20.4 TOLERANCES ON PLACING OF REINFORCEMENT
Unless otherwise specified by the Architects, reinforcement shall be placed within the following tolerances:
(a) For effective depth 200mm or less + 10mm
(b) For effective depth more than 200mm + 15mm
The cover shall in no case be reduced by more than one-third of specified cover or 5mm whichever is less.

20.5 SUBSTITUTION
When reinforcement of specified diameter is not available, Contractor shall use other diameter reinforcement on written approval of the Architects.

20.6 COVER TO REINFORCEMENT
Cover to reinforcement shall be as indicated on the drawing and in their absence as directed by the Architects. Where concrete mortar blocks are used for giving necessary cover, strength shall correspond to the strength of concrete proposed for the structure where such cover blocks are used. All cover spacers shall be secured firmly so that they are not disturbed during vibration.

21.0 PAYMENT
21.1.1 Payment for plain and Reinforced cement concrete in-situ shall be made on cubic meter (M³) basis of the actual finished work done or as per approved construction drawings, whichever is less and shall be inclusive of all labour, materials, curing, cost of leaving pockets for ducts, and providing one coat of cement wash as per clause 19.0 opening in walls and slabs recesses of all sizes, providing benching, making channels in manhole bottom etc. unless otherwise specified. The rate shall also include supply and application of cement slurry prior to concreting of construction joints. The rates shall be deemed to include complete cost of taking and testing concrete cubes and carrying out other tests as per specifications and as directed by Architects. Deduction will be made for built in construction or embedment of volume more than 0.05 m³.
Payment for concrete covered under this item is inclusive of organizing continuous pours as indicated on the drawings and no extra shall be payable on this account.
The rate shall however, be exclusive of steel work in reinforcement and metal inserts pipe sleeves and also exclusive of all shuttering, centering and form work and water bars unless otherwise specified. The expansion/ construction joints, whichever required, shall be paid separately under relevant items.

21.1.2 Where the strength of concrete mix (nominal or controlled) as indicated by tests, lies in between the strength of any two grades given in clause 2.0 and it is accepted by the Owner/Architect/Engineer, such concrete shall be classified as a grade belonging to the lower of the two grades between which it lies. In case the cube strength show higher results than those specified for the particular grade of the concrete, it shall not be placed in the higher grade nor shall the contractor be entitled for any extra payment on such account. The
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IS∆P Architects

concrete giving lower strength than specified may be accepted at reduced rates after safety of
the structure by checking it with devices such as impact hammer, load test etc. or rejected
entirely at the discretion of the Owner/Architect/Engineer. The rejected concrete shall be
dismantled at no extra cost to the owner nor any payment will made be for the concrete so
rejected and the shuttering and reinforcement used for the same. In case the concrete of
lower strength can be improved by carrying out some strengthening measures entirely at the
discretion of the Owner in consultation with Architect/Engineer, then the said measures shall
be carried out by contractor at his own cost. The concrete of lower strength shall however be
paid as per above.

21.1.3 Deductions for pockets shall be as specified in relevant Indian Standards.

21.1.4 Water proofing compound like 'CICO' Grade-I or 'PUDDLLO' or approved equivalent used for
concrete or mortar shall be paid separately on the basis of weight of such compound
consumed. The rate quoted for supply and mixing water proofing compound should include
cost of all such materials including taxes etc. bringing to site, storing and addition to the
concrete or mortar as specified by the manufacturer.

21.2 FORM WORK

21.2.1 Unless otherwise specified, payment for form work shall be on square metre (m^2) basis of the
actual area in contact with the concrete cost. The rates shall be inclusive of keeping the form
work for the full period as required in the above clauses, and removing the same after the
period is over. No extra payment shall be made for providing scaffolding in two or more
stages wherever required.

21.2.2 Superior quality form work for exposed concrete work shall be measured under clause 18 and
paid separately under the relevant item in the schedule of rates. In addition to

21.3 Payment for M.S. reinforcement or high yield deformed bars shall be in the basis of weight.
The weight shall be derived from the sizes and corresponding weights given in handbook of
Indian Standard Institution. Standard hook weight would also be calculated for payment.
Binding wire will not be weighed nor otherwise measured. Measurements for weight shall not
include cutting allowance, wastage etc. Concrete cover blocks will not be measured.

21.3.1 Rate quoted for reinforcement should include cost of cleaning, cutting, bending, placing
binding with contractor's own binding wire welding as per clauses 20.1 & 20.2 and providing
necessary cover blocks of concrete.

21.4 WATER BARS STOPS

21.4.1 Payment for G.I. water bars shall be made on the basis of area (M^2) of G.I. sheets fixed in
position. Rate shall include the cost of materials, cutting, bending, folding, soldering, lapping,
fixing, wastage and labour etc. complete. Any laps in G.I. water bar shall not be measured.

21.4.2 Payment for PVC/Rubber stops shall be made on running meter (M^2) of G.I. sheets fixed in
position. Rate shall include the cost of materials, cutting, bending, folding, soldering, lapping,
fixing, wastage and labour etc. complete. Any laps in G.I. water bar shall not be measured.

22.0 PRECAST CONCRETE

22.1 Specification contained in clauses above regarding concrete, form work and reinforcement
shall apply in addition to the clause laid as under. Contractor shall get the precast bed
approved by Architects.

22.2 Necessary lifting hooks shall be provided for handling as indicated in drawings or as directed
by Architects.

22.3 Unless otherwise specified, the visible surfaces of precast members shall be finished smooth.
The exposed edges and corners should be rounded to a radius of 20mm if it is not directly
butting against any structure. Where required, specified coloured finish shall be given by
adding approved pigments to the finishing mortar. Surfaces used as walkways must be given
a non-skid finish after finishing smooth.

22.4 The precast concrete units shall be marked clearly on top and shall be stored clear of ground
until required for erection. The precast units shall be handled and erected by methods
approved by the Architects to protect them from damage.

22.5 The designed loads on the units shall not be exceeded in any way during the course of
erection e.g. temporary loads of materials of equipment. The contractor shall replace at his
own expenses all such units which are damaged on account of the above if he is responsible
for such loadings. Cement used for a damaged rejected precast elements shall not be taken
into account for material reconciliation.

22.6 PAYMENT
Payment for precast concrete members shall be on the basis of finished members. The rate quoted shall include cost of formwork, finishing as specified, curing, handling and fixing in final position, preparation of casting yard etc. Reinforcement shall be paid separately. Lifting hooks shall be paid on the same basis as the reinforcement. Metal inserts embedded shall be paid as per Architects Standard. However, welding or otherwise fixing, as specified, the metallic parts with other structures shall all be inclusive in the rate quoted for the precast member.

Addition of pigment shall be paid separately on the basis of the surface area so covered by pigment. The rate quoted for pigmenting shall cover the cost of procuring, mixing with mortar and giving necessary finish.

23.0 DAMP PROOF COURSE (D.P.C.)

23.1 The damp proof course shall consist of cement concrete of M-20/M-15 grade or as specified with 10mm and down size grade aggregate unless otherwise specified.

23.2 The damp proof course shall be laid at plinth level of brick walls, flush with the floor surface and shall not be carried across door ways. The finishing layer of flooring should be continued over such openings and should be laid at the same time as flooring.

Before laying, the top surface of the wall shall be thoroughly cleaned and watered. The D.P.C. shall be laid in one or two layers of 20mm thickness each, as the case may be retaining the edges by necessary shuttering and shall be well tamped and trowelled to a smooth finish. The layer shall be cured by keeping the surface wet for 40 hours, and after it has dried two coats of hot bitumen (80/100) shall be applied over it. Over this the second layer of 20mm thick concrete shall be laid and cured as described in case of the first layer and two coats of hot bitumen shall be applied in the similar manner and dry sharp sand sprinkled over it.

23.3 PAYMENT

Payment shall be made on square meter (M²) basis inclusive of providing and applying bitumen and any shuttering if necessary for the actual work done and providing and spreading the sand over bitumen.

24.0 CONTINUOUS CONCRETING

24.1 Where called out on drawings the concreting for these types of foundations shall be done in single continuous pour above the top of raft foundation or as indicated on drawings. No extra shall be payable for continuous pour.

24.2 The concreting for this shall be done as per the requirements of IS: 2974 Part-III and other relevant Indian Standard.
CHAPTER 4:

STANDARD TRADE SPECIFICATION
FOR
STONE WORK
1.0 STONE WORK

1.1 RANDOM RUBBLE MASONRY

Stone shall be hard, sound and free from decay and weathering. Stones with round surface shall not be used. The stones shall be hammer dressed on the face, sides and beds. The bushing in the face shall not be more than 4 cms on exposed faces and one cm on faces to be plastered. The hammer dressed stones shall also have rough tooling for a minimum width of 2.5cm along all the edges of the face. The mortar shall be used as specified in the Schedule of Quantities.

Before laying, all stones shall be wetted. The walls shall be truly in plumb or to specify batter. The bond shall be achieved by closely fitting adjacent stones and may be laid at random without bringing up to a level except at plinth, window sill and roof level. Face stones shall extend and bond the breadth at face or depth in wards. The interior filling shall be of rubble stones of any shape and pass through a ring of 15cm inner dia ring and thickness shall not be less than 10cms. These shall be firmly bedded in mortar hammered down with wooden mallet. To avoid thick mortar joints, chips and sprawls shall be used and ensured that no bottom joints are left. The use of chips shall not exceed 20% of the quantities of stones masonry. The masonry shall be cured regularly. Toothing in masonry shall not be allowed. While joining the existing masonry shall be raked back at an angle not more than 45 degree.

Bond stones right through the thickness of walls up to 60cms thick and in walls of thickness greater than 60cms two or more bond stones over lapping each other by 15cms shall be provided in a line from face to back and shall be provided at every 0.5 sq.m of surface.

Quoins shall be neatly dressed with chisel or hammer to required angle. Selected stone laid header and stretcher alternatively. No quoin stones shall be less than 25 dm3 (0.025 cum).

Face joints shall not exceed 20mm thickness. When plastering, the joints shall be raked up to 20mm depth otherwise shall be struck flush and finished at the time of laying. The scaffolding shall be provided as directed. The inner end of the horizontal scaffolding may rest in a hole provided in masonry.

Measurments: Stone masonry shall be measured in cubic metre nearest to two decimal places. The length, height and thickness shall be measured correct to a cm. The thickness shall be measured at joints excluding the bushing. Only specified dimensions shall be allowed. The rates shall include curing, etc. including all operations required to be done.

1.2 COURSED RUBBLE MASONRY:

Stones shall be as per random rubble masonry and shall be hammer dressed on all beds and joints so as to have rectangular shape and squared on all sides and beds. The bed joints shall be rough chisel dressed at least 5cm back from face and side joints at least 4cm. The remaining portion shall not project beyond the surface or bed and side joints. The bushing on the face shall not project more than 4cm on an exposed face and one cm on a face to be plastered. The hammer dressed stones shall have a rough toothing along on all edges of the face for a minimum width of 2.5cm. The mortar shall be as specified in the schedule of quantities.

The stone shall be wetted before use. The walls shall be built true to plumb or to specify batter. The height of each course shall be not less than 14.5 cm and not more than 30cm. Face stones shall be laid alternate headers and stretchers. These shall break joints at least half the height of the course. No pinning shall be allowed on face. No face stone shall be less in breadth than height, at least 1/3rd of the stones shall tail into the width for length not less than twice their height.

The interior filling shall be with flat bedded stones laid in mortar, chips and sprawls being
used to void thick mortar joints and shall not exceed 10% of the quantity of stones masonry.

The structure shall be cured regularly. Where breaks are unavoidable, the joints shall be racked back at angles of 45 degree. No tooothing is to be allowed.

Bond stones shall be as in random rubble stone masonry except the bond stone or set of bond stones shall be inserted 1.5 to 1.8 mtr. Apart clear in every course.

Quoins shall be of the same height as of the course and shall be formed of stones 40cm long laid stretches and headers alternatively. These shall have chisel drafts on all edges of 2.5cm width.

All bed joints shall be horizontal and all side joints vertical. Face joints shall be not more than 1cm thick.

Face to be plastered shall be raked to a depth of 20mm and un-plastered faces shall be struck flush and finished at the time of laying.

The scaffolding and measurements shall be as for random rubble masonry. The rate shall include curing etc. including all operations required to be done.
CHAPTER 5
STANDARD SPECIFICATION
FOR
BRICK MASONRY WORK
1.0 BRICK WORK

1.1 Ordinary Brick Work

a. Bricks:
   i. The bricks shall be local best quality of regular and uniform size shape and colour, uniformly well burnt throughout but not over burnt. They shall have plain rectangular faces with parallel sides and sharp straight and right angled edges. They shall be free from cracks or other flaws. They shall have a frog of 10mm depth on one of their flat faces.
   ii. They shall give a clear metallic ringing sound when two bricks struck together.
   iii. They shall show a fine grained, uniform, homogenous and dense texture on the fracture and be free from lumps of lime, laminations, cracks, soluble salts causing efflorescence or other defects, which may in any way impair their strength, durability, appearance or usefulness for the purpose intended. They shall not have any part under burnt. They shall not break when thrown on the ground on their flat face in a saturated condition from a height of 60cm.
   iv. The size of brick shall be 22.9 x 11.4 x 7 cm only. Bricks of one standard size shall be used on one work unless specially permitted by the Architects. In parts of Eastern Zone (i.e. West Bengal, Assam and Bihar etc.) bricks which are commonly of size 25 x 12.5 x 7.5 cm shall be used. The following tolerances are permitted in the standard conventional size adopted on a particular work.

<table>
<thead>
<tr>
<th>Specification</th>
<th>Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Plus or minus 3mm</td>
</tr>
<tr>
<td>Breadth</td>
<td>Plus or minus 1.5mm</td>
</tr>
<tr>
<td>Depth</td>
<td>Plus or minus 1.5mm</td>
</tr>
</tbody>
</table>

   v. After immersion in water absorption by weight shall not exceed 20% of the dry weight of the brick when tested according to ISI No. 1077-1957.
   vi. Unless otherwise specified, the load to crush the brick when tested according to IS: 1077-1957 shall not be less than 75 kg/sq.cm

b. Mortar:

   Unless otherwise specified, mortar for brickwork shall be composed of 1 part of cement to 6 parts of coarse approved sand for walls of one brick thick (i.e. 23cm) and over and one part of cement to 4 parts of coarse approved sand for half brick thick walls. Other specifications for mortar in brick work shall be as per IS: 2216-1965.

   The particle size grading of sand in mortars for un-reinforced masonry work shall be within the limits specified below: as per IS 2116/1980

<table>
<thead>
<tr>
<th>IS Sieve Designation</th>
<th>Percentage by weight passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.75mm</td>
<td>100</td>
</tr>
<tr>
<td>2.36mm</td>
<td>90-100</td>
</tr>
<tr>
<td>1.18mm</td>
<td>70-100</td>
</tr>
<tr>
<td>600 micron</td>
<td>40-100</td>
</tr>
<tr>
<td>300 micron</td>
<td>5-70</td>
</tr>
<tr>
<td>150 micron</td>
<td>0.15</td>
</tr>
</tbody>
</table>

c. Construction Details:
   i. Soaking: All bricks shall be immersed in water for two hours before being put into work so that they will be saturated and will not absorb water from the mortar.
   ii. Bats: No bats or cut bricks shall be used in the work unless absolutely necessary around irregular openings or for adjusting the dimensions of different course and for closer in which case full bricks shall be laid at corners the bats being placed in the middle of the column.
   iii. Laying: The bricks shall be laid in mortar to line, level and shapes shown on the plans slightly pressed and thoroughly bedded in mortar and all joints shall be properly flushed and packed with mortar so that they will be completely filled with mortar and no hollows left anywhere. Bricks shall be handled carefully so as not to damage their edge. They should not also be thrown from any height to the ground and should be put
down gently. All courses shall be laid truly horizontal and all vertical joints made truly vertical. Vertical joints in one course and the next below shall not come over one another and shall not normally be nearer than quarter of a bricks length. For battered faces bedding shall be at right angles to face. Fixtures, plugs, frames, etc., if any, shall be built in all places shown in the plans while laying the courses only and not later by removal of bricks already laid.

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

The verticality of the walls and horizontally of the course shall be checked very often with plumb bob and sprit level respectively.

iv. **Bond**: Unless otherwise specified, brick work shall be done in English Bond.

v. **Joints**: Joints shall not exceed 10mm in thickness and this thickness shall be uniform throughout. The joints shall be raked out not less than 10mm deep when the mortar is green where pointing is to be done. When the brick surface are to be plastered, the joints shall be raked to a depth of 5mm when the mortar is still green so as to provide good key to plaster.

vi. **Uniform Raising**: Bricks work shall be carried out regularly in all cases where the nature of work will admit, not leaving any part 60cm lower than another. But where building at different levels is necessary, the breaks shall be stepped so as to give later a uniform level and effectual bond. Horizontal courses should be to line and level and even and face plumb or to batter should be to line and level and even and face plumb or to batter as shown on the plan. The rate of laying masonry be upto a height of 80cm per day if cement mortar is used and 45cm if lime mortar is used.

d. **Scaffolding**: Scaffolding will be double or single as is warranted for the particular work and as approved by the Architects. Holes shall be made good by bricks to match the face work when scaffolding is removed.

e. **Curing**: All bricks work shall be kept well watered for 14 days after laying.

1.2 **Architectural Exposed Brick Work**

Where exposed brick work is specified, the usual specifications for ‘Brick Work’ as mentioned above will be applicable for Exposed Brick, but in addition, if specified, specially selected brick shall be used for facing, ensuring regular and clean faces of uniform colour. No bricks which are broken, chipped, wrinkled or which have irregular edges or corners shall be used. Depending on the quality of bricks and if instructed by the Architects, the exposed face of every bricks shall be rubbed before laying without extra charges. Wooden fillets 10mm thick and 10mm wide shall be placed at the edge of joints so that no mortar comes on the surface of the brick and a regular thickness of joints is maintained. The surface shall be rubbed down with brushes or bricks if necessary and thoroughly washed. No mortar shall allowed to stick to the surface which shall be left clean with all joints even and true to straight line. Double scaffolding shall be used in exposed brick work. Where specified specifically, NBCC bricks shall be used.

1.3 **Reinforcement in Half Brick Thick Walls**

Half brick thick and brick on edge, walls shall be provided with reinforcement consisting of 2 Nos. of 6mm MS bars of Hoop iron 25x1.6mm embedded in mortar 15mm thick at every 3rd course and shall be anchored at ends. The cost of MS bars or Hoop iron shall be included in the rate for partition walls unless otherwise stated in the schedule of quantities.

1.4 **Measurements:**

a. Half brick, cavity walls and brick on edge walls shall be measured in sq.mtr unless otherwise mentioned in the schedule of quantities.

b. One or more brick thick walls shall be measured in Cum. The thickness
of brick walls in one or more brick thickness shall be measured in multiples of half bricks.

1.5 Brick Drip Course: It shall be laid above the junction of roof with the wall to shield the cracks at their junction. The upper course of the projecting brick shall be chamfered or rounded off with 7.6 cm radius. A transverse drip of throating about 1.3 cm deep shall be cut on the under side of the projecting bricks.

The drip course shall project 11.4 cm from the face of the wall thereby completely covering the gola and projection beyond it.

Measurement: The drip course shall be measured in running meters correct to a cm and no deduction shall be made from the wall masonry for the bearing portion of drip course.
CHAPTER 6

STANDARD TRADE SPECIFICATION

FOR

FLOORING AND FINISHING
1.0 FLOORING AND FINISHING:

1.1 Cement Concrete Flooring
Shall be laid in thickness and with cement concrete as specified in the schedule of Quantities laid in panels either made by fixing AC or glass strips or any other class of strips as specified in the Schedule of Quantities or with wooden removable forms. Before laying floor concrete, the sub-grade shall be properly cleaned trimmed to give required thickness of floor and neat cement slurry applied to give proper bond of floor with the sub-grades. The cement concrete shall be laid and finished with trowels and finished with a coat of neat cement on top to give a smooth and homogeneous surface. No extra mortar shall be laid over the concrete to make the floor in level or for drying the concrete for applying the cement slurry. The joints shall be straight both ways i.e. along the length and width. No surplus mortar on the adjoining panels shall be allowed to spill from the other panel. The measurement shall be of exact length and breadth from wall faces.

1.2 Cement Skirting and Dados:
Shall consist of 20mm or as specified in the schedule of quantities thick cement plaster 1:3 cement coarse sand mortar applied to wall face and finished with a floating coat of neat cement including rounding of junctions with floors as directed. The measurements shall be from inside skirting and height above floor vertically measured.

1.3 Cement Concrete Floors with Metallic Hardener Topping:
The same specification as cement concrete floors for the base concrete but without a floating coat of neat cement finishing except for the following:

- a. For heavy duty floors one part of ironite or ferrosite and cement is mixed well in dry state in proportion of 1:4 by weight to 4 parts by bulk of stone chips 6mm size, then the entire aggregate is mixed again, necessary amount of water added and laid as topping as soon as the under laying granolithic has been levelled upto within 12mm to 20mm and then the entire surface is finished with steel trowel and cured for at least 14 days.
- b. Proportion for Heavy duty Floor: 2 kg. Per sq.mtr of floor area of 12mm topping.
- c. For light Duty Floor: 1.6 Kg. Sq.mtr of floor area of 12mm topping.
- d. The aggregate to be mixed with ironite or ferrosite or approved equivalent cement mix shall be free of any stone dust or any other foreign matter.
- e. The division of panels (size of panels as approved) shall be started from the middle towards the sides in both directions.
- f. Around steel stanchions a panel of the size of the RCC column base shall be laid separately.
- g. Before laying floor, the lean concrete sub-grade shall be cleaned with wire brushes and a coat of neat cement slurry applied.
- h. The ironite, ferrosit or approved equivalent topping 12mm thick should be laid when the bottom base of cement concrete is still green.
- i. The top surface of the basement cement concrete shall be cleaned of surplus mortar by means wire brushes and a coat of neat cement slurry applied to receive the ironite or approved equivalent topping.
- j. The shalitex bituminous sheet in expansion joint shall be simultaneously embedded in floors and should be kept 12mm below the finished floor level to receive hot bitumen filler.

1.4 Mosaic Floors Cast in Situ:
Shall consist of bottom layer of required thickness of cement concrete 1:2:4 and top layer of white or grey cement as specified mixed with marble chips of approved quality, colour and gauge in the ratio of 2:1. The floor shall be rubbed with machine, electrically driven with corborandum stones and finally washed with ‘Tatri’ and then wax polished to give a smooth and shining surface. The floor shall be in panels with strips of required materials. The strips shall be laid true to line and level. Measurements shall be from wall face to wall face.

1.5 Mosaic Skirting and Dados:
Shall consist of 20mm or specified over all thickness. Bottom layer of cement plaster 1:3 cement coarse sand mortar shall be applied to wall face and roughed on top to receive the second layer of white or grey cement as specified with marble chips of approved quality, colour and gauge in the ratio 2:1 with necessary grooves or strips or required description as specified and round of junctions with floors. The finished surface shall be rubbed manually with corborandum stones and finally washed with ‘Tatri’ and then wax polished to give a
smooth and shining surface.
The measurements shall be inside of skirting and dado and height measured vertically from
to top of skirting and dado.

1.6 Terrazzo Tile Floorings:
These shall be of approved make and colour conforming to IS 1237 and of level surface.
These shall be laid on 25mm lime mortar bedding cement floated or as specified in Schedule
of Quantities. The joints shall be filled with cement of the same colour and the surface
polished with three operations of machine polish. Skirting tiles shall be fixed in cement mortar
1:3 (1 cement :3 coarse sand) of sufficient thickness. Skirting tiles shall be polished from
factory. A finishing polishing coat shall be applied after fixing.
The measurements shall be as for mosaic floors.

1.7 Polished Kota Stone Flooring
The stone slabs shall be machine-cut and machine polished of specified thickness and of
approved quality and size, free from cracks and flakes and shall be of uniform colour with
straight edges and an even surface. The stone slabs shall be laid in level or in slopes as
directed with invisible joints firmly bedded in lime sand mortar of the required ratio 25mm thick
and cement floated or as specified in schedule of quantities.
Measurements shall be from wall face to wall face.

1.8 Polished Kota Stone Skirting and Dados:
Same as Kota stone flooring except that these shall be fixed in cement mortar 1:3 (1 cement:
3 coarse sand) of sufficient thickness with invisible joints. Measurements shall be from inside
of skirting to inside of skirting and height measured at right angles to the floor from top of floor
to finish level.

1.9 Marble Stone Flooring & Steps of Stairs:
a. Marble Stone Slabs: Shall be conforming to IS 1130 and of the kind specified in the
schedule of quantities. The marble slabs shall be of selected quality, hard, sound,
dense and homogeneous in texture, free from cracks, decay, weathering and flaw as
approved by the Architects. The slabs of required thickness shall be machine cut to
required dimensions. All angles and edges of slabs shall be true, square and free
from chippings and the surface shall be true and plane.
b. Laying: Sub-grade concrete of RCC slab on which marble is to be laid shall be
cleaned, wetted and mopped. The bedding for the marble slab shall be cement
mortar 1:4 (1 cement : 4 coarse sand) or with lime mortar (1 lime putty : 1 surkhi : 1
course sand) as mentioned in the schedule of quantities.
The bedding mortar shall be spread to required thickness and allowed to harden a bit.
Cement slurry at 4.4 Kg. per square metre shall then be spread. The marble slabs
shall then be placed in position and tapped with a wooden mallet till the slab is
properly bedded in line and level. The joints between slabs be as fine as possible.
The slabs shall be matched as shown in drawing. The flooring shall be cured for
seven days.
c. Polishing and Finishing: Slight unevenness at the meeting edges of slabs shall be
removed by fine chiselling. The surface then shall be ground evenly with machine
fitted with coarse grade grit blocks No. 60. The second cutting shall be done by
machine fitted with fine grade grit blocks No. 120. The final grinding with machine
fitted with finest grade grit blocks No. 320 shall be carried out the day, after the 2nd
grinding is done. The oxalic acid shall be dusted over the surface at 33gm per
sq.mtr., sprinkled with water and rubber hard with a NAMDAH block (pad of woolen
rags). The next day floor shall be wiped with a moist rag and dried with a soft cloth
and finished clean
d. Measurements: Shall be square metre correct to two decimal places. Length and
breadth shall be measured correct to a cm from skirting to skirting as finished.

1.10 Marble Stone in Risers of Steps and Skirting
a. Marble Stone Slabs: Shall be the same as per marble flooring of thickness as
specified in the Schedule of Quantities.
b. Preparation of Surface: Wherever required, the wall surface shall be cut uniformly to
requisite depth so that the skirting face shall have uniform projection from the finished
face of wall as per drawings or as directed by the Architects. The concrete wall shall
be hacked and roughened with wire brushes. Masonry walls shall have joints racked
at least 15mm deep. The surface shall be thoroughly cleaned, washed and kept wet.
c. Laying: The risers of steps and skirting shall be set in grey or white cement with an admixture to match the shade of stone, with the line of stone slab at an average distance of 12mm from the wall but not less than 10mm. If necessary, the slabs shall be held in position by temporary MS hooks at suitable intervals. The joints shall be left to harden, then the rear of the skirting or riser slab shall be packed with cement mortar 1:3 (1 cement : 3 coarse sand). The fixing hooks shall be removed after the backing mortar is set. The joint shall be as fine as possible.

d. Polishing and Finishing: Same as for marble floor as above, except that grinding shall be done by hand with carborandum stones 1st grinding with coarse grade stone No. 60, second grinding with minimum grade No. 80 and final grinding with the fine grade No. 120. The face and top of skirting shall be polished.

e. Measurement: Shall be in square metre correct to two decimal places. Length and height shall be measured correct to cm actually laid at site above floor.

1.11 Marble Stone Work for Wall Lining, etc (Veneer Work)

a. Marble stone slabs: Shall be the same as for marble flooring of thickness as specified in the Schedule of Quantities.

b. Preparation of surface: Shall be the same as for marble stone in risers of steps and skirting as above.

c. Laying & Fixing: The stones shall be wetted. These shall be fixed with mortar without the use of any chips or under pinning of any sort. The adjoining stones shall be secured to each other by means of copper pins 75mm long and 6mm dia or as specified. Further, the stones shall be secured to the backing by means of 25x6mm gun metal clamps 30cm long or other size as required or as directed by the Architects. Alternatively, the stones shall be secured to the backing by means of stone dowels 10x5x2.5cm of shape approved by the Architects and the adjoining stones secured to each other by means of gun metal cramps or copper pins of size as required. The pins, cramps and dowels shall be laid in cement mortar 1:2 (1 cement : 2 fine sand). In case of reinforced cement concrete backing the lining shall be secured to the backing after it has set. The cramps shall be fixed in concrete while laying at the required positions. The groundings for veneering work shall be full of mortar. Any hollows noticed shall be made good by taking out the marble slab and refixing.

d. Measurements: Shall be laid in square-metre correct to two decimal places. Length and breadth shall be measured correct to a cm as actually laid.

1.12 a. White Glazed Tile Flooring:

Glazed tiles shall be of approved Indian make unless otherwise specified in the description of item. The tiles shall be flat, true to shape, free from cracks, crazing spots, chipped edges corners. The glazing shall be uniform. The tiles shall be 6mm thick and of size as specified in the items of work or as directed by the Architects and the tiles shall conform to IS: 777-1961.

b. Preparation of surface & laying: The sub-grade concrete or RCC slab shall be cleaned, wetted and mopped. The bedding for the tile shall be 12mm average thick but not less than 10mm at any place, consisting of cement mortar 1:3 (1 cement : 3 coarse sand) or as specified. Mortar shall be spread, tampered and correct to proper levels and allowed to harden. Over the bedding, mortar neat grey cement slurry and honey like consistency shall be spread @ 3.3 Kg. Of cement for square metre. Tiles shall then be laid in the grout and gently tapped with a wooden mallet. These joints shall be as thin as possible and in straight line as to suit the required pattern. Where full size tile cannot be laid, it shall be cut (sawn) to required size and edges rubbed smooth to ensure a true and straight joint. The floor shall be checked with a straight edge to obtain a true surface. The floor tile near the wall shall enter 10mm under the skirting or dado finish.

c. Pointing & Finishing: The joints shall be cleaned of the grey cement grout with wire brush to a depth of 5mm and all dust and loose mortar removed. The joints shall then be flush pointed with white cement and floor kept wet for 7 days. The floor shall not sound hollow when tapped with a wooden mallet.

d. Measurements: Shall be in square metre correct to two decimal places. Length and breadth of the actual tile area laid shall be measured correct to a cm. No extra shall
be paid for the cutting (sawn) of tiles in the work.

1.13 White Glazed Tiles in Skirting & Dados:
   a. Glazed tiles shall be the same as per para 1.12(a)
   b. Preparation of Surface: The joints of bricks work shall be raked out to a depth of at least 15mm. In case of RCC walls, the surface shall be hacked and roughened with wire brushes. The surface shall be cleaned thoroughly, washed with water and kept wet.
   c. Laying: The surface shall be plastered with cement mortar 1:3 (1 cement : 3 coarse sand) or as specified to an average thickness of 12mm and allowed to harden. The plastered surface shall be roughened with wire brushes or by scratching diagonal lines 1.5mm deep at 7.5 cm centers both ways.
   The back of tiles shall be buttered with grey cement slurry and edges with white cement slurry and set in the bedding mortar. The tiles shall be lightly tamped and corrected to proper plans and lines. Tiles shall be set in required pattern with as fine as possible butt joints. Top of dados skating, etc. shall be truly horizontal and joints truly vertical. Where full tiles cannot be used, cut (sawn) tiles of required size shall be provided as in flooring. The joints shall be cleaned and flush pointed with white cement. The surface shall be kept wet for seven (7) days. The finished work shall not sound hollow when tapped with a wooden mallet.
   d. Measurements: Shall be in square metre correct to two decimal places. Length and breadth of the actual tile area provided shall be measured correct to a cm. No extra shall be paid for the cutting (sawn) of tiles in the work.

1.14 Acid and Alkali Resisting Refractory Tile Flooring
   a. Tiles: Shall be 230* 112mm size 37mm thick of approved make and manufacture.
   b. Base: Shall consist of 50mm thick concrete 1:2:4 mix laid over lean concrete 1:4:8 sub-grade laid to slop as required finished smooth on top with a trowel to a uniform surface. Plastering is to be avoided.
   c. Laying: 
      i. The prepared base shall be given a coat of special bituminous primer at 1.4 Kg. Per sq.mtr.
      ii. The tiles are set on a bed of 15mm thick layer of ‘ACIDX’ high melting acid and alkali resisting mastic composition as approved by the Architects. The joints in adjoining tiles shall be as fine as possible filled with the materials as for bedding. The finished surface shall be neat and clean.
   d. Measurements: The length and breadth shall be correct to a cm actually laid at site and paid per sq.mtr.

1.15 Wooden Flooring:
   a. Supporting Joints: The vertical supports, beams and joints shall be of the class of wood specified in the description of item and shall be fixed in position dead level. The sections, arrangement and spacing shall be as specified in detailed drawings. The width of joints shall not be less than 50mm. All the members shall be treated with wood preservative as directed by the Architects.
   b. Boards: Selected boards of uniform width (not less than 100mm or of 150mm) of class of wood specified in the description of item shall be used. The length of boards shall not exceed 3 metre and shall be such that the board rest at least on three supports unless otherwise directed by the Architect. The board shall be planned true on the top face. The longitudinal joints of the planks shall be tongued and grooved to a minimum depth of 12mm. While the heading joint shall be square butt type and shall be over the center line of the supporting joints. Heading joints in adjacent broads shall not be placed over the same joints. The timber used shall be thoroughly seasoned conforming to IS 1141 and treated in accordance with IS 491
   c. Iron Screws: Shall be of the slotted counter sunk type of length not less than the thickness of the plank plus 25mm subject to a minimum of 40mm and of designation No. 9 conforming to IS: 451-1961.
   d. Fixing: The joints supporting the planks shall be checked and corrected to
levels before fixing planks. The end boards shall be accurately fixed with the sides parallel and close to the walls. Each adjoining board shall be carefully jointed and tightened into position and screwed. The boards shall be fixed to joints with two screws at each end and one screw at each of the intermediate joints in zig-zag manner. The screws shall be counter sunk and holes filled with stopping approved by the Architects.

The junction between timber flooring and adjacent flooring shall be formed by inserting aluminium strip at the junction fixed to the end of the planks with screws. The floor shall be planed in both directions and made perfectly even, true and smooth.

e. Measurement: the floor shall be measured in square metre. The length and breadth measured correct to a cm of the superficial area of the finished work.

1.16 PVC Tile Flooring:

a. Tiles: Tile floor finish where called for as per drawings and schedule of finishes shall be carried out with 2.5mm thick 300mm * 300mm size of selected shade, manufactured by standard approved manufacturers. The flooring material shall conform to IS 3462. The base over which the tiles are to be laid shall be finished smooth to receive the tiles. The surface shall be thoroughly cleaned and made dry before laying the tiles.

b. Adhesive: The tile shall be laid in position with an approved brand of thermoplastic binder viz. vinyl chloride polymer adhesive as recommended by the manufacturer's direction.

c. Laying: Tiles shall be laid by skilled workmen experienced in this class of work in a workman like manner. Tiles shall be carefully butted together, cut into corners and angles and showing even margins. The joints between tiles shall be as fine as possible as uniform throughout. Tiles shall be laid in accordance with drawings and the schedule of finishes.

d. Vinyl Skirting: PVC tile skirting to partition and other walls around PVC tile flooring shall be of standard approved manufacture 2mm thick and shall fully match the tile flooring. The skirting shall be fixed to the skirting base with an approved adhesive as recommended by the manufacture.

1.17 Lime Plaster to Walls:
The mortar shall be prepared as per specifications for lime mortar except that the mortar required for plaster shall be ground a second time after storing in a damp condition for an interval of two days in case of kankar lime and one week in case of fat lime and the mortar shall then be used at once. Double scaffolding shall be provided for plaster work having two sets of vertical supports. Before applying plaster to wall faces, the joints shall be raked by hooks. Use of ‘Basuli’ being prohibited. Mortar powder and dust shall be brushed out from joints and washed with clean water and surface well wetted. The minimum thickness of the mortar to be applied shall be as specified. To ensure perfect workmanship in plumb, ‘Bundas’ shall be provided with a plumb before mortar is applied to surfaces for plaster in uniform layer. Plastering shall be started from top towards bottom. All corners, angles and junction shall be truly vertical or horizontal and neatly finished.Any cracks which appear in the surface and portions which sound hollow when tapped or are found soft or otherwise defective shall be cut out and redone. Curing shall be started after 24 hours of finishing and continued at least for 7 days and shall be protected from sun, rain and other damage. Measurements: For walls plastered on one side, the superficial area of plastering shall be measured without deduction for the openings of doors, windows, etc. of area upto 3 sq.mtr. each and at the same time jambs, soffits and sills of openings shall not be measured. When plastering is done on both sides of wall, deductions for openings shall be made from measurements of plastering on one side only and the jambs, soffits and sills of openings shall not be measured. For openings of area above 3 sq.mtr deductions for the openings shall be made for both sides but jambs, soffits and sills shall be measured. In measuring jambs and sills, deductions for the area in contact with the frames shall not be made.

1.18 Cement Plaster:
The same specification as for lime plaster, except the mortar which shall be cement and fine sand in ratios specified in the schedule of quantities.

While plastering, RCC surfaces shall be roughened with steel chisels, cleaned of dust,
washed and kept wet prior to plastering.

1.19 20mm thick sand faced plaster:

a. Scaffolding: Double scaffolding shall invariably be provided having two sets of vertical supports.

b. Preparations of Surface: The joints shall be raked out and the surface cleaned washed and kept wet before plastering is commenced.

c. Mortar:
   i. Under Coat: this shall consist of cement mortar 1:3 (1 cement : 3 coarse sand).
   ii. Top Coat: This shall consist of cement mortar 1:2 (1 cement : 2 coarse sand / stone dust, marble chips of sizes / stone chips of sizes as mentioned in the schedule of quantities.

d. Application:
   i. Under Coat: Plaster shall be started from the top and worked downwards. To ensure even thickness and a true surface, plaster above 15cm shall be first applied horizontally and vertically at not more than 2 metres, intervals over the entire surface to serve as gauge. The mortar shall then be applied in uniform thickness slightly more thin strips of bamboo about one metre long to ensure filling of joints and then brought to a true surface by working a wooden straight edge reaching across the gauge. Finally the surface shall be finished true with the trowel. The surface shall then be left rough and furrowed 1.5mm deep with a scratching tool diagonally both ways to form a key for the top coat. The scratches shall not be more than 0.5mm apart. The surface shall be kept wet till the top coat is applied.
   ii. Top Coat: The top coat shall be applied after the under coat has sufficiently set but not dried and in any case within 48 hours and finished smooth.

i. The finished surface of the second coat shall be roughened with cork sheet trowels and finished finally with a soft cloth pad to get uniform granular surface.

f. Measurements: Shall be the same as the lime plaster.

1.20 White Washing:

Scaffolding where required shall be with double supports. Where ladders are used, gunny bag pieces shall be tied on their top to avoid damage and scratches. For ceiling, stage scaffolding shall be erected. The wash shall be prepared from fresh white lime stone thoroughly slaked, mixed and stirred with sufficient water to make a thick cream which shall be screened through a clean coarse cloth. Five kg. of gum shall be mixed with hot water per cum of cream. Water shall then be added @ 5 litre per kg of lime to produce a milky solutions. Three or more coats shall be applied on new surfaces to give a uniform finish removing mortar drops, scraping of scales and repairing all holes.

Measurements: Shall be same as for plaster.

1.21 Colour Wash:

Required colouring pigment shall be added to white wash. The primary coat shall be white washed. The finished surface shall be of even tint. Any blotchy or bad surface shall be redone. Other specifications shall be the same as for white washing.

1.22 Distempering:

Distemper shall be Shalimar dry distemper or any other approved make conforming to IS 427, as decided by the Architect.

The distemper shall be mixed in clean water using 0.6 litre of water per Kg of distemper as per manufacturers specifications and shall be stirred till the mixture attains an even consistency.

The surface shall be cleaned, cracks and holes repaired, all irregularities and inequalities sand papered smooth and wiped clean to present a fine smooth surface and shall be completed dried before distempering is started.

The mixture shall be applied with a brush in a ling parallel strokes evenly so as not to leave any visible brush marks. The treated surface shall be allowed to dry and harden. Then the 2nd coat shall be allowed to be applied on the 1st coat. If a uniform surface is not achieved then the 3rd coat shall be applied.
Measurements: Same as for plaster work. Openings being deducted from the side where jambs, sills and soffits are not distempered.

1.23 **Cement Paints:**
The cement base paint shall conform to IS 5410 and as approved by the Architects. Before painting is commenced on surface, all dirt and foreign material shall be completely removed. The surface shall be wetted by sprinkling of water with fine spray. The surface shall be sprayed several times with a few minutes intervals between each spraying to allow moisture to soak into the surface. Cement paint solution shall be applied to the finish. After the first coat of paint of coats to get uniform not be wetted again before the application of the 2nd coat. At least 24 hours should elapse between the two coats. Similarly required number of coats (minimum three) shall be given to get a uniform colour. It shall be kept damp at least for seven days.

Measurement: The same way as for dry distemper.

1.24 **Oil Bound Distemper**
The oil bound distemper shall conform to IS 428 and as approved by the Architect. All plaster surfaces shall be thoroughly cleaned and shall receive 4 coats. First coat of prime size shall be applied after the primary coat of white lime is properly scrapped off. The 2nd and 3rd coats shall be of oil bound distemper of approved colour shade and quality mixed with manufacturer's petrifying liquid.
After these operations, if the work is not to the satisfaction of the Architects, then one or more coats shall be applied without extra coats till a smooth and even surface is achieved and approved by Architects.

1.25 **Plaster Emulsion Paint:**
The plastic emulsion paint shall be conforming to IS 5411 and as approved by the Architect. The surface shall be prepared as specified for oil paints. First a priming coat of primer as specified by the manufacturer shall be applied and scrapped off.
The second and third coats of plaster emulsion paint of approved shade manufacturer shall be applied to achieve an even surface. If the finish is not to the satisfaction of the Architects then more coats shall be applied to achieve smooth and even surface.

Measurement: Same as for dry distemper, for work covered by clause 9.24 to 9.26

1.26 **Stucco Paint:**
The surface to be painted shall be dry, free from dust and dirt and rubber smooth with sand paper or pumic stone to the satisfaction of the Architects.
A priming coat of primer as specified by the manufacturer shall be applied and scrapped off.
The second and third coats of stucco paint of approved shade and manufacture shall be applied to achieve an even surface. If the finish is not to the satisfaction of the Architects then more coats shall be applied to achieve smooth and even surface.

Measurement: Same as for dry distemper, for work covered by clause 9.24 to 9.26

1.27 **Oil Paint**
Surfaces to be painted shall be dry, free from dust and dirt and rubbed smooth by means of sand paper or pumic stone to the satisfaction of the Architects.
The paint shall be ready mixed synthetic enamel or oil paint of approved make and manufacture.
The primary coat shall be ready mixed of approved make and manufacture and shall be applied even with brushes. After the primary coat is applied and perfectly dried all holes, cracks, etc. shall be filled with putty and the surfaces sand, papered. Then a second coat of approved shade and manufacture shall be evenly applied and allowed to dry. The third coat shall be carefully applied as and when required to achieve smooth and even surface.

Measurement: Same as for other parts.

1.28 **French Polish:**
The work shall be first cleaned and scrapped thoroughly with glass paper. It then will be painted with 'Filler' composed of whiting and Methylated spirit and sand a papered. A thin coat of French polish shall then be applied and sand papered. Subsequent coats of French polish shall be applied till the proper finishing is achieved to the satisfaction of the Architects.

1.29 **Wax Polish:**
The work shall be done in the same way as for French polish with the exception that wax polish will be used instead of French polish.
CHAPTER 7

STANDARD TRADE SPECIFICATION
FOR
WATERPROOFING
1.0 WATER PROOFING

1.1 Mud Phuska with Brick tiles Paving:

1.1.1 Mortar: Mud mortar shall be prepared from good earth and shall be free from grass, roots, gravel, kankar, etc. free from efflorescent salts and white ants. The earth, fine powdered shall be mixed with plenty of water in a pit adding Bhusa at 35 Kg per cum. of mortar.

1.1.2 The mixture of earth, straw and water shall be allowed to mature for not less than 7 days. During this period, it shall be worked up at intervals with feet and / or Phawaras so that it gets plugged into a homogeneous mass free from lumps and clodes.

1.1.3 Laying: The mortar shall be laid on the terrace to required thickness and slopes in a single layer and rammed with wooden thapies under optimum moisture condition. The surface shall be checked with a straight edge and spirit level and correct with same mortar where necessary. The surface shall slope from all sides towards the outlets with slope not less than 1 in 48. The surface shall be allowed to dry. If any cracks appear, these shall be filled with liquid cow-dung. The consolidated thickness of mud phuska at any point shall not be less than 5 cm.

1.1.4 Mud Gobri Plaster: The surface shall then be given a coat of plaster with mud Gobri mortar 3:1 (3 mud : 1 cow dung).Cow-dung is soaked in water to free it from grass, straw, seeds and other impurities. It shall be sieved if necessary. Fine earth shall be added to this solution in the ratio of one part by volume of fine earth to one of cow-dung. The two shall be thoroughly mixed and brought to a workable state by adding water. The thickness of plaster shall be 13mm uniform throughout.

1.1.5 Paying with the brick tiles & grouting: The brick tiles of local best quality conforming to IS 2690 (Part I) shall be laid flat on the mud Gobri plaster before it dries up. The tiles shall be laid with their longitudinal lines on joints truly parallel and horizontal and right angles to the stopping edge of the roof.

As soon as the paving is done, the open joints shall be grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% crude oil or 2% integral water proofing compound conforming to IS 2645. Care shall be taken that no joints are left unfilled. The joints shall be finished flush with the brick surface. Curing shall be done for at least seven days.

1.1.6 Measurement: Shall be taken for the finished work in superficial area covered. Length and breadth shall be measured correct to a cm.

1.2 Chemical Impregnation Water Proofing External Treatment:

This treatment of water proofing basements and underground structures comprises of forming a base around the structure by creating an impermeable layer of chemical grout between the RCC structure and adjoining strata resisting water infiltration.

The process comprises of laying an impermeable layer of chemical grout horizontally between the base concrete bedding and the RCC structure and is continued and carried along the outer surface of the vertical walls upto a height of 300mm above the adjoining ground level. This proofing shall be carried out in operations as below:

a. The initial concrete course of lean concrete bed below the RCC structure shall be covered by stone slabs of approved quality and thickness. These slabs shall be set in suspension with a gap of 25 to 50mm thickness. The joints of the slab shall be sealed with cement mortar. In the suspended stone slabs layer, 25mm dia pipes shall be provided at suitable intervals for forcing the chemical grout under pressure to fill the gap. The length of the pipes shall be such as to protrude 50mm above the finished top of RCC member and shall be threaded.

b. After the RCC structural member is cast and becomes dry then short pipes provided as in para (1) above shall be connected to the chemical grout mains. The chemical grout shall then be allowed to flow through the pipes to fill the gap between the bottom of the RCC member and the base lean concrete. When the flow of the grout stops the group mains shall be disconnected.

The protruding pipes shall be then be cut to flush with the top of RCC and holes shall be sealed properly to the satisfaction of Architects.

Similar process shall be adopted for vertical faces except that in the case of RCC structural member is cast first and stone slabs are laid on the outside and chemically grouted as stated above.

c. Measurements: Shall be in square metre of the net actual surface area grouted. The length and breadth shall be measured correct to a cm.

d. Guarantee: The contractor through the specialized agency of Sub-Contractor
shall give guarantee against any leakage for a period of 10 years. Any leakage or defect during this period shall be made good by the Contractor at his own cost in a manner to be decided by the Architects.

1.3 Water Proofing Roofs with Felt Lining

a. Bitumen felt type 3 grade 1 water proofing (4 layers) conforming to IS 1322 finished with asphalt/ crushed stone chips and / or gravel.
   i. A layer of special roofing asphalt 1.45 kg per sqm.
   ii. A layer of bitumen conforming to IS 73, felt Hessian based self finished felt type 3 grade-I of approved make.
   iii. A layer of special roofing asphalt at 1.45 kg per sqm.
   iv. A layer of crushed pea size stone chips and / or gravel.

b. Bitumen felt type-3 grade-I water proofing (3 layers) with surface painted with asphalt and finished with brick tiles.
   i. A layer of special roofing asphalt @ 1.45 kg per sqm.
   ii. A layer of bitumen felt Hessain based self-finished felt type-3 grade-I of approved make.
   iii. A layer of special roofing asphalt at 1.45 kg per sqm.

1.4 Damp course lining basements water tanks and foundations:
(Materials conforming to IS 6494/1988)

a. Damp course specification (6 layers) consisting of:
   i. A layer of BRC primer @ 0.2 litres per sqm.
   ii. A layer of hot air blown asphalt @1.6 per sqm.
   iii. A layer of bitumen fibre based self finished felt type – 2 grade weighting 82 lbs per 100 sq ft. Of approved make.
   iv. A layer of hot air blown asphalt @ 1.6 kg per sqm.
   v. A layer of bitumen felt fibre based self-finished felt type-2 grade-2 of approved make.
   vi. A layer of hot air blown asphalt @ 1.6 kg per sqm.

b. Damp coursing specifications (8 layers) consisting of:
   i. A layer of BRC primer 0.25 litres per sqm.
   ii. A layer of hot air blown asphalt @ 1.6 kg per sqm.
   iii. A layer of bitumen felt Hessain based self-finished felt type-2 grade-2 of approved make.
   iv. A layer of hot air blown asphalt @ 1.6 kg per sqm.
   v. A layer of bitumen felt Hessain based self-finished felt type-2, grade-2 of approved make.
   vi. A layer of hot air blown asphalt at 1.5 kg per sqm.
   viii. A layer of hot air blow asphalt @ 1.6 kg per sqm.

Notes:

a. Roofs: After specification (b) has been laid, it will have to be protected with tiles and every care is to be taken while laying the brick or stone tiles so that the
water proofing is not damaged or punctured by the sharp edged implements or bricks, stone or walking over it with some shoes having nails, etc.

b. Basements: This water proofing is laid on the floors and taken up on the vertical walls 30cm above the ground level where a chase 50mm wide and 50mm deep is cut and the fabric tucked in. After the water proofing is laid on the floors, it will be necessary to protect the same with RCC or cement concrete thickness of which will depend on the hydrostatic pressure of sub-soil water and on the verticals by cladding wall with brick or stone masonry. Prior to the laying of RCC or cement concrete on floors, a layer of bricks is to be laid on water proofing so that the fabric is not damaged by the reinforcement bars or by the sharp edges of the ballast, etc.

c. General Conditions: The rates quoted shall include for the cost of material, labour and all charges complete at the site of work and for any preparatory / civil work found necessary prior, during or after the execution of the work which will have to be carried out and for making the surface reasonably smooth and dry by the application of cement plaster before applying water proofing felts as per specifications.

d. Guarantee: The contractor through the specialized agency of sub-contractor shall give a guarantee against any leakage for 10 years. Any leakage or defects during this period shall be made good by the Contractor through the sub-contractor at his own cost in a manner to be decided by Architects to their entire satisfaction.

e. Measurements: As actually laid at site in sqm.

1.5 Water proofing by gunniting basements, raft, tanks, walls etc.

- Preparation of Surface: Concrete surface to be gunnited shall be cleaned of all loose and foreign materials. When required the surface shall be hacked, chiselled or sand blasted to make it rough to receive gunite.

- Equipment: Only standard gunniting equipment shall be used Compressed air for the cement gun and the water tank shall be supplied by a Compressor of minimum capacity of 210 cft per minute at 100 lbs per square inch.

- Mix: The mix for guniting shall consist of 1 part cement 3 parts coarse sand. The mix shall be a little damp to prevent segregation of sand and cement during the passage through hose pipe. The water shall be so controlled at the nozzle so as to be sufficient for the hydration of cement.

- Reinforcement: Shall consist of 8 SWG IRC (or equivalent) wire at 100mm centers both ways. The mesh shall be anchored through suitable dowels in the case of vertical surfaces. The 50mm thick gunite shall have one mesh as above. Both the base and top coats shall be provided with welded wire mesh as above.

- Guniting: Shall be got done through a firm of repute as Sub-Contractor to be approved by the Architects with skilled workers, well trained in the operation of the equipment. The nozzle shall be held at right angles to the surface to be gunited at a distance of 700mm to 1000mm from the surface. The gunited surface should neither show dry spots nor bleeds and shall be cured properly for a minimum period of 14 days by spreading wet Hessain cloth over the gunited surface. The curing shall be commercial after 4 to 5 hours of the guniting operation.

- Measurements: The length and breadth of the net area gunited shall be measured and paid for per square metre.

- Guarantee: The Contractor through the specialized agency of sub-contractor shall give a guarantee against any leakages for 10 years. Any leakages or defects during this period shall be made good by the Contractor through the sub-contractor at his own cost in a manner to be decided by the Architects to their entire satisfaction.

1.6 Water proofing basements, rafts, tanks, walls etc. by using cement water proofing compound. The cement water proofing compound shall conform to IS: 2645-1964 and shall be approved by the Architects. It shall be added to the cement and content of concrete or mortar mix @ 3% by weight or as per manufacturer’s specifications.

- By water proofing compound mix while concreting pile caps, rafts, walls and retaining walls.
i. During concreting adequate dewatering measures shall be adopted by the contractor to keep the excavations and/or basements dry so that normal setting variety of cement water proofing compound can be used.

ii. If any reason concreting is to be carried out in or under water, then quick setting variety of the water proofing compound shall be used.

iii. Only sufficient quantity of water proofing compound shall be mixed as can be used with one hour for normal setting variety of water proofing compound.

b. Plastering the outside of the retaining walls with 12mm thick cement 1:3 (1 cement : 3 coarse sand) with the admixture of water proofing compound at 3% by weight of cement or as per manufacturer’s specifications.

c. Plastering the inside of the retaining walls, column walls, etc. 25mm thick over all the three layers of 12mm, 6mm and 6mm thick each in cement mortar 1:2 (1 cement : 2 coarse sand) in the 1st two layer of 12mm and 6mm thick. The last 6mm thick layer shall be in cement mortar 1:2 (1 cement : 2 fine sand). The 1st two layers shall be left rough in order to receive the subsequent layers to give adequate key. In all the 3 years water proofing compound shall be added @ 3% by weight of cement or as per manufacturer’ specifications.

d. Laying: 37 to 50mm thick cement concrete floor over rafts with an ad-mixture of cement water proofing compound as per manufacture’s specifications.

e. Guarantee: The contractor through the specialized agency of sub-contractor shall give a guarantee against any leakage for ten (10) years. Any leakage or defects during this period shall be made good by the contractor through the sub-contractor at his own cost in a manner to be decide by the Architects to their entire satisfaction.

f. Measurements: Water proofing compound shall be measured and paid separately by weight. The other items shall be measured and paid separately by weight. The other items shall be measured under relevant items of schedule of quantities.

1.7 Protection treatment of terraces against solar heat and moisture.

1.7.1 This work shall be done by a competent firm as approved by the Architects.

a. China mosaic 3 layer treatment:

Preparation of Surface: The final proof terrace after water proofing shall be smooth finished with cement plaster 1:4 (1 cement: 4 fine sand) to receive the following treatment:

i. A layer of BRC primer @ 0.2 litres per sqm.

ii. A layer of roofing asphalt @ 1.45 kg per sqm.

iii. A layer of broken glazed tiles of odd sizes and shapes with as close joints as possible grouted with white cement.

1.7.2 Measurement: Shall be in square metre correct to two decimal places. Length and breadth of actual work shall be measured correct to a cm.

1.8 Water Proofing Basements using “kota” stone i.e. Tanking

1.8.1 This work shall be done by a competent firm as approved by the architect.

1.8.2 The material for tanking shall be as under:

a) Kota Stone: 16-24 mm thickness with average thickness of 20 mm rough kota stone shall be used in the work.

b) Water Proofing Compound / Chemical: As recommended and approved by the architect.

1.8.3 The steps followed shall be as under:
a) After laying of PCC for raft or footing, construct half brick wall and plaster the wall in cement mortar 1:5 (one part of cement and 5 parts of coarse sand) with waterproofing compound as recommended. The height of the brick wall shall be of the same as that of the raft or footing.

b) Kota stone is then laid on top of PCC over a bed of cement sand mortar bed, 25 mm thick, (1 cement and 3 sand) admixed with impermeable chemical. The gap between the adjacent edges of the Kota stone shall be kept about 12 mm which shall be sealed with cement sand mortar 1:2 admixed with impermeable chemical. Another layer will then be repeated as explained above. Finally, a layer of cement sand mortar 1:4 of 25 mm thickness is laid on top of the rough kota stone with stone grit (Zeera) sprinkled on top.

c) After laying of RCC raft and casing of the walls, a single layer of kota stone, as explained above is upturned from the brick wall and then taken up on the walls with the same specifications as given above.

1.8.4 Measurements: Shall be in square metre correct to two decimal places. Length and breadth of the actual work shall be measured correct to a cm.

1.9 Brick Coba Water Proofing:

1.9.1 Brick Coba Water Proofing shall be carried out using brick bats and chemical approved by the Architect/Engineer in charge. The procedure followed shall be same as given in schedule of quantities and the specifications of work laid down by CPWD.

1.9.2 Measurements: Shall be in Square meters correct to two decimal places. length and breadth of the work shall be measured correct to a centimeter.

1.10 All water proofing work shall carry a guarantee for a minimum period of 10 (ten) years for roof and 20 (Twenty) years for the basement. The contractor will submit a guarantee bond in the proforma prescribed by the architect.

1.11 All waterproofing shall be executed through specialised agency as approved by the Architect. The agency, approved for waterproofing work, before commencing the job, will submit the proposal to the Architect outlining the methodology, the chemical to be used etc. The proposal will then be studied by the Architect and the proposal, if approved, the agency will be permitted to proceed with the work.
CHAPTER 8

STANDARD TRADE SPECIFICATION

FOR

STRUCTURAL STEEL WORK
1.0 GENERAL
1.1 This specification covers the supply, fabrication, transportation to site and erection on prepared foundations, structural steel work consisting of columns, beams, flooring, hand railing etc. for pipe racks, equipment, supporting structures, platforms etc.
1.2 Fabrication, erection and approval of steel structures shall be in compliance with:
   - These general specifications and IS: 800.
   - Drawings and supplementary drawings to be supplied to the contractor during execution of the work.
   - List of drawings that will be prepared by the main contractor.
   - Schedule of rates given in this document.
1.3 In case of conflict between the clauses mentioned here and the Indian Standards, those expressed in this specification shall govern.

2.0 SCOPE
This fabrication and erection of the steel work consist of accomplishing of all works herein enumerated including providing all labour, tools and plants, 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 Indian Standards. The work shall be executed in a workman like manner to the complete satisfaction of the Architects.

3.0 FABRICATION DRAWINGS
3.1 Fabrication and erection drawings shall be prepared by the contractor in AutoCAD R-14, or latest release on the basis of design drawings supplied to him & submit the same to Architects for review in triplicate. Architects may review at his option some, all or none of fabrication drawings. Wherever such reviews are carried out the same shall be restricted to the following:
   - Structural layout, orientation and elevation of structures and members.
   - Size of members.
   - Adequacy of critical connections and joints for required strength.
   - Making drawings.
   - Shop/field welding details from view point of erection.
3.2 In case, on review of Architect, the drawings need to be corrected, one copy of drawing submitted by the Contractor shall be returned to him and Contractor shall incorporate the amendments and submit three copies of amended drawings for final review. In case where ARCHITECTS does not review the drawings, the architect shall return one copy of drawings, stamped “Not reviewed proceed at Contractor’s responsibility” to the contractor for further action.
3.3 Fabrication drawings shall include the following:
   - Reference to the ARCHITECTS Drawing No.
   - Structural layout and elevations
   - Making drawings.
   - Sizes of structural members
   - Adequacy of connections and joints
   - Design and detailing of structural joints for required Strength and Erection.
   - Type and dimension of welds and bolts
• Shapes and size of edge preparation for welding
• Details of shop and field joints included in the assembly
• Bills of materials along with total weight for each marked member on the drawing itself.
• Quality of structural steel, welding electrodes, bolts, nuts and washers to be used.
• Erection assemblies identifying all transportable parts and sub-assemblies associated with special erection instructions, if required.

3.4 Review by ARCHITECTS fully/ partially on non review of fabrication drawings submitted by contractor shall not absolve the contractor of his responsibility and he shall modify / rectify the structures at any stage of work when pointed out by Architects that such work is not in conformity with specification and / or standard practice. Schedule for review of fabrication drawings has to be worked out mutually.

3.5 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 same, these shall also be submitted for approval.

3.6 Any alternate design or change in section is allowed when approved in writing by the Architects.

3.7 Minor modifications during erection / fabrication is considered to be included in the given price.

3.8 However, if any variation in the scheme is found necessary later, the contractor shall incorporate these changes in his shop drawings at not extra cost and resubmit for review.

3.9 The contractor shall supply six prints each of the final reviewed drawings to Architects within a week from the date of final review, at no extra cost for reference and record of owner / Architects.

3.10 The Architects will verify the correct interpretation of his requirements.

3.11 If any modification is made in the design drawing during the course of execution of the work, 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 part the above clauses.

4.0 MATERIALS

4.1 Rolled Sections
The following grades of steel shall be used for steel structure.

4.1.1 Structural steel shall be of standard quality conforming to IS: 2062. The vendor shall also supply a conformity by certificate from the manufacturer.

4.1.2 Carbon steel for pipes as per IS: 1161 of grade YST-25.

4.2 WELDING MATERIAL

4.2.1 Welding electrodes shall conform to IS: 814.

4.2.2 Approval of welding procedures shall be as per IS: 823.

4.3 BOLT, 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 x \( \sqrt{A} \). Where \( A \) is the original cross sectional area of the gauge length. Washers shall be as per IS: 2016. Only Bolts & nuts for equipment erection shall be hot dip galvanized.

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 Architects in writing.

Any defective material used, pointed out at any stage of work, shall be replaced by Contractor at his own expense, care shall be taken to prevent any damage to the other portion of work during removal.

4.4.1 Nuts, Bolts and Washers fixing equipment to structures, as well as those required for joints shall be deemed to be included in the rates of structural steel.
4.5 RECEIPT AND STORING OF MATERIALS
4.5.1 Each rolled section must be marked for identification and each lot should be accompanied by manufacturer’s quality certificate, conforming chemical analysis and mechanical characteristic.
4.5.2 All steel parts furnished by supplier shall be checked, sorted out, straightened, and arranged by grades and qualities in stores.
4.5.3 Structural steel with surface defects such as pitting, cracks, laminations etc shall be rejected if the defects exceed the allowable tolerances specified in relevant standards.
4.5.4 Welding wire and electrodes shall be stored separately by qualities and lots inside a dry and enclosed room in compliance with IS: 816 and as per instructions given by Architects. Electrodes shall be perfectly dry and drawn from an electrode oven, if required.
4.5.5 Checking of quality of bolts and any kind as well as storage of same shall be made conforming to relevant standards.
4.5.6 Each lot of electrodes, bolts, nuts etc. shall be accompanied by manufacturer’s test certificates.
4.5.7 The contractor may use alternative materials as compared to design specifications only with the written approval of Architects.

4.6 MATERIALS TESTS
4.6.1 Contractor shall not required to produce manufacturer’s quality certificate for the material or wherever 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 Architects, at no extra cost, in approved test houses.
4.6.2 Materials for which test certificates are not available or for which results do not tally with relevant standard specification, shall not be used.

5.0 FABRICATION
5.1 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 for the same. The connections shall be welded or bolted as per design drawings. Work shall also include fabricating built up sections. (Fabrication of basic rolled sections equivalent from plates is not included).
Any defective materials used shall be replaced by contractor at his own expenses, 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.

5.2 PREPARATION OF MATERIALS
5.2.1 Prior to release for fabrication, all rolled sections warped beyond allowable limits shall be pressed or rolled straight and free from twists, taking care that a uniform pressure is applied.
5.2.2 Minor wrappings, corrugations etc, in rolled sections shall be rectified by cold working.
5.2.3 The sections shall be straightened by hot working where the Architects so directs and shall be cooled slowly after straightening.
5.2.4 Warped members like plates and flats may be used as such only if wave like deformation does not exceed L/1000 but limited to 10mm (L=Length).
5.2.5 Surfaces of members that are to be joined by tap or fillet welding or bolting shall be even so that there is no gap between overlapping surfaces.

5.3 MARKING
5.3.1 Making of members shall be made on horizontal pads, or on appropriate racks or supports in order to ensure horizontal and straight placement of such members.
5.3.2 Each structural component shall refer to the relevant vendor drawing.
5.3.3 Marking accuracy shall be at least ± 1mm.

5.4 CUTTING
5.4.1 Members shall be cut mechanically (by saw or shear) or by oxyacetylene flame.
5.4.2 All sharp, rough or broken edges and all edges of joints which are subjected to tensile or oscillating stresses, shall be ground.
5.4.3 No electric metal are cutting shall be allowed.
5.4.4 All edges cut by oxyacetylene process shall be cleaned of impurities and slag prior to assembly.
5.4.5 Cutting tolerances shall be as follows:
   (a) For members connected at both ends ±1mm.
   (b) Elsewhere ±3mm.

5.4.6 The edge preparation for welding of members more than 12mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough.

5.4.7 Edge preparation shall be as per IS: 823.

5.5 DRILLING

5.5.1 Bolt holes shall be drilled.

5.5.2 Drilling shall be made to the diameter specified in drawings.

5.5.3 No enlarging of holes by filling, man drilling or oxyacetylene flame shall be allowed.

5.5.4 Allowable 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 ±1mm.
   Two perpendicular diameters of any oval hole shall not differ by more than 1mm.

5.5.6 Drilling faults in holes may be rectified by reaming holes to the next upper diameter, provided that spacing of new hole centres and distance of hole centres to the edges of members are not less than allowed and that the increases of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the numbers of faulty holes does not exceed 15% of the total number of holes for one joint.

5.6 BENDING

5.6.1 Bending of plates, flats and sections shall be carried out on bending rolls or in presses.

5.6.2 Cold bending may be accepted when bending radius is equal or more than
   - 25 times member thickness for plates and flats.
   - 25h or 25b for rolled steel beams and channels according to bending plate.
   - 45b for angle.
   Where h = section height and b = flange width.

5.6.3 When bending radius is less than that indicated in 5.6.2 bending shall be done on hot metal by heating the member up to 850-900 deg C light red radiances. Cooling shall be done slowly as directed by Architects.

5.6.4 Bending shall be discontinued when temperature drops below 500°C.

5.6.5 Accuracy of bending operations shall be checked by means of templates and the clearance between member and template shall not be more than 1mm.

5.6.6 Bent members shall not have cracks or deep indentations from bending equipment.

5.7 PREPARATION OF MEMBERS FOR WELDING

5.7.1 Assembly of structural members shall be made with proper jigs fixtures to ensure correct positioning of members (angles, axes, nodes etc.)

5.7.2 Sharp edges, rust of cut edges, notches, irregularities and fissures due to faulty cutting shall be chipped or ground or field over the length of the affected area, deep enough to remove faults completely.

5.7.3 Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint.

5.7.4 Generally no special edge preparation shall be required for members under 8mm thick.

5.7.5 Edge preparation (bevelling) denotes cutting of the same so as to result in V, X, K or U seam shapes as per IS: 823.

5.7.6 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 into the gaps between members to be welded.

5.7.7 Before assembly, the edges to be welded as well as adjacent areas extending for at least 20mm shall be cleaned (until metallic polish is achieved).

5.7.8 When assembling members, proper care shall be taken of welding shrinkage and distortions, as per the drawings and dimensions cover finished dimensions of the structure.

5.7.9 The elements shall be got checked and approved by the Architects of his authorized representative before assembly.

5.7.10 The permissible tolerances for assembly of members preparatory to welding shall be as per IS: 823.

5.7.11 After the assembly has been checked, temporary tack welding in position shall be done by
electric welding, keeping in view finished dimensions of the structure.

5.7.12 Pre-heating of members to be joined to be carried out as per standards wherever necessary.

5.8 WELDING PROCEDURE

5.8.1 Welding shall be carried out only by fully trained and experienced welders as tested and approved by the Architects or his representative or the inspectors constituted by them for such tests and the cost involved there on shall be borne by the contractor himself.

5.8.2 Qualification tests for welders as well as tests for approval of electrodes will be carried as per IS: 823. The nature of test for performance qualification of welders shall commensurate with the quality of welding required on this work as judged by the Architects.

5.8.3 The steel structures shall be automatically, semi-automatically or manually welded.

5.8.4 Welding shall begin only after the checks shown under 5.7 have been carried out.

5.8.5 Welding procedures and tests for welders shall be conducted as per IS: 823 and approved by the Architects.

5.8.6 The welder shall mark with his identification mark on each element welded by him.

5.8.7 When welding is carried out in open air, steps shall be taken to protect the place of welding against wind or rain. The electrodes, wire and parts being welded shall be dry.

5.8.8 Before beginning the welding operation, each joint shall be checked to assure that the parts to be welded are clean and root gaps provided as per IS: 823.

5.8.9 For continuing the welding of seams discontinued due to some reason, the end of the discontinued seam 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 approximately 50mm.

5.8.10 For single but welds (in V, 1/2V or U) and double butt welds (in K, double U, etc.) the rewelding of the root butt is mandatory but only after the metal deposition on the root has been cleaned by back gouging or chipping.

5.8.11 The welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any method.

5.8.12 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.

5.8.13 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.

5.8.14 The defects in welds must be rectified according to IS: 823 and as per instruction of Architects.

5.9 WELD INSPECTION

5.9.1 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, undercuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible limits.

5.9.2 During the welding operation and approval of finished elements, inspections and tests shall be made as given in Indian Standards and Specification for CPWD

5.9.3 The mechanical characteristic of the welded joints shall be as in IS: 823.

5.10 PREPARATION OF MEMBERS FOR BUILDING

5.10.1 The members shall be assembled for bolting with proper jigs and fixtures to sustain the assemblies without deformation and bending.

5.10.2 Before assembly all sharp edges, shaving, rust, dirt etc. shall be removed.

5.10.3 Before assembly, the contacting surface of the members shall be cleaned and given a coat of primer as per IS: 2074.

5.10.4 The member which are bolt assembled shall be set according to drawings and temporarily fastened with erection bolts (minimum 4 pieces) to check if holes are coaxial.

5.10.5 The member shall be finally bolted after the deviations have been corrected, after which there shall not be gaps.

5.10.6 Before assembly, the member shall be checked and got approved by the Architects.

5.10.7 The difference in thickness of the sections that are butt assembled shall not be more than 3%
or maximum 0.8mm whichever is less. If the difference is large, it shall be corrected by grinding or filling.

5.10.8 Reaming of holes to final diameter or cleaning of these, shall be done only after the parts have been checked and assembled.

5.10.9 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.

5.11 BOLTING UP

5.11.1 Final bolting of the members shall be done after the defects have been rectified and approval of joints obtained.

5.11.2 The bolts shall be tightened starting from the centre of the joints towards the edge.

5.12 PLAINING OF ENDS

5.12.1 Plaining of ends of members like column ends shall be done by grinding when so specified in the design.

5.12.2 Plaining of butt welded members shall be done after these have been assembled and the sharp edge shall be removed with grinding machine or files.

5.12.3 The following tolerances shall be permitted on member that have been planed.

- For one length of the member having ends planed, maximum + 2mm with respect of design.
- Level differences of planed surfaces, maximum 0.3mm.
- Deviation between planed surface and member’s axis, maximum 1/1500.

5.13 HOLES OF FIELD JOINTS

5.13.1 Holes for field joints shall be drilled in the shop to final diameters and tested in the shop, with trial assemblies. Gas cutting of holes shall not be permitted.

5.13.2 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 Architects.

5.13.3 For bolted steel structures, trial assembly in shop in mandatory.

5.13.4 The tolerances for spacing of holes shall be + 1mm.

5.14 TOLERANCES

5.14.1 All tolerances regarding dimensions, geometrical shapes and sections of steel structures, shall be as mentioned above and specified in the drawing.

5.15 MARKING FOR IDENTIFICATION

5.15.1 All elements and members prior to dispatch for erection shall be shop marked.

5.15.2 The members shall be visibly marked with punch type marking. The size and thickness of the numbers shall be so chosen as to facilitate the identification of members.

5.15.3 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.

5.15.4 Each bundle of crate shall be packed with members of the same assembly in the same bundle or crate, general utility members such as bolts, gussets etc. may be packed.

5.15.5 All bills of materials showing weight, quality and dimension of contents shall be placed in the crates.

5.15.6 The members shall be marked with punch type in a visible location, preferably at one end of the member so that these may be easily checked during storage and erection.

5.15.7 The members shall be marked in the shop before inspection and acceptance and shall have reference to the relevant vendor drawing.

5.15.8 When the member is being painted the marking area shall not be painted but bordered with white paint.

5.15.9 The marking and job symbol shall be registered in all shop delivery documents (transportation, of erection etc.)

5.16 SHOP TEST PRE-ASSEMBLY

5.16.1 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.

5.16.2 In case one member does not meet the limiting deviations specified in the general specification in pre-assembly shop test, all members shall be shop tested.
5.16.3 For bolted steel structures, shop test pre-assembly, is mandatory for all elements as well as for the entire structure in conformity with clause 5.3.

6.0 SHOP INSPECTION AND APPROVAL

6.1 GENERAL
The Architects or his representative shall have free access at all reasonable times to the contractor's fabrication shop and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with drawings and specifications.

6.1.1 Technical approval of the steel structure in the shop by the Architects is mandatory.

6.1.2 The contractor shall not limit the number and kinds of tests, final as well as intermediate ones, but arrange to conduct extra tests requested by the Architects.

6.1.3 The contractor shall furnish necessary tool gauges, instrument etc. and technical and non-technical personnel for shop tests to the Architects free of cost.

6.2 SHOP ACCEPTANCE

6.2.1 The following approval may be given in shop:

- Intermediate approvals of work that cannot be inspected later.
- Partial approvals.
- Financial approvals.

6.2.2 Intermediate approvals of work shall be given when:

- A part of work is performed later.
- Inspection would be difficult to perform and results not be satisfactory.
- Cannot be inspected later.

6.2.3 Partial approval in the shop is given on members and assemblies of steel structures before the primer coat is applied and includes:

- Approval of material
- Approval of field joints
- Approval of part for correct application of surface preparation
- Test erection
- Approval of members based on dimensional conformity and visual aspect of the material used.
- Approval of marking
- Inspection and approvals of special features, like rollers, loading platform mechanism etc.

6.2.4 During the partial approval, intermediate approvals as well as former approvals shall be taken into consideration.

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.

6.3.2 The final approval comprises of:

- Partial approvals
- Approval of shop primer coat
- Approval of mode of loading and transport
- Approval of storage (for material stored)
7.0 PACKING, TRANSPORTATION, DELIVERY
7.1.1 After final shop acceptance and marking, the item shall be packed and loaded for transportation.
7.1.2 Packing must be adequate to protect items against warping during loading and unloading.
7.1.3 Proper lifting devices shall be used for loading, in order to protect items against warping.
7.1.4 Slender projecting parts shall be braced with additional steel bars before loading for protection against warping during transportation.
7.1.5 Loading and transportation shall be done in compliance with transportation rules.
7.1.6 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 Architects.
7.1.7 Items must be carefully loaded on platforms for transportation means to prevent warping, bending or falling, during transportation.
7.1.8 The small parts such as fish plates, gussets etc. shall be securely tied with wire to their respective parts.
7.1.9 Bolts, nuts and washers shall be packed and transported in crates, marked in at-least 2 places with water-resistant paint.
7.1.10 The parts shall be delivered in the order stipulated by the Architects and shall be accompanied by documents showing:
   - Quality and quantity of structure of members
   - Position of members in the structure
   - Particulars of structures
   - Identification number/job symbol

8.0 FIELD ERECTION
8.1 The contractor shall satisfy himself about the level, alignment, etc. for the foundations well in advance, before starting the erection. Minor chipping etc. shall be carried out by the contractor at his expense.
8.2 Any faulty erection as under, done by the contractor shall be made good at his cost.
   - Accuracy in alignment of structures.
   - Erection according to drawings and specifications.
   - Progress and workmanship
8.3 In case there be many deviations regarding positions of foundations, or anchor bolts, which would lead to erection deviations, the Architects shall be informed immediately. Minor rectifications in foundations, orientation of bolts holes etc. shall be carried out as a part of the work, at no extra cost.
8.4 The various parts of the steel structure shall be so erected as to ensure stability against inherent weight, wind and erection stresses.
8.5 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 Architects.
8.6 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.

9.0 FINAL ACCEPTANCE AND HANDING OVER OF STRUCTURE
9.1 At acceptance the contractor shall submit the following documents:
   (i) Shop and erection drawings – either in tracings or reproducible.
   (ii) 6 copies each of the following:
   - Shop acceptance documents
   - Quality certificates for structural, plates etc. (electrodes, welding wire, bolts, nuts, washers etc.)
   - List of certified welders who worked on erection of structure.
10.0 PAYMENT

10.1 Payment for steel work shall be made on the basis of admissible weight of the structure accepted, the weight being determined as described in clauses 10.2 below. The rate of fabrication and erection shall include cost of all handling and transport, delivery to owner's store/site work trimming, straightening, edge preparation, preparation and getting a review of fabrication drawings, providing scaffolding, temporary supports, tools and tackles, touching up primer coat and providing one coat of primer and two coats of approved final painting unless specified otherwise, and grouting etc. complete.

10.2 The weight for payment will be assessed from the approved fabrication drawings and to respective bill of materials prepared by the contractor and approved by the Architects. The weight of structural material / plate shall be calculated wherever necessary on the basis of IS Handbook and the same shall be adopted. No allowance in weight shall be made for rolling tolerance.

10.3 Sections built out of plates 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 deduction shall be made for skew cuts in rolled steel section.

10.4 Welds, bolts, nuts, washers etc. shall not be measured. Rate for structural steel work shall be deemed to include the same.

10.5 No other payment either for temporary work connected with this contract or for any other item such as welds, shims, packing plates, etc. shall be made. Such items shall be deemed to have been allowed for in the rate quoted for steel work.

11.0 GROUTING OF POCKETS

11.1 Grouting of pockets and under base plates will be done only after the steel work has been leveled and plumbed and the basis of stanchions is supported by steel shims. The space below the base plate and pocket shall be thoroughly cleaned.

11.2 The Mortar used for grouting shall not be leaner than 1:2 (1 cement : 2 sand) and shall be mixed to the minimum consistency required. It shall be poured under a suitable head and tamped until the space has been completely filled.

12.0 TOLERANCES ALLOWED IN THE ERECTION OF PLANT BUILDING WITHOUT CRANES

The maximum tolerances for line and level of the steel work shall be _+ 3.0mm on any part of the structure. The structure shall not be out of plumb more than 5.0 mm on each 10M section of height and not more than 8.0 mm per 30M section. These tolerances shall apply to all parts of the structure unless the drawings issued for erection purposes state otherwise.
CHAPTER 9

STANDARD TRADE SPECIFICATION

FOR

MISCELLANEOUS STEEL WORK
1.0 **ANCHOR BOLTS**

1.1 All materials supplied by the contractor shall be of tested quality as per specifications below and test certification of raw materials shall be provided by the contractor.

(a) Bolts conforming to IS 1367 shall be turned from M.S. conforming to IS: 2062 and IS: 432 Grade –I.

(b) Nuts shall be hexagonal type conforming to IS: 1363-3138.

(c) Plain washers shall be of mild steel conforming to IS: 2062.

(d) Sleeves shall be of M.S. of Tubes (Medium) conforming to IS: 1239.

1.1 **FABRICATION:**

Fabrication of anchor bolts shall be in compliance with the specifications. Complete anchor bolt assembly shall be as per drawings, and will include the cot of sleeve pipes, fine gussets, bottom plates, and other fixtures including all welding work if involved.

(a) Threads shall be of coarse type conforming to IS: 1367 and IS: 4218.

(b) Plain washers shall be of mild steel conforming to IS: 2016.

(c) Bolt shall conform to IS: 1367.

1.2 The anchor bolt assembly to the anchored or embedded in concrete shall be placed and securely held in position strictly as per drawings before and during pouring of concrete, with necessary wooden or steel templates and other devices.

1.3 Tolerances allowed for anchor bolts positioning shall be:

- For sleeved bolts, one tenth of bolt nominal diameter.
- For bolt without sleeves. One twentieth of the bolt nominal dia.

1.4 The surface not to be covered with concrete shall be greased and protected from damage by wrapping and trying jute cloth / polythene.

1.5 **PAYMENT**

1.5.1 Payment for supply and fabrication of anchor bolts including sleeves and nuts shall be on weight basis of the finished product and shall include greasing etc. welding, if required etc. got approved from Architects.

1.5.2 Payment for fixing where separately specified shall be on weight basis and rate shall be including carting, fixing, greasing, providing and trying hessian cloth, welding if required etc. complete.

2.0 **M.S. METAL INSERTS**

2.1 All metal inserts and its fabrication, bolting, rivetting, welding etc. shall conform to the requirement specified under “Specification for Structural Steel”. The metal inserts shall be fabricated as per drawing and drawing and direction of the Architects.

2.2 The placement of the metal inserts shall be in brick masonry, plain or reinforced concrete members. It shall be so security placed in the member that its position is not disturbed while concreting. Suitable templates, spacer blocks, dummy structures and staging shall be provided. Necessary cutting in the shuttering and adjustment of reinforcement shall be effected for the placement of metal inserts if situation so desire. Where so indicated, it shall be welded to the reinforcement.

2.3 The exposed surfaces shall be given one coat of red oxide primer and where directed, protected by jute cloth wrapping and tying.

2.4 **PAYMENT**

Payment shall be made on the basis of actual weight of the metal inserts. Rate for metal inserts shall include supply, fabrication, fixing, turning, tack welding, welding on other embedded items such as Pipe (for puddle flanges) cutting and adjusting the shuttering, and reinforcement and dry packing, if required with cement mortar 1:3, painting, protecting with jute cloth etc. complete.

3.0 **M.S. CHEQUERED PLATE**

3.1 Chequered plates shall be 6mm thick (7mm min. over chequers) and shall conform to IS: 3502. Steel for chequered plate shall conform to IS: 2062. It shall be rolled and shall be free from harmful surface defects such as cracks, surface flaw etc. The plates shall be cut to shape and fixed to bearing members as shown in the relevant drawings and as directed by Architects. The edges shall be made smooth and no burs or jagged ends shall be left. The plates may be spliced with prior consent of Architects but in that case care should be taken so that there is continuity in the pattern of the plates between the two portions.
3.2 PAYMENT
Payment shall be made on the basis of weight of chequered plates actually laid. The rate shall include cost of cutting to size, making holes to required shape, smoothing ends, transporting and welding, bolting, fixing in positions etc. Complete. No deductions will be made for openings up to size of 300mm square.

4.0 M.S. GRATING
4.1 The gratings shall be of following two types.
Type – I – Site fabricated as per the drawings.
Type – II – Shop fabricated / bought out type as per Contractor’s / Supplier’s designs, using Contractor’s materials.
4.2 Material: Both the types of gratings shall be fabricated, out of M.S. flats. The steel shall conform to IS: 2062 and shall be of weldable quality. It shall be clearly rolled and shall be free from harmful surface defects.
4.3 Fabrication Drawings: Based on the arrangement of supporting beams on design drawings, the Contractor shall prepare shop fabrication drawings and get the same approved as per the procedure outlined for shop fabrication drawings for structural steel work.
4.4 TYPE I GRATINGS
These shall be fabricated at site as per the design drawings supplied to the Contractor and as per the approved shop fabrication drawings prepared by the Contractor.
4.5 TYPE II GRATINGS
4.5.1 These shall be of ready made bought out type and designed to carry specified loads with limitations on permissible deflections.
4.5.2 Unless otherwise mentioned in schedule of rates these shall be capable of carrying a uniformly distributed load of 500 kg. per square metre or a concentrated load of 1000 kg. at mid span, whichever is governing. The maximum span for the above loading condition shall be 1200 millimeters. The deflection shall not exceed span/200 or 6mm whichever is less. The design shall be done as per IS: 800. Before fabrication or procurement the contractor shall submit the design calculations, drawings and manufacturer’s literature and get the same approved from Architects.
4.5.3 The gratings for stair treads shall be provided with no signs of chequered plate of approved size and thickness.
4.6 PAYMENT
4.6.1 Type I gratings shall be paid on the basis of the area of M.S. Gratings and frame actually laid.
4.6.2 Type II gratings shall be paid on the basis of the area of M.S. Gratings and frame actually laid.
4.6.3 For both the types, the rate shall include cost of preparation of fabrication drawings, calculations, cost of cutting to size, fabricating, welding, bolting, smoothing ends if necessary, hot dip galvanizing, transporting and fixing in positions by welding or clips as per the design drawings. Full deductions shall be made for all openings above 300mm² sizes. The rates shall also include all incidental costs and charges such as carriage, octroi, loading, unloading, storing, safe custody, watch and ward, returning back of surplus materials to godown of issue where applicable.

5.0 M.S. TUBES FOR HAND ROLLS
5.1 All mild steel tubes and fittings shall conform to IS: 1239 and shall be of medium grade. All screwed pipes shall have threads as per IS: 554. All fittings shall be malleable iron fittings as approved by Architects.
5.2 All pipes shall either be directly welded or jointed with screwed couplings. Care shall be taken to remove burrs from the ends of the pipe and if required the vertical members should be grouted with cement mortar as specified. The pipe shall be fixed to pipe or angle uprights by means of suitable clamps or by means of welding. After fixing, the pipe shall be painted with two coats of white paint or aluminium paint over a coat of primer as directed by Architect.
5.3 PAYMENT
The payment shall be made on running metre basis of the actual length of hand rail and shall include the cost of pipes, clamps and fittings, if any, transportation, cutting of pipes as required, threading or welding, fixing, painting etc. all complete as per direction of the Architects.

6.0 M.S. RUNGS
6.1 M.S. bars used for rungs shall conform to IS: 432 and shall be fixed in position as per details drawings and directions of Architects.
6.2 **PAYMENT**
Payment shall be made on the basis of actual weight in kilogram (kg) of the M.S. rungs.

7.0 **EXPANSION FASTENERS**

7.1 **SCOPE**
This specification deals with the use of expansion fasteners for providing fixtures to concrete surfaces.

7.2 **BROAD CLASSIFICATION OF EXPANSION FASTENERS**

7.2.1 **Expansion Dowels (E.D.) Type:** The outer diameter for these fasteners is equal to the diameter of the mounting hole of the fixtures. Therefore, these can be installed directly through the mounting hole of the fixture kept in position.

7.2.2 **Threaded Expansion Shield (T.S.) Type:** The outer diameter of this type of fasteners is larger than the diameter of the mounting hole of the fixture. Therefore these are to be installed at a marked location and expanded before the fixture can be placed in position and secured through us mounting holes by means of bolts.

7.3 **HOLDING POWER OF EXPANSION FASTENERS**

7.3.1 **EXPANSION DOWELS**

<table>
<thead>
<tr>
<th>Thread Size (mm)</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
<th>22</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Thickness of fixture (mm)</td>
<td>25</td>
<td>40</td>
<td>50</td>
<td>50</td>
<td>60</td>
<td>65</td>
</tr>
<tr>
<td>Min. Axial Holding Power-Static (Kg.)</td>
<td>400</td>
<td>600</td>
<td>800</td>
<td>1100</td>
<td>1400</td>
<td>2000</td>
</tr>
<tr>
<td>Min. Shear load (Kg.)</td>
<td>620</td>
<td>1095</td>
<td>1710</td>
<td>2470</td>
<td>3360</td>
<td>4390</td>
</tr>
</tbody>
</table>

7.3.2 **EXPANSION SHIELD**

<table>
<thead>
<tr>
<th>Bolt dia with B.S.W. (mm)</th>
<th>10</th>
<th>12</th>
<th>16</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thread (mm)</td>
<td>20</td>
<td>25</td>
<td>25</td>
<td>37</td>
</tr>
<tr>
<td>Size of Hole (mm)</td>
<td>14</td>
<td>20</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Min. Axial holding power-Static (Kg.)</td>
<td>400</td>
<td>600</td>
<td>800</td>
<td>1200</td>
</tr>
<tr>
<td>Min. shear load (Kg.)</td>
<td>620</td>
<td>1095</td>
<td>1710</td>
<td>2470</td>
</tr>
</tbody>
</table>

7.4 **SELECTION OF EXPANSION FASTENERS**
The Contractor shall submit to the Architects for his approval manufacturer's specification and samples of specified expansion fasteners.

7.5 **INSTALLATION PROCEDURE**
The Contractor shall install the expansion fasteners at the specified places according to the approved manufacturer's specification with the help of necessary tools specified by the manufacturers with the prior approval of Architects. The contractor shall obtain the approval of Architects. The contractor shall obtain the approval of Architects for every installation of expansion fasteners in regard to its correct location and strength.

7.6 **PAYMENT**
Payment shall be made on number basis. The rate shall include cost of fasteners, nuts, washers and bolts of required size, necessary scaffolding, drilling with electric drill, labour, materials etc. complete.
CHAPTER 10
STANDARD TRADE SPECIFICATION
FOR
MISCELLANEOUS WORK
1.0 MISCELLANEOUS

1.1 Barbed Wire Fencing with Angle iron posts and struts:

a. Angle iron posts and struts: These shall be of MS angle iron 50x6mm. The length shall be as directed by the Architects.

b. Barbed wire: Shall be GI as specified and shall conform to IS: 278-1978. The weight shall not be less than 9.38 Kg per 100 Rm

i. The line and point wire shall be circular in section, free from scales and other defects and shall be uniformly galvanized. The line wire shall be continuous lengths and shall be generally free from signs of welds. It shall be able to withstand wrapping and unwrapping and turns round its diameter.

ii. The barbed wire shall consist of two splices per reel. The barbed wire shall be formed by twisting two line wires, one containing the barbs. The barbs shall carry four points, formed by twisting two point wires, each two turns, tightly round one line wire, making altogether 4 complete turns. The four points of the barbs shall be so set and locked at right angles to each other and shall be not less than 13mm and not more than 18mm in length.

c. Spacing & fixing of posts & Struts: The posts shall be spaced 3 metres centre to centre, unless otherwise specified or as directed by the Architects to suit the dimensions of the area to be fenced. Every 13th, last but one, end post and corner post shall be strutted on both sides and end post on one side only.

I. For posts pit 30x30cm and 30cm deep or as directed shall be left in brick walls true to line and level. For struts pits 45x30x45cm deep or as directed shall be left in brick masonry wall to suit the inclination of the struts so that it is surrounded by concrete not less than 15cm at any point.

II. The pits shall be filled with a layer of 15cm thick cement concrete 1:2:4. The posts and struts shall then be placed in the pits, true to line and position and cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size) filled in flush with the top of wall. The concrete shall be watered for at least 7 days to ensure proper curing.

III. For fixing posts in ground the size of the pits to be excavated shall be 45x45x75 cm deep and concrete block shall be filled 15cm below ground level. For the struts, the size of excavation shall be 70 x 45 x 70 cm.

d. Fixing of Barbed Wires: The barbed wire shall be stretched and fixed in number of rows specified and two diagonals, the bottom row shall be 14cm above the top of wall or ground and the rest at 12.5 cm center to center. The diagonals shall be weaved through the horizontals and stretched between adjacent post from top wire of one post to the bottom wire of the 2nd post. The barbed wire shall be held to angle iron post by means of GI staples. Straining bolts shall be used at the end post.

e. Measurement: The length of fencing shall be measured correct to a cm for the finished work and height correct to a cm from top of wall or ground to the top edge of the post.

f. Rates: The rate shall be per sq mtr or per running mtr. As specified. It shall include the cost of labour and materials involved in all the above operations, including the cost of posts, struts, straining bolts, making of pits in brick wall and of ground and concrete and painting angle iron posts and struts.

1.2 Pre Construction Anti-Pest treatment against termites & white ants:

1.2.1 GENERAL
This specification covers the Anti-termite treatment to foundations and wood work.

1.2.2 SCOPE OF WORK
Contractor shall treat the foundation trenches, soil for back filling and trenches, rammed earth surface under plinth and all wood work coming in contact with wall or flooring as per drawing and specifications and as per IS 6313 (Part II)
The chemicals to be used shall be CHLOROPYRIPHOS, LINDANE or other approved equivalent diluted to 1% emulsion concentrate obtained by mixing water to higher emulsion concentrate of chemicals available in market.

The treatment comprises of the following:

a. Foundation trenches treatment: After digging foundation trenches and before laying concrete, holes shall be drilled one foot apart and impregnated with strong and long lasting insecticidal solution on the soil. Both sides of the trenches are to be sprayed thoroughly and in case of isolated pits all the four sides.

b. Exterior Trenches Treatment: At the time of filling earth in the sides of trenches after building up the masonry upto plinth level, every 225mm earth filling layer shall be saturated with chemicals to make chemicals wall to avoid in filtration of termites.

c. Solid Treatment (Floors): Before laying fine sand concrete layer under flooring holes 300mm deep at 300mm centers both ways are drilled and insecticidal solutions are poured under pressure.

(i) A carpet spray shall also be given on the middle portion of the flooring.

d. Wood Work Treatment: The wooden fixtures which come in the building shall be impregnated with wood preservative kerosene oil mineral turpentine oil mixed with required chemicals and to obtain a mixture of 0.1 emulsion concentrate.

e. Plinth Protection Treatment: The top surface of the plinth fill shall be treated with chemical emulsion at the rate of 5 liters per Sqm of the surface before finally laying the soling. 150mm deep holes and 150mm apart shall be made both ways with the help of crowbar to facilitate injecting the chemical. This will help in saturation of the soil with emulsion.

f. Soil Surrounding Pipes: Wherever any service pipes enter the soil inside the area of the foundation of the building, the soil surrounding the point of entry of each pipe at the foundation, floor etc shall be fully soaked with the chemical solution for a distance of one meter from the point of such entry.

g. Measurements: The plinth area of the building treated shall be paid for length and breadth shall be measured correct to a cm.

h. Rates: shall include all labour and materials including chemicals and expert supervision for all operations enumerated above.

i. Guarantee: The main contractor shall get the work carried out through a specialized firm to be approved by the Architects and shall give a protection guarantee for a period of 10 years through the specialist.

1.3 PAYMENT
Payment for anti-termite treatment shall be on square metre (m²) basis of the area of plinth. This shall include:
(i) Treatment to bottom of foundations and their sides upto three hundred (300) mm height or as specified in schedule of rates.
(ii) Treatment of backfill soil ground level around brick walls in foundation.
(iii) Treatment to earth filling below floor slabs in plinth.
The rate quote shall include cost of all materials, spray pumps, tools, tackles and other accessories, all labour, storing facilities of insecticides as approved by competent authorities, licence, if required etc. complete.

2.0 Anti-corrosive Layer
2.1 Anti-corrosive layer will consist of screened river sand mixed with eight percent (8%) to ten percent (10%) by volume of eighty by hundred (80/100) grade Bitumen or equivalent.

2.2 Sand shall be clean, dry, coarse, hard, sharp, free from all impurities and shall conform to IS: 383 Grade-III.

2.3 Sand shall be thoroughly mixed with grade eighty by hundred (80/100) Bitumen heated to a temperature of two hundred degree Celsius (200°C) in mixing drum to give uniform mixture and shall be laid over the paid to line, grade and levels as shown in drawings and as directed by Architects.

2.4 The anti-corrosive layer shall be tamped to form hard mass of specified thickness.

2.5 PAYMENT
The payment shall be made on square metre (m²) basis of the finished area and shall include cost of all materials, labour, tamping to specified thickness, heating, mixing etc. all complete.
3.0 DRESSING AND TRIMMING ON COMPLETION

3.1 For three metre width or as directed by the Architects all around the sides of the structures, the ground shall be cleaned, dressed to a suitable slope away from the structure and a layer of approved earth shall be spread, watered and well consolidated so as to have an average thickness of seventy five (75) mm or as directed by the Architects.

3.2 The operation of this item of view as well as spreading extra layer shall be solely at the discretion of the Architects as site conditions may be damaged, keeping in view the general layout of roads and other horticulture work around building.

3.3 PAYMENT
Payment shall be made on square metre (m²) basis of the actual area dressed and paved with earth and the rate shall be inclusive of all materials and labour involved in all the operations.

4.0 SITE CLEANING ON COMPLETION

4.1 During construction and on completion, inclusive of all internal and external finish. Contractor shall arrange to clear all the debris and waste materials scattered around the site and dispose off as per the directions of the Architects.

4.2 No extra payment for this item shall be made but rate quoted for various items shall be inclusive of cleaning all dirt, muck and rubbish away from site.
CHAPTER 11

STANDARD TRADE SPECIFICATION

FOR

ROAD WORK
1.0 ROADS

1.1 Embankment:
The ground shall be cleared of all grass, bushes, trees and vegetable growth before earth is laid for embankment. The embankment shall be formed from earth obtained from borrow pits excavated along the side of road. The size and shape of borrow pits shall be in the shape of road side kachha drain or as approved by the Architects. The position of borrow pits shall also be marked by the Architects.

Before commencing the embankment, the foot of slopes shall be marked on each side by pegs at 15 mtr intervals and by continuous picking to indicate the limits. Bamboo and string or earthen profiles will then best set to serve as guides for the workers as directed by the Architects. The profiles shall depict the total height including the allowance for settlement. Embankment shall be raised in regular layer not exceeding 225mm thick and shall be carried out to the full width of the slopes so as to avoid an additional earth for slopes later. The side slopes shall be maintained as 2:1.

Each layer of earth shall be watered adequately to aid compaction. It shall then be rolled with hand or bullock roller of minimum 1/2M tonnes weight in 5 to 8 trips till it is evenly and densely compacted. Where roller cannot work, steel rammers of 8 to 10 Kg shall be used. Every 3rd layer of earth and the top most layer shall be well consolidated with power roller of 8 tonnes weight 5 to 8 trips till soil behaves as an elastic material and gets compressed only elastically under the load of the roller.

For satisfactory bond between two successive layers, the under layer shall be watered and scarified by pick axes or spades.

When complete, the embankment shall be dressed to proper sections and grade.

Measurements:

a. Where excavation is by borrow pits, measurements of cutting in borrow pits shall be made conforming to IRC -10. Diagonal ridges, cross ridges or dead man, the position of which shall be fixed by the Architects, shall be left in borrow pits for accurate measurements.

b. Where earth is obtained by cutting the ground, levels shall be taken before the start of work and after the completion of work and quantities computed from these levels by average method.

c. Where it is not possible or convenient to take measurement by the above two processes, the measurements of embankment shall be taken from cross sections by means of levels as in (b) above and quantity of embankment filling shall be computed which shall be reduced by 5% and paid as cutting after compaction by mechanical means.

1.2 Sub-grade:
The embankment shall be taken to full height and compacted and then the surface width equal to the bottom most layer of road treatment and depth to the combined depth of wearing coat and soling coat shall be cut and consolidated with power road roller 8 to 10 tonnes with a minimum of 5 runs over the sub-grade till it is consolidated. Surplus earth shall be disposed of as directed and dressed.

Cutting: Where the formation level of road is lower than the ground cutting shall be done upto the required levels and sub-grade consolidated as in the foregoing para.

1.3 Collection of Materials:
The materials for the road shall be stacked on both sides of the road in stacks of convenient height and sizes which may be sufficient for a particular reach. No work shall be started unless the whole of the material for a particular reach of road is collected.

a. Soling Stone: It shall be clean, hard stone, free from decay and weathering. The size of soling stone shall be not more than 225mm and not less than 100mm in any direction and its height shall be equal to the depth of soling course as specified with a tolerance of 25mm.

The soling stone shall be brought to site and broken to the size specified with hammer. The stack shall be formed on a fairly level and clean ground. The stacks shall be of uniform width and length and 1 to 1.25mtr height as directed by the Architects, the stacks shall be compact.

Measurement: Soling stone shall be measured in cum. The length, breadth and height shall be measured correct to a cm. The computed volume of the stack
b. **Stone Aggregates:** This shall be broken hard stone obtained from approved quarry. It shall be free from dirt, foreign matter soft, friable, thin elongated and laminated pieces and shall be roughly cubical in shape of nominal size as specified. The stacks shall be formed in convenient units of one metre bottom width, 60cm height and length in multiples of 3 mtr. Templates of wood or steel shall be used for making the stacks. The stacks shall be made on fairly level and clean ground.

**Measurement:** The section of stacks shall be taken from the standard templates and length correct to a cm. The total quantity so computed of stacks shall be reduced by 7.5% to arrive at the net quantity for payment in cubic metres.

c. **Moorum:** It shall be obtained from pits of weathered disintegrated rocks. It shall preferably contain siliceous material and natural mixture of clay of calcareous origin. The size shall not be more than 20mm. The moorum shall be got approved from the Architects.

The stacks shall be formed on a fairly level and clean ground with wooden box of 2x2x0.25 mtr. Dimensions open at both ends in convenient units of one cubic metre.

d. **Stone Aggregate 10mm, nominal size:** This shall be machine crushed hard stone from approved quarry free from dirt and any foreign matter and shall pass 100% from 12.5mm and 10mm sieves to be maintained at site. The stacks shall be formed in the same manner as in the case of moorum.

**Measurement:** Shall be the actual dimensions of the stack measured correct to a cm and paid in cubic metres.

e. **Bitumen and Tar:** The bitumen shall conform to IS: 73 and tested as prescribed in IS - 72 . It shall be heated at a temperature of 110 degree C for grade R.T. 3 and R.T. 4 respectively when used. It shall be brought in sealed original containers, material in damaged containers shall not be allowed. Bitumen shall be purchased from reputed firms and dealers.

It shall be stacked in fenced enclosures on one side of the road. All drums shall serially numbered and used in the same order. It shall be kept in the joint custody of the contractor and the representative of the Architects.

**Measurement:** The material shall be recorded as per standard weights of different type containers as intimated by the manufacturers. The material shall be weighed where containers are found leaking.

**Note:** No work shall be started unless the whole or all material for a particular reach of road is collected.

1.4 **Soling Coat:**

The width of the soling shall be 30cm more on either side than that of wearing coat. Its depth shall be 15cm in cutting and 22.4cm in filling and in made up soils unless otherwise specified. For 15cm soling actually 18cm layer shall be laid with a suitable template. The soling shall be laid closely with its broadest side downward with single stone to correct camber, grade and density. The interstices between stones shall be wedged in with smaller stones well driven, tightly packed and completely filled.

The soling shall then be thoroughly consolidated with power roller of 8 tonnes weight starting at edges and working towards the center until sufficient compaction is achieved by rolling at least 8 times over the soling. The surface shall be checked with template to be provided by the contractor and all undulations correct to the satisfaction of the Architects.

**Measurement:** shall be taken for the required finished form in sq.mtr as per schedule of quantities and if measurements are required in cubic metres, it shall be net measurement of the stacks of soling stone used in work.

1.5 **Wearing Coat:**

The metal shall be racked off the stacks into gaskets, screened, if dirty, and spread evenly over the prepared surface to the required depth with a twisty motion to avoid segregation. Wooden templates of the required depth shall be used to ensure correct depth of metal. Metal shall then be hand packed bigger sizes being placed at bottom. A small quantity shall be retained for rectification work. Metal shall then be dry rolled with 8 to 10 tonnes power roller commencing at the edges and working towards the center until sufficient compaction of metal
is achieved and metal are not displaced by the roller. The water shall be applied and metal kept saturated till the rolling is complete i.e. when roller makes no visible impression on the surface. Then moorum and red bajri shall be spread evenly over the surface in 6mm thick layer copiously watered and rolled till a paste of water, red bajri and moorum begins to flow ahead of the roller and moorum stops sticking to the roller and forcing the metal out.

Measurements: The measurements of the work shall be same as for soling coat.

### 1.6 Cement Concrete Pavement

The pavement shall consist of cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 hard stone ballast 40mm nominal gauge) or richer mix as specified laid on the prepared base including compaction and curing. Materials such as water, cement, sand and stone ballast shall conform to the materials specification hereto before mentioned. The prepared surface shall conform to the line, grade and cross section shown on the plans and for this purpose, the sub-base shall be prepared by scarifying the existing surface where necessary and adding extra material and consolidating. The forms shall be of steel and shall be of a depth equal to the thickness of the slabs. Steel forms shall be of required section and length. They shall be generally of channel section perfectly straight with a broad base of sufficient stiffness to withstand without displacement or distortion due to placing and compaction of the concrete. They shall be provided with an efficient locking device to ensure continuity of line and level through joints and with steel pins to hold them in position. For mixing placing in position the cement concrete specification mentioned hereto before shall apply. The compaction shall be done by vibration. The vibration in the vibrator screened shall be of a frequency not less than 350 impulses per minute. Internal vibrator shall also be used when slabs more than 200mm thickness is laid. After compaction of the concrete in the base, the surface level shall be checked by straight edge longitudinally and by tamper transversely. Any hollow spot or depression shall be made up with cement concrete by compaction till a uniform surface is obtained. The surface may also be checked with a string. The road surface shall be belt finished. The belt usually consists of a piece of canvas 150mm wide and one metre longer than the width of the slab having wooden handles at each end. The process consists of a preliminary stage when the belt shall be drawn slowly across by a series of long strokes and finally by short strokes with rapid advance intermediate stages being used as decided by the Architects. The measurements shall be made correct to two decimal points of a cum. The rates shall also include leaving expansion joints and expansion joint filler.

### 1.7 Scarifying Metalled (Water Bound) Surface

All dirt, dust, caked up mud, slush, animal droppings, vegetation and all other rubbish shall be removed from the water bound macadam surface. The macadam surface shall be scarified to a depth of about 5cm with additional pricking of high parts to the required camber and gradient. Any hollows after pricking shall be filled with new aggregate and well consolidated to bring the surface to template. The scarified aggregate shall be raked to bring smaller stone on the top and surface brought to the required camber and gradient with a tolerance of 12mm longitudinally and transversely and consolidation with road aggregate received from scarifying before the 2nd course is laid. All rubbish, etc. shall be disposed of as directed by the Architects.

Measurements: The length and breath shall be measured correct to a cm and shall be paid for per sq.mtr.

### 1.8 Premix Carpet

The treatment consists of applying a tack coat on the prepared base followed immediately by spreading aggregates precoated with specified binder to camber and consolidated. The consolidated thickness to treatment shall be as specified in the schedule of quantities. Preparation of Mix and Laying: The stone grit (aggregate) shall be dry, screened of dust and measured in boxes and then loaded into the drum mixer in the proportions specified. This shall be heated. The binder heat in boilers to the required temperature for the particular grade shall be drawn of from the boiler in gauged buckets showing the weight of bitumen, poured over the aggregate in the mixture at the correct rate of 64 kg per cubic metre of aggregate and mixing started till the aggregate is uniformly coated with bitumen. The hot mix shall be carried to the road and spread to levels after applying the tack coat as specified to a thickness sufficient to achieve after consolidating the specified thickness. Rakes and phawrah or drag spreaders shall be used spreading the mixture.

Consolidation
The road surface shall be consolidated with 6 to 8 tonne power roller starting at the edges and working towards the center. The roller shall be started and stopped without jerks. Consolidation shall be considered complete when the stone chippings are firmly embedded. Any high spots or depressions shall be corrected by adding premix material.

**Measurements:** The length and breadth of the finished work shall be measured correct to a cm and paid in sq.mtr.

1.9 **Seal Coat with Bitumen:**

The treatment consists of applying a coat of bitumen on prepared surfaced blinding with stone grit and consolidating with road roller.

The bitumen and stone grit shall be collected stacked and measured as specified and as per specifications.

**Cleaning the Road Surface:** Prior to the application of binder, all dust, dirt, caked mud, animal dung, loose and foreign matter shall be removed 30cm beyond the width to be painted, by brooms, small picks wire brushed, etc.

**Applying binder:** The binder shall be heated in a boiler to the specified temperature and shall be applied longitudinally along the length to the clean dry surface by sprayer at 1.5 Kg per sq.mtr distributed evenly.

**Binding:** Immediately after the binder is applied and it is hot, stone grit free from dust shall be evenly spread over the surface with 1.05 cubic metre per 100 sq.mtr or as specified.

Spreading shall be done with a twisting motion to avoid segregation which otherwise shall be removed by brushing the extra grit into hungry spots to obtain uniform surfaces, free from waviness, depressions and other irregularities.

**Consolidations:** Immediately after the application of stone grit and light brooming, the road surface shall be compacted by power roller 7 to 8 tonne starting at the edges and working towards the center. The roller shall be started and stopped without jerks. Consolidation shall be considered complete when the stone chippings are firmly embedded.

**Measurements:** The length and breadth of finished work shall be measured correct to a cm and paid in sq.mtr.
CHAPTER 12

STANDARD TRADE SPECIFICATION

FOR

STORM WATER DRAINS
1.0 STORM WATER DRAINS

1.1 Brick pitched open surface drains
   a. Bricks: Bricks shall be of the quality specified in the nomenclature of the item.
   b. Preparation of Surface: The sides and bottom of earth work to be pitched shall be brought to the required slop and gradient and shall be compacted to a firm and even surface.
   c. Pitching: Pitching can be dry or with cement mortar 10cm in depth in multiples of 10cm as specified. Profiles as suitable intervals shall be put by means of pegs and strings or by placing bricks. Bricks shall be laid dry or in cement mortar as required in parallel rows. Breaking bond or herring bond and pattern as directed. At the top, the toe and at every 3 metre intervals, brick courses be laid with the bricks on edge.
   d. Measurements: The measurements shall be taken in sq.mtr. The area of pitching for drain shall be calculated by multiplying the length with the perimeter (bed with plus side slopes + 10cm on either side for the top course). The length, width and perimeter shall be measured correct to a cm.

1.2 R.C.C. Pipes:
   The pipes shall be with or without reinforcement as required of the class as specified and shall conform to IS: 458-1971. All pipes shall be manufactured by centrifugal process, true to shape, straight, perfectly sound, free from cracks and flaws. The non-pressure pipes shall withstand a test pressure equivalent to 0.70 Kg/cm² of water.
   The pipes shall be carefully lowered in trenches laid true to line and grade. The pipes shall proceed up-grade of slop. In cases where the pipeline runs in the proximity of trees, poles and under existing or proposed tracks, etc. the pipe shall be encased all round in 15cm thick cement concrete 1:4:8 (1cement : 4 coarse sand : 8 stone aggregate 40mm and down gauge).
   Collar Joint: The adjoining pipes shall be abutted and adjusted in correct position. The collar shall be then slipped over the joint covering both pipes equally. The angular space shall be filled with stiff mixture of cement mortar 1:2 (1 cement : 2 fine sand) which shall be rammed with caulking tool.
   Testing of Joints: Water test shall be performed by suitably plugging the low end of the drain and filling the system with water. Where leakage becomes visible the defective work shall be removed and made good.
   Measurements: The length shall be measured in running mtrs. nearest to a cm as laid or fixed at site, measured along the center line.

1.3 Road Gully Chambers:
   The chamber shall be of local best quality brick masonry in cement mortar 1:5 (1 cement : 5 coarse sand) and shall have a CI grating of standard size with frame fixed in 15cm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 hard stone ballast 20mm nominal size) on top. The size of the chamber shall be taken as the clear internal dimensions of the CI frame. The brick walls, the top of the bed concrete 1:4:8 (1 cement : 4 coarse sand : 8 hard stone ballast 40mm and down gauge) of the chamber shall be plastered inside with 12mm thick cement plaster 1:3 (1 cement:3 coarse sand)finished with a floating coat of neat cement.
   The full grating cover shall be hinged to the frame. The weight of grating shall be 75 kg minimum. The exposed surfaces of the grating and the frame shall be painted with a thick coat of coat tar.
   Measurements: Road gully chambers shall be enumerated.

EMPLOYER

CONTRACTOR
CHAPTER 14

LIST OF APPROVED MAKES

The list of products approved for incorporation in the work is given under., where more than one manufacturer is listed, the names are in order of preference. Tenderers/contractors shall take the approval from the Architect/Engineer before procuring any item. Unless Contractor stipulates to the owner in his tender, it shall be presumed that the rates have been quoted considering the specified brand names. If for any item, the material is not specified in the list given below, the same shall be got approved in advance from the Architects, Consultants/Engineer Incharge.

<table>
<thead>
<tr>
<th>S.No</th>
<th>DETAILS OF MATERIAL</th>
<th>MANUFACTURERS NAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cement</td>
<td>L&amp;T, JK, ACC, Laxmi,</td>
</tr>
<tr>
<td>2.</td>
<td>Reinforcement Steel</td>
<td>TISCO, RINL, SAIL Equivalent</td>
</tr>
<tr>
<td>3.</td>
<td>Structural Steel</td>
<td>TISCO, SAIL Equivalent</td>
</tr>
<tr>
<td>4.</td>
<td>ATT Chemicals</td>
<td>Montari Industries, HOCHEST</td>
</tr>
<tr>
<td>5.</td>
<td>Waterproofing Compound</td>
<td>FOSROC/PIDILITE/CICO</td>
</tr>
<tr>
<td>6.</td>
<td>Super Plasticizer</td>
<td>FOSROC/SIKKA/PIDILITE/ASIAN</td>
</tr>
<tr>
<td>7.</td>
<td>Armor Board</td>
<td>Supreme Industries</td>
</tr>
<tr>
<td>8.</td>
<td>Flush Doors</td>
<td>Kutty, Kerala Timber, Vindhya Ply Board Pvt Ltd, Duro</td>
</tr>
<tr>
<td>9.</td>
<td>Glass</td>
<td>Modi Guard/ Saint Gobain/ Glaverbel</td>
</tr>
<tr>
<td>10.</td>
<td>Cement Paint</td>
<td>Snowcem India</td>
</tr>
<tr>
<td>11.</td>
<td>Ply Wood and Block Boards</td>
<td>Green</td>
</tr>
<tr>
<td>12.</td>
<td>Poly Sulphide Sealant</td>
<td>FOSROC, DR FIXIT</td>
</tr>
<tr>
<td>13.</td>
<td>Water Bars</td>
<td>Fixo Stop</td>
</tr>
<tr>
<td>14.</td>
<td>Wire Mesh</td>
<td>Tiger Brand</td>
</tr>
<tr>
<td>15.</td>
<td>RMC</td>
<td>ACC, UNITECH, Birla</td>
</tr>
<tr>
<td>16.</td>
<td>FACE BRICKS</td>
<td>JINDAL MECHNO</td>
</tr>
<tr>
<td>17.</td>
<td>NORMAL BRICKS</td>
<td>FPS GRADE-1</td>
</tr>
</tbody>
</table>
CHAPTER XVII

LIST OF SAMPLES AND MOCK-UPS

Major items of work for which samples and mock-ups shall be produced by the Contractor for approval by the Architect.

<table>
<thead>
<tr>
<th>S.No</th>
<th>PARTICULARS OF ITEMS</th>
<th>DETAILS OF SAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Reinforced Cement Concrete</td>
<td>Coarse Aggregate and Fine Aggregate</td>
</tr>
<tr>
<td>2.</td>
<td>Masonry work</td>
<td>Bricks</td>
</tr>
<tr>
<td>3.</td>
<td>Waterbars</td>
<td>Water bars of various types and sizes</td>
</tr>
<tr>
<td>4.</td>
<td>Sealant</td>
<td>POLYSULPHIDE SEALANT</td>
</tr>
<tr>
<td>5.</td>
<td>Expansion Joint Filler</td>
<td>Thermocole of required thickness</td>
</tr>
<tr>
<td>6.</td>
<td>Admixtures</td>
<td>Various concrete and water proofing admixtures</td>
</tr>
<tr>
<td>7.</td>
<td>Mesh</td>
<td>Chicken Wire Mesh</td>
</tr>
<tr>
<td>8.</td>
<td>Concrete inserts</td>
<td>Insert and suspenders</td>
</tr>
<tr>
<td>9.</td>
<td>Concealed Conduits</td>
<td>M/s Conduits and accessories</td>
</tr>
<tr>
<td>10.</td>
<td>Stones</td>
<td>All Stones Samples</td>
</tr>
<tr>
<td>11.</td>
<td>All Kinds of Tiles</td>
<td>Samples along with catalogue</td>
</tr>
</tbody>
</table>

DETAILS OF MOCK UP

<table>
<thead>
<tr>
<th>S.No</th>
<th>PARTICULARS OF ITEMS</th>
<th>DETAILS OF SAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Shuttering</td>
<td>Sample of each major element viz. colum, beam, retaining wall, other typical elements showing the joint and framework detail.</td>
</tr>
<tr>
<td>2.</td>
<td>Masonry work</td>
<td>One wall infill panel</td>
</tr>
<tr>
<td>3.</td>
<td>Waterbars</td>
<td>Fixing each type no of waterbars showing welding of two bars etc.</td>
</tr>
<tr>
<td>4.</td>
<td>Expansion Joints</td>
<td>One 3m length complete in all respect with filler, sealant and top cover.</td>
</tr>
<tr>
<td>5.</td>
<td>Flooring</td>
<td>One panel not less than 1 Sqm for in-situ terrazzo and 2 Sqm for stone flooring.</td>
</tr>
<tr>
<td>6.</td>
<td>External Finish</td>
<td>One panel not less than 1 Sqm for every sample.</td>
</tr>
<tr>
<td>7.</td>
<td>Painting works</td>
<td>All samples not less than 1 Sqm.</td>
</tr>
</tbody>
</table>

NOTE: Irrespective of what is contained herein above, the contractors are duty bound to prepare and produce samples as asked for and as covered under clause 47 of the Special Conditions of the Contract.
**TOP SHEET TO GENERAL CONDITIONS OF CONTRACT**

1. Earnest money Deposit : **60000/-**
2. Date of commencement : 7 days from the date of receipt of the work order or from the date of mark out
3. Period of Completion : **75 DAYS** after date of commencement plus one week for shifting in case required
4. Defects Liability Period : **12 months**
5. Agreed Liquidated Damages : **1/2 %** of tender amount per week subject to a maximum of **5%** of contract value
6. Period of Final Measurement : **15 days**
7. Value of work for the issue of Interim Certificate : Minimum Rs. **12.00 Lakhs**
8. Retention money from each each interim bill : **10%**
9. Total retention money : **10%**
10. Architects certificate of payment : 7 days after submission of interim bills by the Contractor.
11. Period of honoring payment certificate : 7 working days from date of Architect’s certificate of payment for interim bills and 45 working days for final certificate.
12. Installment after virtual completion : Clause 13
13. Delayed Payments : No interest will be paid on this account
14. Estimated value : **Rs.60,00,000/-**(as per DSR)
15. Bid Submission : Two envelop 1) Technical Bid 2) Financial Bid

**SIGNATURE OF THE CONTRACTOR WITH DATE**

WITNESS :

DATE :
DECLARATION

I/We have inspected the site of works and have made me/us fully acquainted with the local conditions in and around the sites of works. I/We hereby declare that I/We have gone through the conditions laid down in the Notice Inviting Tender, Conditions of Contract, Technical Specifications and understood the same and on the basis of the same I/We quoted our rates in the Schedule of Quantities attached with the tender documents.

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

Signature of Tenderer

Witness: ____________________________
Address ____________________________
Date : ____________________________
SCHEDULE OF QUANTITY
BILL OF QUANTITY
TENDER DRAWINGS
<table>
<thead>
<tr>
<th>S. no.</th>
<th>IPMG Code</th>
<th>URC</th>
<th>Description</th>
<th>UOM</th>
<th>Qty</th>
<th>Net Amount</th>
<th>Rate/Unit</th>
<th>Source Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>31 14 13 23 20002</td>
<td>2.1.1</td>
<td>Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 m on plan including disposal of excavated earth up to 50 m and lift up to 1.5 m, disposed soil to be levelled and neatly dressed : All kinds of soil</td>
<td>100 m²</td>
<td>40.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.2</td>
<td>31 23 16 51 20002</td>
<td>2.2.1</td>
<td>Earth work in rough excavation, banking excavated earth in layers not exceeding 20 cm in depth, breaking clods, watering, rolling each layer with / tonne roller or wooden or steel rammers, and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal banks and guide banks or filling up ground depressions, lead up to 50 m and lift up to 1.5 m : All kinds of soil</td>
<td>m³</td>
<td>50.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>31 23 23 13 20002</td>
<td>2.3.1</td>
<td>Earth work in excavation by mechanical means (hydraulic excavator) / manual means over areas (exceeding 30cm in depth. 1.5 m in width as well as 10 m on plan) including disposal of excavated earth, lead up 50m and lift up to 1.5m, disposed earth to be levelled and neatly dressed. All kinds of soil</td>
<td>m³</td>
<td>200.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.4</td>
<td>31 23 16 51 20004</td>
<td>2.6.1</td>
<td>Earth work in excavation by mechanical means (hydraulic excavator) / manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 m on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. All kinds of soil</td>
<td>m³</td>
<td>50.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.5</td>
<td>31 23 16 12 20002</td>
<td>2.8.1</td>
<td>Extra rates for quantities of works, executed : In or under water and/or liquid mud, including pumping out water as required</td>
<td>m³</td>
<td>100.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.6</td>
<td>31 50 13 13 20042</td>
<td>2.4.1</td>
<td>Extra rates for quantities of works, executed : In or under water and/or liquid mud, including pumping out water as required</td>
<td>m³</td>
<td>R/O</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.7</td>
<td>31 50 13 13 20044</td>
<td>2.4.2</td>
<td>Extra rates for quantities of works, executed : In or under foul position, including pumping out water as required</td>
<td>m³</td>
<td>R/O</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.8</td>
<td>31 23 23 13 20008</td>
<td>2.25</td>
<td>Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift up to 1.5 m.</td>
<td>m³</td>
<td>50.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.9</td>
<td>31 23 13 13 20010</td>
<td>2.26.1</td>
<td>Extra for every additional lift of 1.5 m or part thereof in excavation / banking excavated or stacked materials. All kinds of soil</td>
<td>m³</td>
<td>R/O</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>31 23 13 17 20002</td>
<td>2.27</td>
<td>Supplying and filling in plinth with jamuna sand under floors, including watering, ramming, consolidating and dressing complete.</td>
<td>m³</td>
<td>100.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.11</td>
<td>31 14 13 13 20002</td>
<td>2.28.1</td>
<td>Surface dressing of the ground including removing vegetation and inequalities not exceeding 15 cm deep and disposal of rubbish, lead up to 50 m and lift up to 1.5 m. All kinds of soil</td>
<td>100 m²</td>
<td>200.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.12</td>
<td>01 22 23 15 20002</td>
<td>2.37</td>
<td>Supply and stacking of fly ash conforming to IRC: SB at site, including carriage, loading , unloading &amp; stacking up to any lead (measured stacks will be reduced by 20% for payment).</td>
<td>170.00</td>
<td>200.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>1.13</td>
<td>31 23 13 17 20004</td>
<td>2.38</td>
<td>Filling with available fly ash and earth (excluding rock) in trenches or embankment in layers (each layer should not exceed 15 cm), with intermediate layer of compacted earth (Soil density of 98%) after every four layers of compacted depth of fly ash, sides &amp; top layer of filling shall be done with earth having total minimum compacted thickness 30 cm or as decided by Engineer -in-charge, including compacting each layer by rolling/ramming and watering, all complete as per drawing and direction of Engineer -in -charge.</td>
<td>170.00</td>
<td>200.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
</tbody>
</table>

2. Concrete

<table>
<thead>
<tr>
<th>S. no.</th>
<th>IPMG Code</th>
<th>URC</th>
<th>Description</th>
<th>UOM</th>
<th>Qty</th>
<th>Net Amount</th>
<th>Rate/Unit</th>
<th>Source Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>32 16 13 27 20002</td>
<td>4.6.1</td>
<td>Providing and fixing at or near ground level precast cement concrete in kerbs, edgings etc. as per approved pattern and setting in position with cement mortar 1:3 (1 Cement : 3 coarse sand), including the cost of required centering, shuttering complete. 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)</td>
<td>m³</td>
<td>10.00</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>2.2</td>
<td>03 31 05 30 20550</td>
<td>4.15</td>
<td>Extra for laying concrete in or under water and/or liquid mud including cost of pumping or bailing out water and removing slush etc. complete.</td>
<td>m³/m³</td>
<td>R/O</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>03 31 05 30 20552</td>
<td>4.16</td>
<td>Extra for laying concrete in or under foul positions.</td>
<td>m³</td>
<td>R/O</td>
<td></td>
<td>DSR 2013 [Civil]</td>
<td></td>
</tr>
<tr>
<td>SPC</td>
<td>Code</td>
<td>Description</td>
<td>Unit</td>
<td>Rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>-----</td>
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<td>------------------------------------------------------------------------------</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.4</td>
<td>03 31 05 35 20010</td>
<td>Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centering, shuttering and finishing, including cost of curing, admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. All works upto plinth level : M-15 grade plain cement concrete (cement content considered @ 240 kg/cum)</td>
<td>cum</td>
<td>35.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5</td>
<td>03 31 05 35 20012</td>
<td>Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centering, shuttering and finishing, including cost of curing, admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. All works upto plinth level : M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)</td>
<td>cum</td>
<td>25.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.1</td>
<td>07 11 16 12 20004</td>
<td>Providing and laying damp-proof course 50 mm thick with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size).</td>
<td>sqm</td>
<td>130.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.2</td>
<td>07 11 13 10 20002</td>
<td>Applying a coat of residual petroleum bitumen of grade of VG-10 of approved quality using 1.7 kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.</td>
<td>sqm</td>
<td>130.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.1</td>
<td>04 21 13 46 20002</td>
<td>Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:4 (1 cement : 4 coarse sand)</td>
<td>cum</td>
<td>100.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.2</td>
<td>04 21 13 46 20004</td>
<td>Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundation and plinth in: Cement mortar 1:6 (1 cement : 6 coarse sand)</td>
<td>cum</td>
<td>R/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.3</td>
<td>04 21 13 46 20010</td>
<td>Brick work with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V level in all shapes and sizes in : Cement mortar 1:4 (1 cement : 4 coarse sand)</td>
<td>cum</td>
<td>140.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.4</td>
<td>04 21 13 46 20026</td>
<td>Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundations and plinth in : Cement mortar 1:3 (1 cement : 3 coarse sand)</td>
<td>sqm</td>
<td>R/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.5</td>
<td>04 21 13 46 20028</td>
<td>Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in foundations and plinth in: cement mortar 1:4 (1 cement : 4 coarse sand)</td>
<td>sqm</td>
<td>R/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.6</td>
<td>04 21 13 46 20030</td>
<td>Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 7.5 in superstructure above plinth level up to floor V. Cement mortar 1:3 (1 cement :3 coarse sand)</td>
<td>sqm</td>
<td>10.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.7</td>
<td>04 21 13 46 20032</td>
<td>Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class level designation 7.5 in superstructure above plinth level up to floor V. Cement mortar 1:4 (1 cement :4 coarse sand)</td>
<td>sqm</td>
<td>R/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.8</td>
<td>04 21 13 47 20006</td>
<td>Half brick masonry with common burnt clay machine moulded tile bricks of class designation 12.5 conforming to IS : 2690 (Part t) in foundation and plinth in cement mortar 1:6 (1 cement : 6 coarse sand).</td>
<td>cum</td>
<td>R/O</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.1</td>
<td>09 63 40 11 20020</td>
<td>30MM thick gangsaw cut RED AGRA STONE flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab, including rubbing and polishing complete with base of cement mortar 1 : 4 (1 cement : 4 coarse sand) 25 mm thick.(base rate of lota is 290 rs/sqm which may be replaced with red agrag as per architect instruction)</td>
<td>sqm</td>
<td>225.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.2</td>
<td>09 63 40 11 20004</td>
<td>Red AGRA Gang saw Cut stone slabs 30 mm thick in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement : 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including polishing of stone</td>
<td>sqm</td>
<td>50.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.3</td>
<td>09 63 40 11 20018</td>
<td>Extra for pre finished nosing in treads of steps of RED AGRA (GANGSAW CUT) / sand stone slab.</td>
<td>m</td>
<td>100.00</td>
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<td>5.4</td>
<td>09 63 40 11 20020</td>
<td>Extra for RED AGRA (GANG SAW CUT) / sand stone in treads of steps and risers using single length up to 1.05 metre .</td>
<td>sqm</td>
<td>50.00</td>
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<tr>
<td>5.5</td>
<td>10 63 40 11 20020</td>
<td>Stone tile work for wall lining upto 10 m height with special adhesive over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand), including pointing in white cement with an admixture of pigment to match the stone shade. 8mm thick (mirror polished and machine cut edge) Granite stone of any colour and shade</td>
<td>sqm</td>
<td>125.00</td>
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### Structural Steel

<table>
<thead>
<tr>
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<th>Description</th>
<th>Unit</th>
<th>Rate</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.1</td>
<td>Steel work in built up tubular (round, square or rectangular hollow tubes etc.) trusses etc., including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete. Hull finished seamless type tubes</td>
<td>kg</td>
<td>3,500.00</td>
<td>DSR 2013 (Civil)</td>
</tr>
<tr>
<td>8.2</td>
<td>Providing, fabricating and erecting welded structural steel built up sections in trusses and frames and applying a primer coat of zinc chromate on duly prepared surfaces, complete.</td>
<td>kg</td>
<td>1,000.00</td>
<td>IPMG</td>
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### Room Construction

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<th>Remarks</th>
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</thead>
<tbody>
<tr>
<td>9.1</td>
<td>Constructions of two green rooms and two toilets near the stage inclusive of all civil and interior works including fittings and fixtures for an area of around 200 Sqft. Interior finishing in tile till 7'-0&quot; height with 600x600 vitrified tiles on flooring. The works should be complete in all respect with doors, windows, paint, fans, lights, plumbing, water tank, wc, sinks, taps etc as per architects equipment</td>
<td>sqm</td>
<td>25.50</td>
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### TOTAL

### GRAND TOTAL
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<th>S. no.</th>
<th>Code</th>
<th>UOM</th>
<th>Qty</th>
<th>Net Amount</th>
<th>Rate</th>
<th>Source Name</th>
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**Estimate Details**

**Project Name**: RAMJAS COLLEGE

**Estimate Name**: AMPHITHEATRE

**Non-Schedule Items**

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**NOTE:**
- A + (225mm + 10mm, concrete mix) FROM FFL OF STEP
- B + (150mm + 10mm, concrete mix) FROM FFL OF STEP
- C + (75mm + 10mm, concrete mix) FROM FFL OF STEP