INDIAN INSTITUTE OF MANAGEMENT KOZHIKODE

IIM KOZHIKODE CAMPUS P.O, KOZHIKODE 673 570

Tel: 0495-2809195, 2809217 Fax: 0495-2803011

Web site: www.iimk.ac.in

TENDER

FOR

CREATING ADDITIONAL RECREATIONAL FACILITIES FOR SWC AT THE BASEMENT FLOOR OF FACULTY APARTMENT II BUILDING IN IIMK CAMPUS

PART I (TECHNICAL BID)

Issued to: ----------

Tender No.	**: IIMK/CIVIL/15/2019-20**
Date of Issue of NIT	**: 28.10.2019**
Date of Issue of Tender Form	**: 28.10.2019 to 22.11.2019**
Due Date of Submission	**: 25.11.2019 up to 3:00 p.m.**
Date of Opening of Technical bid	**: 25.11.2019 at 4:00 p.m.**
Date of opening of financial bid	**: Will be announced later**
Cost of Tender Form (Original)	**: Rs.560/- (Including 12% GST)**

(Tender Document can be downloaded directly from the website of the Institute, in which case the cost towards the Document need not be submitted)

Probable Amount of Contract : Rs. 24, 75,000/-

CONTENTS

INDIAN INSTITUTE OF MANAGEMENT KOZHIKODE

I. NOTICE INVITING TENDER

1.1.1 Sealed and competitive item rate Tenders are invited by the Indian Institute of Management Kozhikode (Kerala) in Two-Bid system i.e. (i) Technical Bid and (ii) Price Bid for the following work: -

a)	Tender No.	: IIMK/CIVIL/15/2019-20
b)	Name of work	: Creating additional Recreational Facilities for SWC at the Basement Floor of Faculty Apartment II Building in IIMK Campus
c)	Time of completion	: Three Months.
d)	Earnest Money	: Rs.75,000/-
e)	Cost of tender forms	: Rs.560/- (Including GST @ 12%).

1.2 ELIGIBILITY CRITERIA FOR PARTICIPATION IN BID/TENDER

Every Tender should have satisfactorily completed at least three works of similar nature costing Rs. 10 lakhs each or two similar completed works of Rs. 15 lakhs each or one similar completed work costing of Rs. 20 lakhs during the last 7 years. For this purpose, 'cost of works' shall mean gross value of the completed work including the cost of materials supplied by the Govt./Client, but excluding those supplied free of cost. This should be certified by an officer not below the rank of Executive Engineer/Project Manager or Equivalent. Similar works means Civil construction works/Civil Maintenance works of buildings/other structures. Tenderers are required to submit TDS Certificates in form 16A in case of similar works are executed for a private body which shall form basis for establishing the completion cost of works executed by the bidder

1.3 Every Tender should be accompanied by a forwarding/covering letter in which the Tenderer should clearly mention the details of additional or loose papers/documents/certificates attached and all such papers/documents/ certificates should be serially numbered from first page to last page duly initialed by the tenderer.

1.4 Tenderers should quote their rates both in figures and in words. The Schedule of Quantities must be fully priced and the total of each page along with carried over figures of the previous page shall be given in ink and signed by the tenderer. No blank space shall be left. Tenders with rates quoted in any other form, other than the prescribed Schedule of Quantities, are liable to be rejected.

1.5 Tenders not properly filled, mutilated, with incorrect calculations or generally not complying with the conditions are liable to be rejected.

The Tenders should be submitted under Two Bid system as mentioned below:

f) (a) Part I: Technical Bid comprising of all techno-commercial details such as NIT, General Conditions of Contract, Technical Specifications, Drawings, Earnest Money Deposit (EMD), proof for having similar works executed, any other matter the tenderer wishes to submit duly signed with official seal, etc. This is to be submitted in a sealed cover/envelope duly super scribed as "**Part I (Technical Bid) for Creating additional Recreational Facilities for SWC at the Basement Floor of Faculty Apartment II Building in IIMK Campus**" and

(b) Part II: Price Bid comprising of only the Schedule of Quantities duly filled in and signed with official seal. This is to be submitted in a sealed cover/envelope duly super scribed as "**Part II (Price Bid) for Creating additional Recreational Facilities for SWC at the Basement Floor of Faculty Apartment II Building in IIMK Campus**". No other paper other than the Schedule of Quantities contained in this cover/envelope shall be accepted.

Both the above Bids, i.e. Part I and Part II in sealed covers/envelopes, shall be put into a larger cover/envelope and sealed properly. This larger cover/envelope (containing the Part I and Part II in sealed covers) shall be submitted after super scribing the name of the work.

1.6 Receipt and Opening of Tenders

Sealed Tenders super scribing the name of the work on the top of the envelop should be either deposited in the "Tender Box (Engineering)" kept in the Reception counter of the Administrative Block of the Institute or sent by Registered Post to reach the office of "The Chief Administrative Officer" on or before **25.11.2019 at 3:00 p.m**. The Institute will not assume any responsibility whatsoever for late receipt of Tenders. Tenders received late shall be summarily rejected.

Part I (Technical Bid) will be opened at 4:00 p.m. on the same day in the presence of those tenderers who are present in the office at the time of opening. Thereafter, after evaluation of the Technical Bids, only those tenderers whose Technical Bid (Part-I) are found acceptable shall be opened on a later date. Prior notification shall be given to all tenderers who qualify for opening of the Price Bid. Part II (Price Bid) of those tenderers who do not qualify for opening of the Part II (Price Bid) shall be returned.

The tenders along with all necessary documents in sealed envelopes should be sent to the following address.

THE CHIEF ADMINISTRATIVE OFFICER,
INDIAN INSTITUTE OF MANAGEMENT KOZHIKODE,
I.I.M.K. CAMPUS (P.O.),
KOZHIKODE – 673 570,
KERALA.
***Phone: 0495-2809100*.**

1.8 Authorized Signatory

If the tender is made by or on behalf of a company incorporated under the Companies Act (of 1956), it shall be signed by their **Managing Director** or one of the **Directors** duly authorized on that behalf. If it is made by a partnership firm, it shall be signed with the co-partnership name by a member of the firm who shall sign his own name and give the name and address of each partner of the firm and attach a copy of Power of Attorney with the Tender authorizing him to sign on behalf of the other partners. A certified copy of the registered partnership deed shall also be submitted along with the tender.

The tenders shall be duly signed by the authorized signatory. Unsigned tenders shall summarily be rejected and no correspondence shall be entertained. The tenderer shall sign on each page of the tender document as a token of acceptance of the tender conditions and also Schedule of Quantities. Unsigned tenders shall not be considered.

1.9 Acceptance Period

The tender shall remain valid for acceptance for a period of 90 days from the date of opening of tender. Any withdrawal of offer / bid during firm period will entail forfeiture of the EMD.

1.10 Site Inspection

Every tenderer is expected to inspect the site of the proposed work at his own cost before quoting his rates. He must also go through all the drawings and documents. No extra amount or payment would be released by IIMK for claim by Vendor for any extra work carried out unless it is authenticated by the representative of IIMK. Competent Vendors may only apply for the execution of the work in IIMK terrain. Keeping all possible contingencies in mind of working in IIMK terrain. It will be construed that the contractor has inspected the site and satisfied himself and the quoted rates shall hold good in all conditions.

1.11 Schedule of quantities

A schedule of approximate quantities for various items accompanies this tender. It shall be definitely understood that the Institute/Consultant do not accept any responsibility for the correctness or completeness of the schedule, in respect of items and quantities and this schedule is liable to alterations by omissions, deductions or additions at the discretion of the Institute/ Consultant without affecting the terms of the contract and the Contractor's quoted rate is valid for all such variations. The Institute / Consultant reserves the right to completely delete any item from the scope of the work without affecting the terms of the contract.

1.12 Contractors' Rates

The contractors' rates must include the cost of transportation of material to the site, loading, unloading, storage at site, ESI, PF, KCWWF, all taxes such as, Works contract tax, GST, IT, Customs & Excise Duties & Octroy , etc. and the fixing or placing in position for which the items of work is intended to be operated. The rate would also include any earth work removal and filling.

The Institute will not provide Form `C' or any other such certificates to the Contractor.

The rates shall remain firm, throughout the contract period including the extended period if any. No extra payment would be released by IIMK unless IIMK desires extra work to be carried out.

1.13 Interpretation

In interpreting the specifications, the following order of decreasing importance shall be followed:

(a) Nomenclature of Item as given in the Schedule of Quantities
(b) Drawings
(c) Particular or special specifications
(d) General Specifications

Matters not covered by the specifications given in the contract as a whole, shall be covered by the relevant Indian Standard Codes. If such codes for a particular subject have not been framed, the decision of the Institute/Consultant shall be final and binding.

1.14 Alterations in Tender Documents

No alterations shall be made by the tenderer in the Tender documents. Instructions to the Contractors, Contract Form, Conditions of the Contract, Drawings and Specifications, and if any such alterations are made or any special condition attached, the tender is liable to be rejected.

1.15 Acceptance of Tender

The acceptance of the tender will rest with the Institute, which does not bind itself to accept the lowest tender and reserves to itself the authority to reject any or all of the tenders received, without assigning any reason(s).The Institute reserves the right of accepting the whole or any part of the tenders received and the tenderers shall be bound to perform the same at their quoted rates.

1.16 Site Supervision

The work shall be carried out under the direction and supervision of the Institute/ Particular or special specifications or their representative at site. On accepting the tender, the contractor shall intimate the name of his accredited representative who would be supervising the construction and would be responsible for taking instructions for carrying out the work on day to day basis.

The Institute/ Consultant or their representative at site shall have access to the workshops of the successful tenderers so as to ensure themselves of the quality of material and workmanship.

1.17 Quality

The Institute's decision with regard to the quality of the material and workmanship will be final and binding. Any material rejected by the Institute/

Consultant shall be immediately removed by the contractor from the site at his own cost.

1.18 Commencement of work/Period of Completion

The Contractor shall commence work on site within **Seven days** from the date of issue of the work order. This date shall be considered as the date of commencement of the said work.

Time is the essence of the Contract. All works as per this tender will be completed within **Three months** from the date.

Completion period includes Monsoon period as well as festival period.

1.19 Scope of Work

The following works are broadly envisaged in this Contract –Providing Crèche and Recreational Facility at Faculty Apartment II Building (Phase II) in IIMK Campus.

1.20 Income Tax

Every tenderer shall furnish along with the tender the copy of the Income Tax PAN Card, unless the same has been already furnished to the Institute, without which his tender is liable to be rejected. The Institute will deduct amount towards Tax Deducted at Source (TDS) as per the latest Income Tax Rules, from all payments made to the Contractor.

1.21 Goods Service Tax (G S T)

In the case of contract involving materials required for the works, the contractor shall have a valid registration number before entering in to the contract and it is mandatory for the contractor to mention registration number in the Bills/Claims. All payments made to the contractor will attract TDS Liability and, therefore, it is the responsibility of the contractor to obtain the Liability Certificate from the Sales Tax Department for release of final payment against Bills/Claims as per GST rules.

1.22 Defects Liability Period

Any defects which develop within `Defect Liability Period' of **Twelve months** from the actual date of completion will have to be rectified by the contractor at his own cost. In case of failure to do so, the Institute with the concurrence of the Project Manager/Consultant, shall get the rectification work done by some other agency at the risk and cost of the contractor. The rectification of such defects shall be done immediately on receipt of written notice from the Institute/ Project Manager/Consultant and such defects may extend "the liability period" for a period of 12 months from the date of rectification.

1.23 Part Occupation

If Institute wants to occupy areas in part, the contractor shall have to complete the work of the areas in conjunction with the Institute and hand over the same to the Institute without affecting any of the Clauses of the contract agreement.

1.24 Contract Signing

After acceptance of the tender, the tenderer shall sign the necessary contract papers within seven days of the intimation in the prescribed form. Expenses for the agreement including cost of stamp papers etc. shall be borne by the contractor. In case of delay the 'Earnest Money' shall be forfeited and the tender cancelled or the contract enforced as per terms of the tender and the tenderer shall thus be bound even though the formal agreement has not been executed and signed by the tenderer.

1.25 Earnest Money Deposit (EMD), Performance Guarantee (Security Deposit) and Retention Money

a) The tender document shall be accompanied by earnest money of **Rs. 75,000/- (Rupees Seventy Five Thousand Only)** by Deposit at call receipt of Schedule Bank/ Fixed Deposit Receipt of a schedule Bank/ demand Draft of a Schedule Bank valid for a minimum period of 3 (three) months issued/assigned in favour of Indian Institute of Management Kozhikode payable at Kozhikode.

The tender received without EMD or with EMD in any form other than as stated above is liable to be rejected. The EMD will be refunded to the unsuccessful tenderer within one month of the acceptance of the tender.

(b) **Performance Guarantee** (Security Deposit): Within seven days of the award of the contract, the contractor shall furnish to the Institute a bank guarantee/ Fixed Deposit/ Demand Draft for a sum equivalent to 7% of contract value as Performance Guarantee (Security Deposit) valid for the duration of the contract period plus two months. EMD already deposited along with tender shall be returned on furnishing the performance guarantee.

(c) **Retention Money:** Retention money @ **5%** of each running Bill value, excluding Secured Advance, shall be deducted from each running account payment.

(d) The Retention Money/EMD shall not bear any interest.

1.26 Refund of Deposit

Security deposit shall be returned after virtual completion of all the works and the Retention Money recovered from the bills, shall be refunded only after the defects liability period of 12 (twelve) Months**.**

1.27 Supply of materials

The Institute does not bind itself to supply any materials whatsoever required for the work. However, in case of supply of any materials by the Institute, the Contractor shall be responsible for the safe custody and proper utilization of such materials for the works as instructed by the Institute.

The quality/make of material to be purchased by the contractor shall have the approval of the Institute before incorporation within the works. For the purpose of payment, actually recorded quantities shall be taken into consideration. Rejected material shall be removed at once from the site of work at contractor’s cost.

1.28 Insurance:

The successful contractor shall take out **Contractor's All Risk** (CAR) insurance policy, in the name of the contractor, the beneficiary being **Indian Institute of Management Kozhikode (Kerala**) and the original policy shall be deposited with the Institute. The policy shall cover clauses as under:

i) The Contractor shall at all times indemnify and keep indemnified the Institute and its officers, servants, agents and any other guest or person moving in the Campus Area premises from and against all third party claims whatsoever (including but not limited to property loss and damage, personal accident, injury or death of/to property or person of any Sub-contractor and/or the servants or agents of the contractor, any sub-contractor(s) and/or the Institute) and the contractor shall at his own cost and initiative at all times up to the successful conclusion of the defect liability period specified in Clause 1.20 hereof take out and maintain all insurable liabilities under this Clause, including but not limited to third party insurance and liabilities under the Motor Vehicles Act, Workmen's Compensation Act, Fatal Accidents Act, Personal Injuries Insurance Act, Emergency Risk Insurance Act and/or other Industrial Legislation from time to time in force in India with insurance company(ies) approved by the Institute, and such policy(ies) shall be of not lesser limit than the limits hereunder specified with reference to the matters hereunder specified, namely:

a) **Workmen's Compensation Insurance** - to the limit to which compensation may be payable under the laws of the Republic of India.

b) **Third Party Insurance** - body injury and property damage to the limit of not less than **Rs.1, 00,000/- (Rupees one lakh** only) in each accident at each job site and to a limit of not less than **Rs. 5, 00,000/- (Rupees five lakhs** only) for all accidents at all job sites.

Provided that the limits specified above shall operate only as a specification of minimum limits for insurance purposes, but shall not in any way limit the contractor's liability in terms of this Clause to the limit(s) specified.

ii) Should the Contractor fail to take out and/or keep afoot insurance as provided for in the foregoing Sub-Clause, the Institute shall be entitled (but without obligation to do so) to take out and/or keep afoot such insurance at the cost and expense of the Contractor, and without prejudice to any other rights or remedies of the Institute in this behalf, to deduct the sum(s) incurred, from the dues of the Contractor.

IV) Period of Policies: All insurance covers mentioned above shall be kept alive till the completion period of contract and defects liability period.

1.29 Payments

Only One bill shall be prepared every month, based upon the joint measurement by the Contractor and Institute’s representative. Contractor shall submit 3 copies of the bill and 3 copies of the measurement sheet.

1.30 Compensation for delay

If the contractor fails to maintain the required progress in terms of Clause 1.16 or to complete the work and clear the site on or before the contract period or the extended date of completion, he shall, without prejudice to any other right or remedy available under the law, pay the Institute on account of such breach, the agreed compensation amount calculated at the rates stipulated below and the Institute's decision in writing shall be final and binding in this respect.

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

Compensation for delay of work : @1% per week of delay

Provided always that the total amount of compensation for delay to be paid under this Condition shall not exceed **10% of the Tendered Value of work** or of the Tendered Value of the item or group of items of work for which a separate period of completion is originally given.

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Institute. In case, the contractor does not achieve a particular milestone mentioned in Clause 1.16, or the re-scheduled milestone(s), the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of Extension of Time.

1.31 Deviations / Variations Extent and Pricing

The Institute shall have power (i) to make alteration in, omissions from, additions to, or substitutions for the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work, and (ii) to omit a part of the works in case of non-availability of a portion of the site or for any other reasons and the contractor shall be bound to carry out the works in accordance with any instructions given to him in writing signed by the Engineer in charge and such alterations, omissions, additions or substitutions shall form part of the contract as if originally provided therein and any altered, additional or substituted work which the contractor may be directed to do in the manner specified above as part of the works, shall be carried out by the contractor on the same conditions in all respects including price on which he agreed to do the main work except as hereafter provided.

1.31.1 The time for completion of the works shall, in the event of any deviations resulting in additional cost over the tendered value sum being ordered, be extended, if requested by the contractor,

i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus.

ii) 25% of the time calculation in (i) above or such further additional time as may be considered reasonable by the Institute.

1.31.2 Deviation, Extra items and Pricing

In the case of extra items(s) the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the Engineer in charge shall within one month of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the Contractor shall be paid in accordance with the rates so determined. Market rate shall be the rate as decided by the Engineer in charge on the basis of cost of materials and labour at the site where the work is to be executed plus 10% to cover all overheads and profits of the contractor.

1.31.3 Deviation, Substituted items, Pricing

In the case of substituted items, the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the aforesaid para.

a) If the market rate for the substituted item so determined is more than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) so increased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

b) If the market rate for the substituted item so determined is less than the market rate of the agreement item (to be substituted) the rate payable to the contractor for the substituted item shall be the rate for the agreement item (to be substituted) to be decreased to the extent of the difference between the market rates of substituted item and the agreement item (to be substituted).

1.32 Advances

The Contractor shall not be entitled to get any sort of advances for the work.

1.33 Water and Electricity

Water and Electricity shall be arranged by the Contractor at his own expense. In case of failure of power, the contractor shall have alternate arrangement (DG Set etc.) to keep the work in progress at his own cost.

1.34 Receipt of Tenders

Tenders along with all the copies, drawings etc. in sealed envelope will be received as stated on the cover of this Notice.

1.35 E.S.I. & Provident Fund Obligations

The Contractor shall include in his rates all expenses towards meeting obligations under the Employees State Insurance Act and the Provident Fund Act. He shall follow all rules and regulations required under the Act as may be in force from time to time. All employees engaged upon the Works shall be covered under these schemes and the required amounts deposited by him directly with the concerned authorities. All records in connection with the above shall be properly maintained by the Contractor and produced for scrutiny by the Institute/Consultant whenever called for.

1.35 Supplier / Labour Payment

The Contractor shall pay to its Suppliers/ Labourers within reasonable time fixed with them. The Institute shall not be responsible during the period of Contract or after completion of Project for Contractors liabilities towards Suppliers/Laboures.

APPENDIX - I

SUMMARY OF VARIOUS CLAUSES

1.	Validity of Tender	*1.9*	90 days
2.	Address, date & time of submission	1.7	The Chief Administrative Officer Indian Institute of Management Kozhikode I.I.M. Kozhikode Campus .P.O, Kozhikode - 673 570 Date: **25.11.2019 up to 3:00 p.m**.
3.	Period of commencement from Institution's order (Mobilization Period)	*1.18*	7 days
4.	Time of Completion	*1.18*	**Three Months**
5.	Amount of Compensation for delays	*1.30*	1.0% per week of delay subject to a max. of 10.0 % of total value of work
6.	Period of Maintenance	*1.22*	Twelve Months
7.	Amount of EMD	*1.25(a)*	**Rs. 75,000/- (Rupees Seventy Five Thousand Only)**
8.	Amount of Security Deposit	*1.25(b)*	7% of Contract Value by way of Bank Guarantee/Fixed Deposit /Demand Draft
9.	Interim Certificates (R.A.Bills)	*1.29*	Once in a month
10.	Third Party Insurance	*1.28* (i) b)	Rs.1, 00,000/- (Rupees One Lakh) for any one accident.

PROFILE OF THE VENDOR

(All fields are mandatory)

I. Name of the Contractor :

II. Address for communication:

III. Contact details

a. Telephone Number :

b. Mobile Number :

c. Email ID :

IV. GST NO :

II. TENDER FORM

Indian Institute of Management Kozhikode
I.I.M. Kozhikode Campus P.O., Kozhikode - 673 570

Dear Sirs,

Sub: - Creating additional Recreational Facilities for SWC at the Basement Floor of Faculty Apartment II Building in IIMK Campus

With reference to the tender invited by you for the above work, I/we write this after having:

a) Examined the, specifications, Schedule of Quantities, instructions to tenderers, draft agreement and the conditions of contract annexed thereto (here-in-after called the Contract Documents) relating to construction.
b) Visited and examined the site of the proposed work and the terrain profile of IIMK
c) Acquired the requisite information as affecting the tender.

I/We undersigned, hereby offer to construct the above work in strict accordance with the contract documents for the consideration to be calculated in terms of the priced Schedule of Quantities.

I/We undertake to complete the whole of the works as per the attached schedule within a period of **Three Months** from the date of issue of intimation by you that our tender has been accepted and upon receiving possession of the site. I/We further undertake that on failure to adhere to the programme of work as approved by the Institute, subject to the conditions of the contract relating to extension of time, I/We shall pay to the Institute the sum named in the Appendix to the conditions of contract, as `Compensation for delay'.

I/We hereby deposit with you an `Earnest Money' of **Rs. 75,000/- (Rupees Seventy Five Thousand Only)** carrying no interest and I/We do hereby agree that this sum shall be forfeited in the event of the Institute accepting my/our tender and I/We failing to take up the contract when called upon to do so.

I/We further agree to the deposit of 7% of contract value as **PERFORMANCE GUARANTEE** (Security Deposit) within fourteen days of the award of the contract in the form of a Bank guarantee/ Fixed deposit/Demand Draft valid for the duration of the contract period.

I/We further agree to the deduction of 5% from the `Interim Payment' towards the 'Retention Money' which will be refunded as per the relevant Clauses in the agreement.

Yours faithfully,

Name of the partners of the firm
OR
Name of the persons having Power-of-
Attorney to sign the contract.

III. DRAFT AGREEMENT

ARTICLES OF AGREEMENT

Made the_____ day of _____ 2019

between **INDIAN INSTITUTE OF MANAGEMENT KOZHIKODE**
I.I.M. Kozhikode Campus P.O., KOZHIKODE - 673 570

(Hereinafter called `The Institute') on the one part and
M/s _____

_____ _____

(Hereinafter called 'the Contractor' on the other part

WHEREAS the Institute is desirous of execution of _____
_____
(Hereinafter called the Work).
and has caused Drawings and Schedule of Quantities showing and describing the work to be done to be prepared by or under the direction of **M/s ....**

AND WHEREAS the contractor has supplied the Institute with a fully priced copy of the said Schedule of Quantities (which copy is hereinafter referred to as `The Contract Bills') AND WHEREAS the said Drawings (hereinafter referred to as the 'Contract Drawings) and the contract bills have been signed by or on behalf of the parties hereto : AND WHEREAS the contractor has furnished a Bank guarantee for the sum of ` _____ (Rupees_____) issued by _____branch of _____Bank (B.G. No_____ dated_____/ FD dated/ DD Dated) as performance guarantee to the Institute.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

1. In this Agreement words and expressions shall have the same meanings as are respectively assigned to them under Section `Definitions in the General Conditions of Tender Document issued by the Institute and accepted by the Contractor while submitting his bid dated _____.

2.a) The following documents included in the tender bid shall be deemed to form and be read and construed as part of this Agreement along with amendments negotiated and confirmed in various subsequent letters exchanged as mentioned herein after :
   I) Notice Inviting Tender
   II) Tender Form
   III) Draft Agreement
   IV) General Conditions of Contract
   V) Safety Code
   VI) Technical Specifications
   VII) List of approved makes of materials
   VIII) Drawings

b) The following documents shall also be deemed to form and to be read and construed as part of this Agreement and shall be complimentary to one another.

i) Letter No. _____ dated _____ inviting tende`
ii) Letter No._____ dated_____ of Contractor submitting the tender bid.
iii) Work Order No. _____ Dated _____ .

NOW IT IS HEREBY AGREED AS FOLLOWS:

1. For the consideration hereinafter mentioned, the contractor will upon and subject to the conditions annexed carry out and complete the work shown upon the contract drawings and described by or referred to in the Contract Bills and in the said conditions.
2. The Institute will pay the contractor the sum of `_____ (Rupees_____ _____) (hereinafter referred to as the contract sum) or such other sum as shall become payable hereunder at the times and in the manner specified in the said conditions.
3. The term “the Consultant" the said conditions shall mean the said **M/s.....** or in the event of his ceasing to be the Consultant for the purpose of this contract, such other person as the Institute shall nominate for that purpose, not being a person to whom the contractor shall object for reasons considered to be sufficient by an arbitrator appointed in accordance with the said conditions. Provided always that no person subsequently appointed to be the Consultant under this contract shall be entitled to disregard or overrule any certificate or opinion or decision or approval or instruction given or expressed by the Consultant for the time being.
4. The said Conditions shall be read and construed as forming part of this Agreement, and the parties hereto shall respectively abide by, submit themselves to the conditions and perform the agreements on their parts respectively in such conditions contained.
5. No extra payment for extra work claimed by the vendor due to profile condition or any other matter could be sanctioned by IIMK unless IIMK desired addition work or additional quantity to be executed. Only competent vendors having carried out similar work to bid for the work.

AS WITNESS our hands this _____ day of _____ 2019

Signed by the said Institute
in the presence of

Witness
Name :
Address :

Signed by the said Contractor
in the presence of
Witness

Name :

Address :
Date:

IV. GENERAL CONDITIONS OF CONTRACT

1.0 DEFINITIONS AND INTERPRETATIONS

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

a) Institute, means Indian **Institute of Management Kozhikode (IIMK),** or its authorized representative.

b) Contractor shall mean the successful tenderer to whom the contract has been awarded.

c) Engineer in charge shall mean the representative of the Institute as Site in charge of works.

d) Contract, shall mean and include the documents forming the Tender and acceptance thereof and the formal Agreement executed between the Competent Authority on behalf of the Institute and the Contractor, together with documents referred to therein including those conditions, specifications, designs, drawings and instructions issued from time to time by the Engineer in charge (on behalf of the Institute) and all these documents taken together shall be deemed to form part of the Contract and shall be complementary to one another.

I) Notice Inviting Tender
II) Tender Form
III) Draft Agreement
IV) General Conditions of Contract
V) Safety Code
VI Technical Specifications
VII) List of approved makes of materials

e) Site, shall mean the actual place in, over or under which work is to be done, allotted by the Institute for the purpose of carrying out the contract.

f) Work shall means the work or works contracted to be executed under this agreement whether original altered, substituted (or) additional and includes materials or labour or both.

g) Contract Price, shall mean the sums referred to in the formal agreement, if any or the work order.

2.0 ASSIGNMENT

The contractor shall not assign the contract or any part thereof or any benefit or therein or there under without the written permission of the Institute / Consultant.

3.0 DRAWINGS

3.1 Issue of Drawings

Five Sets of drawings approved for construction will be issued to the contractor according to the progress of work at site and the contractor shall arrange for the execution of the works and the procurement of materials accordingly. The contractor shall give adequate notice in writing to the Institute of any further drawings or specification that may be required for the execution of the works or otherwise under the contract.

3.2 Copies of Drawings to be kept at site

One copy of the drawings furnished to the contractor as aforesaid shall be kept at the site and the same shall at all reasonable times be available for inspection and use by the Institute/ Consultant or their Representatives and by any other person authorized by the Institute / Consultant in writing.

3.3 Issue of further drawings and instructions

The Institute shall supply to the contractor from time to time through his representative, during the progress of the works such further drawings and instructions as shall be necessary for the purpose of proper and adequate execution and maintenance of the works and the contractor shall carry out and be bound by the same.

3.4 Ownership of Drawings

All drawings supplied to the contractor are deemed to be the property of the Institute. The contractor agrees both on behalf of himself and his employees, whether during or after completion of the contract not to divulge or use, except for the purpose of this contract, any information contained in the drawings.

3.5 Execution as per Drawings

The contractor must not vary or deviate from the drawings in any respect while executing the work or executing any extra work of any kind whatsoever unless advised by the Institute/ Consultant.

3.6 Plans and drawings to be submitted by the Contractor.

The contractor shall submit the following information in triplicate to Institute/ Consultant for approval within the time stipulated against each item below:

a) A general tentative layout plan of construction plant and equipment for the execution of work within the time period stipulated in schedule.
b) Drawings or prints showing the location of major plants and other facilities which he proposes to put up at the site, including any changes in the general layout, at least 7 days prior to the commencement of the respective work
c) Layout and details of temporary works that the contractor wants to carry out to fulfil his obligation under the contract.

Within 7 days the Institute will give their approval/comments sufficient to proceed with the work or objections/instructions to the contractor

based on which the drawings shall be revised and re-submitted for approval by the Institute

All these plans and drawings submitted by the contractor and approved by the Institute/ Consultant shall become part of the contract.

3.7 Shop drawings

Wherever specified in the Contract, the Contractor shall furnish for the approval of the Consultant within fourteen days of the issue of the relevant information, two sets of shop drawings at his own cost, containing details of construction, size, coordinated arrangement as per other trades and site constraints, operating clearance, performance characteristics, Specification of all items of equipment accompanied by manufacturer's catalogues, and any other particulars desired by the Consultant. In case of amendments or corrections to these drawings, the Contractor shall submit at his own cost two sets of the corrected drawings, along with the drawings on which the corrections were made. Upon approval of the shop drawings, the Contractor shall further submit at his own cost six sets of the approved shop drawings for the exclusive use of and retention by the Consultant. No material or equipment may be delivered or installed at the Site, until the Contractor has in his possession the relevant approved shop drawings.

3.8 Completion Drawings and Maintenance Manuals

Upon virtual completion of the Works, the Contractor shall submit to the Engineer in charge comprehensive operating instructions and maintenance schedules, for all relevant items, elements and equipment. This shall be supplemented with but not substituted by manufacturer's manuals.

4.0 GENERAL OBLIGATIONS

4.1 Inspection of site etc. before submission of tender:

The contractor shall inspect and examine the site and its surroundings, and shall satisfy himself before submitting his tender, as to the nature of the ground, form and nature of the site, the quantities and nature of work and materials required for the completion of the works, the means of access to the site, the local labour conditions, the accommodation he may require and in general shall obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his tender.

4.2 Sufficiency of Tender

The contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices stated in the priced Schedule of Quantities and the schedule of rates and prices, if any. The tender rates and prices shall cover all his obligations under the contract and all matters and things necessary, for the proper completion and maintenance of the work.

4.3 Clarification before submitting tenders

Should the contractor notice any discrepancy or error in the statement made, or quantities or units shown against items, he shall immediately bring to the notice of the authorities and obtain the clarification before submitting the tender. The tender shall be based on such clarifications received and shall be recorded as such in the covering letter to the tender, failing which the Institute shall have the right to ask the contractor to execute the work according to the statement made or quantities or units shown in the tender, without any compensation.

4.4 Rates quoted for finished work

The rates quoted in the tender by the contractor must be for the finished work as per the drawings and specifications. No extra payment for the extra work claimed by the contractor/vender would be admitted.

4.5 Location of work

Unless specifically mentioned in the item, the work described therein may be at any location or elevation inside the Institute's campus. Where there is no road approach, the Contractor may have to transport the materials by head load. No extra payment can be claimed on this account.

4.6 The tender shall remain open for acceptance for a period of 90 days from the date of opening of the tender.

4.7 Commencement of work:

The contractor shall commence the work at site immediately on being advised by the Institute of the acceptance of the tender and shall proceed with the same with due expedition.

4.8 Programme of work

Soon after the award of contract, the Contractor shall submit to the Institute for his approval a programme to match with the planned completion of the whole job showing the order of preference and method in which he proposes to carry out the works and shall whenever required by the Institute furnish further detailed programme and particulars in writing of the contractor's arrangements for carrying out the works and of the construction plant and temporary works which the contractor intends to supply, use or construct as the case may be. The submission to and approval, if any, by the Institute of such programmes or particulars shall not relieve the contractor of any of his duties or responsibilities under the contract. Also refer special conditions.

4.9 Contractors' Employees

The contractor shall provide and employ at site in connection with the execution and maintenance works:

a) Only such technical assistants as are skilled and experienced in their respective callings and such sub-agents, foreman and leading hands as are competent to give proper supervision to the work they are required to supervise and,

b) Such skilled, semi-skilled and un-skilled labour as is necessary for the proper and timely execution and maintenance of works.

4.10 Removal of Workmen

The Institute/Engineer in charge shall be at liberty to object to and require the contractor to remove forthwith from the works any person employed by the Contractor in or about the execution or maintenance of the works who in the opinion of the Institute/ Project Manager/ Consultant misconducts himself or is incompetent or negligent in proper performance of his duties or whose employment is otherwise considered by the

Institute/ Engineer in charge to be undesirable and such person shall not again be employed upon the works without the written permission of the Institute/ Project Manager/ Consultant. Any person so removed from the works shall be replaced by the contractor without delay by a competent substitute approved by the Institute/ Consultant. Misconduct of employee of the contractor or poor workmanship shall be a valid reason for suspension of the contract by the Institute and in that case, no compensation of whatsoever nature shall be paid to the contractor.

4.11 Communications to be in writing

All references, communications, correspondences made by the Institute/ Project Manager/ Consultant, and their representative or the contractor concerning the works shall be in writing and no reference, communication, or complaint which is not in writing, shall be recognized.

4.12 Occupation and use of land

No land/building belonging to or in the possession of the Institute shall be occupied by the contractor. The contractor shall not use, or allow to be used, the site for any purpose other than for executing the works.

4.13 Fossils/Coins, etc.

All fossils, coins, articles of value of antiquity and structures and other remains or things or geological or archaeological interest discovered on the site of the works shall be the absolute property of the Institute. The contractor shall not take away any such article or thing and take reasonable precautions to prevent his workmen or any other person from removing or damaging such article or thing and shall immediately upon discovery thereof acquaint the Institute's representative of such discovery and carry out order as to the disposal of the same.

4.14 Construction of site shed

Any site shed, proposed to be temporarily constructed by the contractor for his office work, storage of materials etc. shall conform to the standard sketch, or to the plan approved by the Institute. Permission for the construction of such shed shall be obtained in writing. The Institute has the right to refuse permission without giving any reason.

4.15 Materials, tools and plant

All materials required for the execution of the works other than those mentioned in the Notice Inviting Tender shall be supplied by the contractor. Materials so supplied shall have the approval of the Institute using on the

works. All the rejected materials shall be removed at once from the site of work at the contractors' own cost. The contractor shall supply all tools, tackles, and equipments like compressors, concrete mixers, vibrators, pumps, welding or pneumatic tools, tar boilers etc. required for the execution of the works.

4.16 Tollages etc.

The contractor shall pay all tollages and other royalties, rent and other payments or compensations, if any, for getting stone, gravel, sand, clay and all other materials required for the works.

4.17 Setting out

The contractor shall be responsible for the true and proper setting out of the works and for the correctness of the position, levels, dimensions, and alignment of all parts of the works and for the provision of all necessary instruments, appliances, and labour in connection there with. If at any time during the progress of the works any error shall appear or arise in the position, level, dimensions or alignment of any part of the works, the contractor on being required to do so by the Institute/ Project Manager/Consultant or his representative, shall at his own cost rectify such error to the satisfaction of the Institute/Project Manager/ Consultant or his representative. The checking of any setting out or of any line or level by the Institute/Project Manager/ Consultant or his representative shall not in any way relieve the contractor of his responsibility for the correctness thereof. The contractor shall provide all necessary instruments, appliances, and labour required by the Institute/ Project Manager/ Consultant or his representative for checking, if any, of the setting out. The contractor shall carefully protect and preserve all bench marks, site levels, pegs and other things used in setting out the works. The rates quoted for the work shall also include the cost of all reference and level pillars and their dismantling when no longer required.

4.18 Damage to persons and property

The contractor shall indemnify and keep indemnified the Institute against all losses and claims for injuries or damages to any person or property whatsoever which may arise out of or in consequence of the construction and maintenance of works and against all claims, demands, proceedings, damages, costs, charges, expenses, whatsoever in respect thereof or in relation thereto.

4.19 Interference with Traffic and Adjoining Properties

All operations necessary for the execution of the works shall, so far as compliance with the requirements of the contract permits, be carried on so as not to interfere unnecessarily or improperly with the public convenience or the access to use and occupation of public or private roads and footpaths or of properties whether in the possession of the Institute or of any other person. The contractor shall save harmless and indemnify the Institute in respect of all claims, proceedings, damages, cost, charges and expenses whatsoever arising out of, or in relation to, any such matters in so far as the contractor is responsible thereof.

4.20 Extraordinary Traffic

The contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the route to site from being damaged or injured by any traffic of the contractor and in particular, shall select routes choose and use vehicle and restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of plant and material from and to the site shall be limited, as far reasonably possible, and so that no unnecessary damage or injury may be occasioned to such highways and bridges.

4.21 Settlement of Extraordinary Traffic Claims

If during the execution of the works or at any time thereafter the contractor shall receive any claim arising out of the execution of the works in respect of damage or injury to highways or bridges he shall immediately report the same to the Institute / Consultant and thereafter the Institute shall negotiate the settlement and pay all sum due in respect of such claim and shall indemnify the contractor in respect thereof and in respect of all claims, proceedings, damages, cost, charges and expenses in relation thereto.

4.22 Co-operation with other Agencies

The contractor shall co-operate with the work of other agencies or contractors that may be employed or engaged by the Institute and as far as it relates to the contractors' work. The sequence of work shall be so arranged that the work of other agencies are also in progress simultaneously.

4.23 Barricading around excavated trenches etc.

The contractor shall at his own cost provide around excavation, temporary barricading with ballies and bamboos with warning signals during day and night and shall maintain it so long the trenches are not filled up. Similar barricades shall also be provided at all dismantling work, erection of structural, sheeting work etc. No extra claim shall be entertained for providing, maintaining and removing such barricades.

4.24 Protection of underground services

The contractor must take all precautionary measures to protect the underground and other services lines, viz. cables, water and sewer lines etc. and observe any specific instructions which may be given in this regard by the Institute/Consultant.

4.25 De-watering trenches and pits

The tendered rates shall always be deemed to have taken into account the cost of removal of silt and materials that may slip in the trench and pit and de-watering the trenches or pits of water accumulated or collected through seepage or subsoil water or rain water. The contractor shall in no case be entitled to claim any extra amount for the above work. The contractor shall remain prepared with necessary pumps and equipment for de-watering the trenches or pits so as to avoid unnecessary delay and possible damage to the property etc.

4.26 Work in or around operating plant or offices etc.

Where the work is being carried out in or around an operating plant where the plant must run un-interrupted, the contractor shall work only at specified places and times as mutually arranged between the contractor and the Institute/ Consultant. Similar arrangement must be made while executing works inside the offices, buildings etc. without causing disturbance to the office work. For this the work may be required to be done during off-hours and Sundays. No extra will be allowed beyond the rates quoted for doing work in the manner described above.

4.27 Work in shifts and off-days

The contractor shall work in one or more shifts as also on Sundays and off days to complete the work in time, if so required for which the Institute shall not be liable to pay any extra.

4.28 Site Order Book

A site order book must be maintained and always be available at site to record the instructions by the Institute/ Project Manager/ Consultant or his representative. The contractor must see that the instructions noted therein are properly carried out.

4.29 Delay in obtaining materials supplied by the Institute

If the Institute has undertaken to supply any material specified in the special conditions at rates and conditions cited therein, the contractor shall keep himself in touch with day to day position regarding the supply of materials from the Institute and so adjust the progress of the works that labour may not remain idle nor there be any other claim due to or arising from delay in obtaining the materials.

4.30 Record of materials supplied by the Institute

The contractor shall maintain an account of different materials obtained from the Institute for executing the works under the contract. The Institute shall have the power to check the position of materials at all times and verify stocks as and when desired.

4.31 Safe storage of materials

The contractor shall be responsible for the safe storage of materials supplied by the Institute for execution of the works. Surplus materials or materials lost or damaged or un-accounted for or made unserviceable by the contractor shall be charged at the prevailing market price.

4.32 Cement Godown

Cement godown shall be provided by the contractor as per the standard sketch including dismantling on completion of the project and removing from site all the debris.

4.33 Transport of materials

Unless otherwise specified, all the materials supplied by the Institute shall be transported by the contractor from the Institutes' store/yard, to the site of work at no extra cost.

4.34 Site to be kept clear

The surplus spoil and dismantled debris shall be removed to a place as directed by the Institute/Project Manager/Consultant and stacked, leveled and dressed as directed.

4.35 Assistance and Instruments for Engineer's Representative

The contractor shall provide at all times for the duration of the contract, chain-men, staff-men, workmen and survey instruments for the exclusive use of the site Engineer as may be deemed necessary for carrying out his duties in connection with the contract.

4.36 Site Notice Board

The contractor shall provide for all necessary site notice boards as required by the Institute/Consultant to display the project name, the Institute. Consultant's name and the names of all consultants associated with the work.

4.37 General Lighting for the work

The contractor shall provide electric lights, maintain system all as required for the works and remove the temporary installations on completion.

4.38 Conflict in meaning between schedule of rates and specifications

The Schedule of Quantities shall be read in conjunction with the specifications, and in the event of conflict in meaning between the two, the corresponding item in the schedule shall always have precedence over the specifications.

4.39 Conflict in meaning between general conditions of contract and the terms and conditions

In case of any inconsistency between the General conditions of contract and the special conditions, the special conditions of contract shall have precedence over the General Conditions.

5.0 LABOUR

5.1 Labour Rules

In respect of all labour directly or indirectly employed on the works by the contractor, the contractor shall comply with the provisions of the contract labour (Regulation and Abolition) Act 1970, Minimum Wages Act 1948, Payment of Wages Act 1936 and any amendments thereof and all legislations and rules of the State and/or Central Government or other local authority, framed from time to time, governing the protection of health, sanitary arrangements, wages, welfare and safety for labour employed on building and construction works and for bonus, retirement benefits, retrenchment/lay off, compensation and all other matters involving liabilities of Institutes to employees. The rules and the other statutory obligations with regard to fair wages, welfare and safety measures, maintenance of register etc. will be deemed to be part of the contractor's obligation under the contract.

5.2 Reporting accident of labour

The contractor shall be responsible for the safety of all employees and/or workers employed or engaged by him on and in connection with the works and shall forthwith report all cases of accidents to any of them, however caused and whenever occurring to the authorities concerned required as per law and to the Institute/Project Manager/Consultant or his representative and shall make every arrangement to render all possible assistance and aid to the victim of the accident.

5.3 Provision of workmen's compensation act

The contractor shall at all times indemnify and keep indemnified the Institute against all claims for compensation under the provisions of the workmen's compensation act 1923 or any other law for the time being in force in respect of any workmen employed by the contractor in carrying out the contract and against all costs and expenses or penalties incurred by the Institute in connection there with. In every case in which, by virtue of the provisions of the said act, the Institute is obliged to pay compensation to workmen employed by the contractor in executing the works, the Institute shall recover from the contractor the amount of the compensation so paid and without prejudice to the rights of the Institute under the said act, the Institute shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any dues by the Institute to the contractor, whether under this contract or otherwise without prejudice to any other remedy that may be available to the Institute in law. The Institute shall not be bound to contest any claim made against it under the said Act, except on the written request of the contractor and upon his giving to the Institute full security for all costs for which the Institute might become liable in consequence of contesting such claim.

5.4 Accident or injury to workmen

The Institute shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or his sub-contractors, and the contractor shall indemnify and keep indemnified the Institute against all such damages and compensation and against all claims, demands, proceedings costs, charges and expenses whatsoever in respect thereof or in relation thereto.

5.5 Safety, Health and Welfare of work people

The contractor shall be responsible for providing for all costs and charges incurred by complying with all safety health and welfare regulations, appertaining to staff and work people employed on the site including those employed by the sub-contractors including registration with the labour department of Government. The contractor shall be responsible for and shall allow for providing medical facilities including emergency medical facilities for his staff.

5.6 Creches

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

The rooms shall be built in consultation with Consultant to reasonably good specifications and be of appropriate sizes conducive to comfort of the children. The rooms shall be provided with sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean. The Contractor shall supply adequate number of toys and games in the playroom and sufficient number of cots and bedding in the bedroom. The Contractor shall provide one maid to look after the children in the crèche when the number of women workers does not exceed 50 and two maids when the number of women workers exceeds 50. The use of the rooms earmarked as crèche shall be restricted to children, their attendants and mothers of the children.

5.7 Provision of mines Act

The contractor shall observe and perform all the provisions of the Mines Act 1952 where applicable or any statutory modifications thereof and shall indemnify and keep indemnified the Institute from and against any claim under the said Act.

5.8 Preservation of peace

The contractor shall take requisite precautions to prevent any riotous or unlawful behavior by or amongst his workmen and/or others employed on the works by him, for the preservation of peace and protection of the inhabitants and security of property in the neighborhood of the works.

5.9 Age limit of labour

The age limit for employment of labour shall be in strict accordance with the existing labour legislation's.

5.10 Return of labour employed

The contractor, if required by the Institute/Consultant, shall submit return in detail in such form and at such interval as the Consultant may prescribe showing number of different classes of labour employed on the works from time to time by the contractor.

5.11 Observance by sub-contractors

The contractor shall be responsible for the observance of the provisions of aforesaid Clauses by the sub-contractors' employed by him in the execution of the contract.

6.0 MATERIAL TESTS AND WORKMANSHIP:

6.1 Quality of materials, workmanship and tests

All materials and workmanship shall be of the respective kinds described in the contract and in accordance with the Institute or representative's instructions and shall be subjected from time to time to such tests as the Project Manager/Consultant or his representative may direct at the place of manufacturer or fabrication or on the site at all or any of such places. The contractor shall provide such assistance instruments, machines, labour and materials, as are normally required for examining measuring, and testing any work and the quality, weight or quantity of any material used and shall supply samples of materials before incorporation in the works for approval as may be required by the Institute or their representative.

6.2 Construction of prototypes or samples of work

The contractor shall construct prototypes or samples of work as laid down in the contract or as instructed by the Institute. Such prototypes or samples of work, after approval by the Institute shall serve as the standards to be achieved in the final construction.

6.3 Cost of samples

All Samples shall be supplied by the contractor at his own cost.

6.4 Cost of tests

The cost of making any test as per specifications shall be borne by the contractor and contractor should arrange for all requirements like cubes etc. to take the samples by Institute/ Consultant.

6.5 Inspection of operation

The Institute or representative or any person authorized by the institute shall at all times have access to the works and to the site and to all workshops and places where work is being prepared or where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

6.6 Examination of work before covering up

No work shall be covered up or put out of view without the approval of the Institute/Project Manager/ Consultant or their representative and the contractor shall afford full opportunity to the Institute/ Project Manager/Consultant or their representative to examine and measure any work which is about to be covered up or put out of view and to examine that work before permanent work is placed thereon. The contractor shall give due notice to the Institute's representative wherever any such work(s) is or are ready or about to be ready for examination and the Engineer in-charge shall without unreasonable delay, unless he considers it unnecessary and advises the contractor accordingly, attend for the purpose of examining and measuring such work or of examining such works.

6.7 Uncovering and making openings

The Contractor shall uncover any part or parts of the works or make openings in or through the same as the Engineer in charge may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Institute's representative. If any such part or parts have been covered up or put out of view after compliance with the requirements of Clause 6.5 hereof and are found to be executed in accordance with the contract the expenses of uncovering making openings in or through, reinstating and making good the same shall be borne by the Institute. But in any other case all such expenses shall be borne by the contractor and shall be recoverable from him by the Institute and deducted by the Institute from any moneys due or which may become due to the contractor, without prejudice to any other remedy that may be available to the Institute in law.

6.8 Removal of improper work and materials

The Institute or their representative shall during the progress of the works have power to order in writing from time to time.

a) The removal from the site within such time or times as may be specified in the order of any material which in the opinion of the Institute/Engineer in charge or his representative is not in accordance with the contract.

b) The substitution of proper and suitable materials.

c) The removal and proper re-execution (notwithstanding a previous test thereof or interim payment therefore) of a work which in respect of materials or workmanship is not, in the opinion of the Institute or their representative, in accordance with the contract.

6.9 Suspension of work

The contractor shall, on the written order of the Institute suspend the progress of the works or any part thereof for such time and in such manner as the Institute/ may consider necessary and shall, during such suspension, properly protect and secure the work, so far as is necessary in the opinion of the Institute.

7.0 TIME OF COMPLETION, AND TAKING OVER:

7.1 Possession of site

Save in so far the contract may prescribe the extent of portions of the site of which the contractor is to be given possession from time to time and the order in which such portions will be available to him and subject to any requirement in the contract as to the order in which the work shall be executed, the shall give to the contractor possession of so much of the site as may be required to enable the contractor to commence and proceed with the construction of the works in accordance with such reasonable proposals of the contractor as he will make in writing to the Project Manager/ Consultant and shall, from time to time as the work proceeds give the contractor possession of such further portions of the site as may be required to enable the contractor to proceed with construction of the works in accordance with the said programme or proposal.

7.2 Time of completion

The whole of the works shall be completed within the time stipulated or within such extended time as has been allowed under clause 7.3.

7.3 Extension of time of completion

Should the amount of extra or additional work of any kind or changes in scope of work or other special circumstances of any kind whatsoever which may occur, be such as fairly to justify the contractors' request for extension of time for the completion of the works the Engineer in charge shall determine and recommend the amount of such extension and the Institute shall sanction and intimate the contractor in writing. Provided that the Institute is not bound to take into account any extra or additional work or other special circumstances unless the contractor has within 10 days, after such work has been commenced or such circumstances have arisen, submitted to the Institute full

and detailed particulars of any request to the extension of time in the prescribed format of IIMK to which they may consider to be justified.

The contractor should seek extension of time of completion in the prescribed format of IIMK.

7.4 Extension of completion time due to strike, fire etc.

If in the opinion of the Institute/ Engineer in charge, the progress of the work has at any time been delayed by strikes, fire, inclement weather, un-avoidable casualties etc. beyond the control of the contractor, then the time of completion of the work may be extended for such reasonable time as the Institute/ Engineer in charge may decide and this will be indicated in writing.

7.5 Work treated as complete (Virtual Completion)

When the whole of the Works have been substantially completed and have satisfactorily passed any Tests on Completion prescribed by the Contract, including fulfilling all obligations for electrical works governed by Clause No. 5 & 8 under “Special Conditions” for Electrical Works., the Contractor may give a notice to that effect to the Engineer in charge, with a copy to the Institute, accompanied by a written undertaking to finish with due expedition any outstanding work during the Defects Liability Period. For the purpose of virtual completion, under Clause 8 above, the Contractor should have completed all the formalities with the Electrical Inspectorate and got signed by the Institute the Application for Power Allocation, as may be applicable, and submitted the same to the Kerala State Electricity Board (K.S.E.B.). This does not absolve the Contractor of his responsibility of undertaking the liaison work with K.S.E.B. for obtaining the power supply at the earliest. Such notice and undertaking shall be deemed to be a request by the Contractor for the Engineer in charge to issue a Virtual Completion Certificate in respect of the Works.

The works shall not be treated as complete until,

i) The site is clear from all materials, site shed etc. and the Institute/ Engineer in charge are satisfied with the job done by the contractor.

ii) The contractor has submitted the reconciliation statement regarding the stores if any received from the Institute and all the surplus and salvaged materials are returned to the Institute's stores, and the Institute has agreed to the same.

iii) All equipment, tools, plants etc. taken from the Institute have been returned by the contractor.

iv) Any other material, taken on loan/transfer from any other agency have been returned by the contractor

v) All power and water supply connections taken for the execution of the works have been disconnected by the contractor.

vi) Rectifications of any damage done by the contractor to the work executed have been satisfactorily done by the contractor.

vii) All formalities for power connections both with Electrical Inspectorate and K.S.E.B. (wherever applicable) are fulfilled.

7.6.A Virtual Completion of Sections or Parts and Taking over

Similarly, in accordance with the procedure set out in Sub-Clause 7.5 above, the Contractor may request and the Engineer in charge shall issue a Virtual Completion Certificate in respect of:

(a). any Section in respect of which a separate Time for Completion is provided in the Appendix to Tender, or

(b). any substantial part of the Permanent Works which has been both completed to the satisfaction of the Engineer in charge and, otherwise than as provided for in the Contract, occupied or used by the Institute.

After completion of substantial parts of the works before the completion of the whole of the works, the contractor shall notify the Engineer in charge in writing, who within 21 days of receipt of the said notice shall give such certificate with respect to any substantial parts of the works which has been completed to the satisfaction of the Engineer in charge and fit to be occupied or used by the Institute or refuse to issue the same stating the reasons thereof in writing. When any such certificate is given in respect of a parts of the works, such parts shall be considered as completed for the purpose of taking over and computation of the period of maintenance of such parts, that is, such period shall commence from the date of completion of such part of the works as certified. The works in whole or part shall not, however, be treated as completed for the purpose of other relevant Clauses hereof unless and until the provisions of Clause 7.5 hereof are fully complied with.

7.7 Maintenance

For a period of twelve months commencing immediately after virtual completion of the work by Contractor, the contractors' liability shall be to replace the defective parts, rectify/reconstruct the defective work that may develop of his own construction or those of his sub-contractors approved by the Institute (under clause 1.9 of Special Conditions of Contract) arising solely from faulty material or workmanship or for any other reason.

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

The contractor shall bear the cost of such repairs/rectifications carried out on his behalf at site. Immediately upon expiry of the maintenance period the Institute shall issue a final certificate indicating that the contractor has completed his obligation under the contract.
The decision of Institute or their authorized representative's view regarding workmanship shall be binding on the Contractor and Contractor shall abide by the decision.

The deduction of expenditures for rectification shall be made from the Security Deposit/ Retention Money of the Contractor, in case Contractor does not attend the problem in a reasonable time.

8.0 TERMINATION OF CONTRACT:

8.1 Termination of contract

If the contractor has abandoned the contract or has failed to proceed with the work with due diligence or the progress on any particular item or items is slow or he has failed to execute the work in accordance with the terms and conditions of the contract, is persistently or flagrantly neglecting to carry out his obligation under the contract, then it shall be lawful for the Institute to terminate the contract forthwith under written notice and to proceed with the balance of the work through any other agency/agencies. During the course of execution of the job, in case the contractor has done any substandard work, he shall be asked in writing to dismantle and re-do the same at his own expenses. If the contractor fails to comply with the above instructions immediately, then the Institute shall proceed with the above rectification work, through another agency or agencies. Similarly, if the contractor goes slowly on any particular item or items of work, the Institute shall have the right to execute this item or items through another agency or agencies, including its own department at the cost and risk of the Contractor.

8.2 Back charging the contractor

Extra cost and expenses incurred for completing the work or balance work or carrying out the rectification of any work as mentioned above through another agency or agencies including its own department shall be debited to contractors' account and shall be recovered from any money due or that may become due to the contractor without prejudice to any other remedy that may be available to the Institute in law.

9.0 ALTERATIONS, ADDITIONS, AND OMISSIONS:

9.1 Variation:

The Institute shall be entitled to make any variation of the quality or quantity of the works or any part thereof that may, in his opinion, be necessary and for that purpose, or for any other reason if it shall, in his opinion be desirable, he shall have power to order the contractor to do and the contractor shall do any of the following:

a) Increase or decrease the quantity of any work included in the contract.
b) Omit any such work.
c) Change the character or quality or kind of any such work.
d) Change the levels, lines, position and dimensions of any part of the works and,
e) Execute additional work of any kind necessary for the completion of the works.

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

9.2 Order for variations to be in writing

No such variation shall be made by the contractor without an order in writing of the Engineer in charge, provided that no order in writing shall be required for increase or decrease in the quantity of any item of work where such

increase or decrease is the result of the actual quantities exceeding or being less than those stated in the Schedule of Quantities which are estimates. In such cases, the contractor shall be paid only for the actual quantity of work done as certified by the Institute at the accepted unit item rates and no compensation shall be allowed. Provided also that if for any reason the Institute shall consider it desirable to give any such order verbally, the contractor shall comply with such order but it must be followed by confirmation in writing of such verbal order given by the Institute/Project Manager/Consultant, which shall be deemed to be an order in writing within the meaning of this Clause.

9.3 Extra Items

Refer clause from 1.29 to 1.29.3 of Notice Inviting Tender (NIT).

9.4 Items of Ad-hoc nature

The contractor shall procure necessary materials and carry out miscellaneous work of ad hoc nature not specifically provided in the agreement with necessary tools and tackles as may arise during execution of the contract. The actual quantum of work shall be certified and settled by the Engineer in charge and payment for the same shall be fixed on the basis of actual cost plus 10% towards overheads, profits and establishments.

9.5 Claims

The contractor shall send to the Institute's representative an account, giving full and detailed particulars with proper analysis, of all claims for any additional expense to which the contractor may consider himself entitled and of all extra items of work ordered by the Institute, which he has executed, within one month of execution of such work, and no claim for payment for any such work will be considered which has not been included in such particular` Provided always that the Institute shall be entitled to authorize payment to be made for any such work notwithstanding the contractors' failure to comply with this condition, if the contractor has at the earliest practicable opportunity notified the Institute in writing that he intends to make a claim for such work.

10.0 MEASUREMENTS:

10.1 Quantities

The quantities set out in the Schedule of Quantities are the estimated quantities of the work. These are not to be taken as the actual and correct quantities of the works, to be executed by the contractor in fulfilment of his obligation under the contract.

10.2 Works to be measured

The Engineer in charge shall, except as otherwise stated, ascertain and determine by measurement the value in terms of the contract. He shall when he requires any part or parts of the works to be measured, give notice to the contractors' authorized agent or representative, who shall forthwith attend or send a qualified agent to assist the Engineer in charge or his representative in

making such measurement, and shall furnish all particulars required by either of them. Should the contractor not attend or neglect or omit to send such agent, then the measurement made by the Project Manager/ Consultant or approved by him, shall be taken to be the correct measurement of the work. If the contractor does not so attend to examine and agree such records and drawings they shall be taken to be correct. If, after examination of such records and drawings, the contractor does not agree to the same or does not sign the same as agreed, these shall nevertheless be taken to be correct, unless the contractor shall, within fourteen days of such examination, lodge with the Institutes representative for decision by the Engineer in charge, notice in writing of the respects in which such records and drawings are claimed by him to be incorrect.

10.3 Method of measurement

The works shall be measured net in accordance to IS: 1200 (all parts), notwithstanding any general or local custom, except where otherwise specifically described or prescribed in the contract and subject to the following:-

10.4 Provisional sums

"Provisional Sum" means a sum included in the contract and so designated in the Schedule of Quantities for execution of works or the supply of goods, material or services or for contingencies, which sum may be used, in whole, or in part or not at all, at the direction or discretion of the Project Manager/ Consultant. The contract price shall include only such amounts in respect of the work, supply or services to which provisional sums relate as the Project Manager/ Consultant shall approve or determine.

The contractor shall when required by the Project Manager/ Consultant, produce all quotations, invoices, vouchers, and accounts or receipts in connection with expenditure in respect of provisional sums.

11.0 SETTLEMENT OF DISPUTES:

11.1 Matter to be settled by Institute

All disputes and differences of any kind whatsoever arising out of or in connection with the contract, whether during the progress of the works or after their completion shall be referred by the contractor to the Institute and the Institute shall within a reasonable time after their presentation make and notify decisions thereon in writing.

The decisions, directions, clarifications etc. with respect to measurements, drawings and certificates with respect to any matter the decision for which is specially provided for by these or other special conditions to be given and made by the Institute on behalf of the Institute are matters which are referred to hereinafter as Excepted matters and shall be final and binding upon the contractor and shall not be set aside on account of non-observance of any formality, any omission delay or error in proceeding in or about the same or on any other ground or for any reason and shall be without Appeal.

11.2 In the event of any dispute or difference between the parties hereto as to the construction or operation of this contract, or the respective rights and liabilities of the parties on any matter in question, dispute or difference on any account or as to the withholding by the Institute of any certificate to which the contractor may claim to be entitled to or if the Institute fails to make a decision within a reasonable time, then and in any such case, but except in any of the Excepted matters referred to in the above clause, the contractor after 90 days of his presenting his final claim on the disputed matters, may demand in writing that the dispute or difference be referred to arbitration. Such demand for arbitration shall specify the matters which are in question, dispute or difference, and only such dispute or difference other than Excepted Matters of which the demand has been made and no other dispute or difference shall be referred to the arbitration of an officer to be nominated by the consent of both the parties and the provisions of the Indian Arbitration Act 1996, for the time being in force or of any other Act of the Legislature passed in substitution thereof or modification thereof and for the time being in force shall apply to such arbitration.

11.3 Arbitration

The contractor shall not, except with the consent in writing of the Institute in any way delay the carrying out of the work by reason of any such matter, question or dispute being referred to arbitration but shall proceed with the work with all due diligence and shall, until the decision of the arbitration is given, abide by the decision of the Engineer in charge and no award of the arbitrator shall relieve the contractor of his obligation to adhere strictly to the Project Manager’s/ Consultant’s instructions with regard to the actual carrying out of the work except as specifically affected by such award.

12.0 NOTICES:

12.1 Service of notice on contractor

All certificates, notices or written orders to be given by the Institute or by the Project Manager/ Consultant to the Contractor under the terms of the contract shall be served by sending by Registered Post or delivering the same to the contractor's place of business or such other address as the contractor shall nominate for this purpose.

12.2 Service of notice on Institute

All notices to be given to the Institute under the terms of the contract shall be served by sending by post or delivering the same to the Institutes' address.

APPENDIX - II

BANK GUARANTEE PROFORMA OF PERFORMANCE GUARANTEE

BANK GUARANTEE NO: ……. DATED :.....
Amount …….. **Valid up to: …….**

M/S INDIA INSTITUTE OF MANAGEMENT KOZHIKODE,
IIM Kozhikode Campus P.O
Kozhikode – 673 570.

1. In consideration of "Indian Institute of Management Kozhikode" (hereinafter called "The Institute") having agreed to exempt M/s ……(Name & Address)…….. (Hereinafter called the said "Contractor") from the demand under the terms and conditions of the Tender No. …….. and Work order No. ……..dated …… made between the Indian Institute of Management Kozhikode having its office at IIMK Campus. P.O, Kunnamangalam, Kozhikode – 673 570 and M/s ……. for the ….(Name of work) ……..in the Campus of IIMK (hereinafter called the said "agreement") of security deposit for the due fulfilment by the said contractor of the terms and conditions contained in the said agreement on production of a Bank Guarantee for ` . ……. (in words)

2. WE, (Name of Bank)… Branch a body constituted and established under the ---------- Act and having our registered office at …… (Hereinafter referred to as "the Bank") at the request of M/s . … the said Contractor do hereby undertake to pay the Institute an amount not exceeding ` ….. (in words)

3. We the bank do hereby undertake to pay the amounts due and payable under this Guarantee without any demure, merely on a demand from the Institute stating that the amount claimed is required to meet the recoveries due or likely to be due from the said contractor. Any such demand made on the Bank shall be conclusive as regards the amount due and payable by the bank under this Guarantee. However our liability under this guarantee shall be restricted to an amount not exceeding ` …. (in words)

4. We, the Bank undertake to pay to the Institute any money so demanded not withstanding any dispute or disputes raised by the said contractor in any suit or proceeding pending before any court or Tribunal relating thereto, our liability under this presents being absolute and unequivocal. The payment so made by us under this bond shall be valid discharge of our liability for payment there under and the said contractor shall have no claim against us for making such payment.

5. We, the Bank, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said agreement and that it shall continue to be enforceable till all the dues of the Institute under or by virtue of the said agreement have been fully paid and its claims satisfied or discharged or till the Institute certifies that the terms and conditions of the said agreement have been fully and properly carried out by the said contractor and accordingly discharges this guarantee or till …..date…. whichever is earlier.

6. We, the Bank further agree with the Institute that the Institute shall have the fullest liberty without our consent and without effecting in any manner our obligations here under to vary any of the terms and conditions of the said agreement or to extend time of performance by the said contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by the Government against the said contractor to for-bear or enforce any of the terms and conditions relating to the said agreement and we shall not be relieved from our liability by reason of any such variation, or extension being granted to the said contractor or for any forbearance, act of omission on the part of the Institute or any indulgence by the Institute to the said contractor or by any such matter or thing, whatsoever which under the law relating to sureties would, but for the provision, have effect of so relieving us.

7. This guarantee will not be discharged due to the change in the constitution of the Bank or the said contractor.

8. We, the Bank, undertake not to revoke this guarantee during its currency except with the previous consent of the Institute in writing.

9. This guarantee shall be valid upto ……(date)…. The Bank may extend the guarantee at its discretion, on a written request from the Institute, provided the request is received by the Bank within the validity of the Guarantee i.e. ……date….

10. Notwithstanding anything contained herein above.
    a). Our liability under this guarantee shall not exceed ` ……(in words)
    b). This Bank Guarantee shall be valid upto …(date).. inclusive of claim period.
    c). Our liability to under this guarantee will arise only if we receive a notice in writing from the Institute on or before …(date) … advising us of the said contractor's failure leading to our liability hereunder.

The Bank do hereby declare that Mr. The Bank do hereby declare that Mr. ……., who is authorized to sign this Guarantee/Undertaking on behalf of the Bank and to bind the Bank thereby.

This Guarantee will be valid upto ……..(date) …

V. SAFETY CODE

1. The contractor shall be responsible for the safety of the labour employed by him and he shall be liable to pay the necessary compensation in case of accidents, as per the Workmen's Compensation Act.

2. Suitable and strong scaffolds should be provided for workmen for all works that cannot safely be done from the ground or from solid construction except such short period work as can be done safely from ladder.

3. No portable single ladder shall be over 8m in length and the width between side rails shall not be less than 30cm (clear). Suitable foot holds and hand holds shall be provided on the ladder and the ladder shall be given sufficient inclination. When a ladder is used an extra mazdoor shall be engaged for holding the ladder.

4. Scaffolding or staging more that 3.60m above ground or floor swung or suspended from an overhead support or erected with stationery support shall have a guard rail, properly attached, bolted, braced and otherwise secured at least 90cms above the floor or platform of such scaffolding and extending along the entire length of the necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building structure.

5. Working platform, gangway, stairways, etc. should be so constructed that they should not sag unduly or unequally. Such gangway, stairway, etc. should have adequate width and should be suitably fastened as described in the para above.

6. Suitable fencing or railing of 90cms minimum height should be provided for every opening in the floor of building or in a working platform to prevent the fall of persons or materials.

7. No floor, roof or other parts of the structure shall be so overloaded with materials or debris as to render it unsafe.

8. Safe means of access shall be provided to all working platform and other working places.

9. Adequate precautions shall be taken to prevent danger from electrical equipment's.

10. The Contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defence of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precaution and to pay damage and cost which may be awarded in any such suit, action or proceedings to any such persons or which may with the consent of the contractor be paid to compromise claim by any such person.

11. All trenches and excavations shall be provided with necessary fencing and lighting. Excavated materials shall not be placed within 1.5m of the edge of the trench or half of the depth of the trench whichever is more. All trenches of depth 1.2m or more shall be supplied with at least one ladder for each 30m length or fraction thereof. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.

12. Workers employed on mixing and handling materials like cement, asphalt, cement mortar, concrete, lime mortar, etc. shall be provided with protective foot wear and rubber hand gloves and protective goggles.

13. Workers employed on welding work shall be provided with welders' protective eye shield and gloves.

14. Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

15. No paint containing lead or lead products shall be used except in the form of paste or readymade paints.

16. Suitable face masks should be supplied for use by the workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.

17. Overhaul shall be supplied by the Contractor to the workmen and adequate facilities shall be provided to enable the working painters to work during the periods of cessation work.

18. Hoisting machines and tackles used in the work including their attachment anchorage and supports shall be in perfect condition.

19. The ropes and pulleys etc. used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from defects.

20. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe and good condition, and no scaffold, ladder or equipment shall be altered or removed while it in use.

21. Contractor should provide safety helmets for all their employees and to be insisted to wear the helmet while on duty.

22. There shall be maintained at readily accessible place at work site, first aid appliances including adequate supply of sterilized dress in and sterilized cotton wool.

23. An injured person shall be taken to a public hospital without loss of time, in cases where the injury necessitates the help of a doctor or hospitalization.

24. There shall be provided and maintained at suitable places, easily accessible to labour a sufficient supply of cold water fit for drinking.

25. Adequate washing and bathing places shall be provided at or near the place of work separately for men and women. Such places shall be kept in clean and drained condition.

26. Separate latrine and urinals for men and women shall be provided at or near the places of work. Such latrines shall be kept clean and drained condition.

27. Contractor should also provide crèche for the little ones of their employees/ labourers.

VI. TECHNICAL SPECIFICATIONS

1.0 GENERAL

1.1 Preamble to Specifications

The conditions of contract and the drawings shall be read in conjunction with the specifications and matters referred to, shown or described in one are not necessarily repeated in the other. These specifications are comprehensive and may exceed the requirements of this project. Any ambiguity between the general specifications, Schedule of Quantities and contract drawings, shall be referred to the Institute and got clarified before the submission of tenders

Notwithstanding the sub-division of the specification in to various headings, every part of it is to be deemed supplementary to every other part and is to be read with it, so far it may be practicable so to do, or when the context so admit. In this contract, references is made to the latest Indian Standards, specifications or by-law including all revisions up to the date of invitation of tenders.

The contractor shall keep at site copies of all such standards and codes of practice referred to above throughout the period of contract.

1.2 Approved Manufacturers.

Names of approved manufacturers are given in the specifications. Reference in the specifications to approved manufacturers shall be construed as establishing a standard of quality and not as limiting competition.

The contractor shall include in his prices for supplying the items or materials from the approved manufacturers listed or other equivalent approved materials. All items or materials shall be delivered to the site in the manufacturers original unopened containers with the manufacturers brand and name clearly marked on them. All items or materials shall be assembled, mixed, fixed, applied or otherwise incorporated in the works in accordance with the printed instructions of the manufacturer of the item or materials. All mortar and concrete shall be machine mixed and mechanically vibrated. Measuring boxes of standard sizes are to be used for measuring coarse/fine aggregate. Date of laying / construction shall be marked on all major items of work for monitoring curing of the structure.

1.3 Scope of work

The works envisaged under this contract are mainly:

Creating additional Recreational Facilities for SWC at Basement Floor of Faculty Apartment II Building in IIMK Campus

1.4 Setting out the work

The contractor shell set out the works and during the progress of the work shall amend at his own cost any errors arising from inaccurate setting out. During the execution of the work contractor must cross check his work with the drawings. The contractor shall be responsible for all the errors in this respect and shall have to rectify all defects and/or errors at his own cost failing which the Institute reserves the right to get the same rectified at the risk and cost of the contractor.

1.5 Clearing up and handing over

Upon completion of the work all the areas should be cleaned. All floors, doors, windows, surface, etc. shall be cleaned down in a manner which will render the work acceptable to the Institute. All rubbish due to any reason, shall be removed daily from the site and the area left clean by the contractor as a part of the contract.

1.6 Tests

All materials and methods of tests shall conform to the latest rules, regulation and / or specifications of the following authorities where specified herein as applicable. Bureau of Indian Standards (BIS), British Standards Code of Practice (BS) in case no equivalent BIS is available. The Institute will have the option to have any of the materials tested and if the test results show that the materials do not conform to the specifications, such materials shall be rejected. A reasonable number of representative tests will be deemed to be included in the rates tendered.

1.7 Rates

The item rates quoted in schedule of quantities are deemed to include all the cost to execute the works in strict accordance with the relevant specifications read in conjunction with the appropriate Standard Specifications.

1.8 Mode of Measurements

All measurements will be taken in accordance with IS 1200 latest issue unless otherwise specified.

2. DISMANTLING / DEMOLITION

2.1 Existing building and structures within the boundary of site, and as indicated in the drawings or as instructed by the architect, shall be carefully and gradually dismantled or demolished, as the case may be.

(a) The contractor shall furnish to the Architect, a detailed scheme as well as programme of these works, at least one week prior to the commencement of the actual demolition works and get the latter’s approval of the same.

(b) On approval of the above programme and scheme, the contractor shall serve notices to concerned authorities, owners, etc. As and wherever applicable, informing them of the proposed demolition and get their approval of the same, prior to the demolition/dismantling.

(c) The whole of the building/structures that are to be demolished shall be excavated and cleared off any valuable life and/or property the satisfaction of the architect. where required, the institute shall provide alternative arrangements to house those who have been excavated.

(d) The site of demolition shall be cordoned off from the other areas to the satisfaction of the architect, with all necessary warning & erected in the vicinity by the contractor.

(e) Such of those parts of the building/ structures that are likely to fetch some returns from the market and/or those parts which are likely to be reused elsewhere, shall be first carefully removed from the existing buildings and then stored away properly to the complete satisfaction of the architect. Such parts shall include items like wood work, built in the furniture, electrical fittings sanitary wares etc. and all others that are listed out by the architect.

All dismantling/demolition works shall include excavation of the ground wherever necessary, to dismantle the existing foundations and back filing including compacting to the satisfaction of the architect. The material used for back filling shall be as per specifications and as approved by architect.

All dismantling/demolition works shall be carried out in such manner, so as not to cause any damage, what so ever, to the properties or persons in the vicinity of the site. if such damage occur, the contractor shall be liable for full reinstatement ,of all such damages, at his own cost. All services, like electrical, water supply and sanitary lines/ connections, to the existing buildings or structures that are to be dismantled and/or demolished, shall be properly cut off at points as per the instructions of the architect. If any such services lines are feeding adjacent plots/sites/premises as well as within the premises, the contractor shall inform the architect, well in advance, and shall follow up with the authorities concerned, to provide necessary reconnection to the users of these service lines.

Wherever applicable, the contractors shall apply for the various permits, for executing such works as may be required, from the relevant authorities.

2.2 DISPOSAL OF DEMOLISHED/DIMANTLED MATERIALS

Demolished/ dismantled materials shall not be staked or dumped in such a manner, as to present a hazard to vehicles or pedestrians or properties or to cause blockage in drainage channels etc. in case contractor fails to clear the malba from the site, the same shall be cleared by the owner at contractors risk and cost.

The contractor shall obtain necessary permission from the local government authorities, pay the necessary deposits, for the location and the manner in which the debris to be disposed and then carry out the disposal, as directed by the architect.

Demolished/dismantled debris shall be dumped/staked in an area primarily within the site and, if required, subject to the approval of the architect shall be carted away and disposed off within the shortest possible time, as directed by the architect.

All dismantling works shall be carried out by crow bar, chiseling or by jack hammering but in no case blasting operation is permitted at site.

All debris shall be transported from the site on daily basis during prescribed hours as approved by local authorities for transportation.

3.0 EARTH WORK

3.1 General

This specification deals with the clearance and preparation of the site for the commencement of the construction wherever applicable. This is deemed to include all preliminary works like dismantling/demolition, site clearance, general leveling etc. The tenderer shall inspect the site and satisfy himself about the nature of the ground, the subsoil, availability of labour and materials, and all other relevant factors such as access to site etc before quoting his rates. No claim will be entertained later on account of any misunderstanding or incorrect information or ignorance of the existing conditions etc. on the part of the tenderer.

3.2 Blasting

Blasting is prohibited and shall not be permitted under any circumstances. The contractor has to remove hard rock met with by chiseling, wedging and barring.

3.3 Trimming of slopes

All slopes shall be trimmed manually or mechanically true to line and profile and consolidated to the satisfaction of Engineer-in-charge. Any isolated rock or boulder appearing on the face and likely to be unstable shall be removed and the void thereof filled with approved material and compacted.

3.4 Shoring / Earth work support

The contractor shall shore and strut the sides of excavation to the satisfaction of the Institute. Should there be any slips or settlement, notwithstanding the shoring, the contractor shall make good the same at his own expense, with concrete or other approved material, as directed by the Institute. Shoring shall be removed gradually side by side with backfilling to prevent any settlement and under no circumstances, until such time as the foundation concrete has

hardened enough, to take any loss brought on by the removal. Under special circumstances, shoring shall be left in place, if so directed by the Institute.

3.5 Dewatering

All excavation shall be kept free from the water from any source. The contractor shall provide and clear away on completion all drains, pumps, and other equipments, for this purpose. The contractor shall be responsible for preventing any subsidence of adjoining ground due to pumping. No extra payment will be paid to the contractor for bailing out water. The contractor's quoted rate for earth work shall include all such contingencies.

3.6 Contractor to keep excavation clear

Should any sand, mud, weed, rubbish or other materials be deposited on excavated area, by sandstorm, rain, flood, landslides or from any cause, whatsoever, such materials shall be removed by the contractor at his own expense.

3.7 Back filling

All materials used as fill shall be to the Institute's approval. Filling materials shall be well graded clean stone, Gravel and other approved non-plastic granular material, all not more than 100 mm, in any direction and shall be well consolidated in layers not more than 150 mm thick. Final compacting must be done just before concrete is to be laid.

All fill materials shall be compacted at moisture content appropriate to the material being used. The compacted fill shall achieve a density which shall not be less than 95% of the maximum dry density obtained. Filling shall be free of any wood, organic matter or any other deleterious material.

Sand, soil, gravel etc. from the excavation may be used for back filling pits and trenches or for making up levels subject to approval of the Institute and subject to selection of proper materials. The contractor shall take instructions from the Institute regarding the type of excavated material is to be used for back fill.

In case the excavated materials are not approved for back filling, either totally or in part or if their quantity falls short of the quantity required for filling, suitable materials shall be brought to site from an approved source.

3.8 Measurements

Diagonal ridges, cross ridges, or dead-men shall be left in position shown by the Institute to enable accurate measurements being taken on the completion of the work. Where the ground is not uniform or where the site requires to be leveled, levels shall be taken before the start of the work and after the completion of the work and the quantity of excavation in cutting computed

from these levels. The ridges or dead-man shall be removed by the Contractor at his cost after the measurements.

3.9 Excavation in all kind of soils

Excavation and/or removal of any other material on the site, shall be carried out accurately to the lines, levels and dimensions shown in the drawings or as ordered by the Engineer-in-charge. The method of excavation shall be at the discretion of the Institute but should the dimensions of any excavation exceed those shown on the drawings or ordered by the Institute or should the sides collapse, the contractor will not be paid for such over excavation and he shall fill such extra space with approved material, at his own expense. All founding levels shall be got inspected by the Engineer-in-charge before the start of concrete or masonry. The founding bed shall be dressed and rammed satisfactorily.

4.0 STONE MASONRY

4.1 Scope of work :

The work covered under these specifications consists of supplying and erecting stone masonry walls with available best quality of stone in strict compliance with this specifications and applicable drawings.

4.2 Random Rubble Masonry:

4.2.1 Material :

The rubble shall be of the best quality trap / granite / ballast stones obtained from the approved quarry. The same of the stone, to be used shall be got approved from the Engineer-in charge. All stones shall , generally be freshly quarried and shall be sound, dense, hard, free from segregation, cracks, weathered portions and other structural defects to requisite sections and forms and shall have fully dressed beds and joints. Atleast 50% of the stones shall be 0.015 cum. in content when reckoned individually. The length of stones for stone masonry shall not exceed three times the height not the breadth or base shall not be greater than the fourth the thickness of wall, or not less than 15cm. the height of stone may be up to 30 cm. stones shall be laid on the natural beds and shall run sufficiently inside the wall thickness. No hollow space shall be left out and inter spaces of stones being filled with mortar and stone chips, driven hard and not with mortar only.

All mortar to be used shall be of the type and proportion mentioned in the item. Cement, sand and water to be sued shall conform to their relevant specifications as described under cement concrete.

The masonry shall be laid plumb, lines levels, curves, shapes as shown in drawings. All required holes for passage o water or pipes are to be embedded during construction as specified.

All stones shall be wetted before laying in masonry. Concrete surfaces of columns, beams, lintels, chajjas etc. coming in contact with masonry shall be properly chipped, washed and wetted before start of masonry work. The concrete slurry as the masonry work progresses in height. Clean chips and spawls carefully selected to fit in the space shall be wedded into the mortar. Joints and beds wherever necessary to avoid thick beds or joints or mortar. However, proper shaping and dressing of stones shall be done prior to their laying in masonry and hammering shall not be resorted to often after the stones are laid in position. The bond stones shall be used in every square metre area of masonry wall and shall extend from front to back to thin walls having width of 600 mm. and shall overlap by at least 150 mm. in walls having thickness more than 600mm. when lid from both sides.

When the work has to be started on the old or the one competed a long while ago or in the previous working seasons, care shall be taken to roughen and clean old surface satisfactorily without disturbing the masonry before laying the new. It shall be wetted before laying the bedding mortar.

When practicable, the whole masonry in any structure shall be carried out up to a uniform level throughout. But when breaks are unavoidable in carrying the work continuously in uniform level, sufficiently long steps shall be left. All junctions of walls shall be formed at the time when walls are being built. Cross walls should be carefully bonded in to the main walls. All masonry built in cement mortar shall be kept continuously wet for 14 days from the date of lying. Should the mortar perish i.e., becomes dry, white or powder through neglect of watering if the masonry shows hollow joints or non adherence of mortar to the stones or if the work does not conform to drawings and specifications, the work shall be pulled down and rebuilt by the contractor at his own cost and risk. All masonry shall be thoroughly cleaned ad washed down on completion and all stains, adhering mortar removed from the surface and raking of joints carried out as the P -77 scaffolding is being lowered and removed. Holes left in masonry for supporting scaffolding shall be filled and made good before pointing / plastering.

4.3 Mode of measurement:

All stone masonry shall be measured in cubic meters as actually done. All openings for windows, doors, lintels etc. shall be deducted to get the net quantity of actual work done. Openings or chases required for P.H. and electrical inserts less than 0.1 sqm. and bearings of precast concrete members shall not be deducted. The rate shall also include cost of corner stones, bond stone, scaffolding, labour, curing etc.

4.4 Stone Copings, Jambs, Soffits, etc.

Stone used for copings, jambs, soffits etc. shall be of specified variety. It shall be hard, sound and uniform in colour & texture and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. percentage of water absorption shall not exceed 5 % when tested in accordance with IS 1124. Samples shall be got approved prior to ordering of stone.

4.5 Dressing

All exposed plane surfaces and sides shall be chisel dressed such that dressed surface shall not vary by more than 1 mm at any point from a 600 mm long straight edge placed against it. All visible angles and edges shall be free from chippings and polished as specified or as directed by the PM. The surface to be buried in masonry shall be rough chisel dressed. Copings, jambs, soffits shall be finished to the shape as shown in drawings. Stone shall be cut as per the pattern shown in the drawing. Thickness of stone shall be as specified, with a tolerance of 2mm.

Laying and fixing shall be done with approved grade and cement slurry, in the manner shown in the drawing and as directed by the PM. Fixing of stone shall be done with adjoining work in grooves, rebates etc. as shown in drawing. They shall also be secured to the backing masonry / concrete work by means of stainless steel / Gum metal / G.I. pin dowels, cramps etc. as detailed in drawing or as directed by the Consultant/Project Manager.

All joints shall be pointed in approved marching colour readymade grout as specified in BOQ. Joints shall be as detailed in drawing.

Minimum depth of pointing shall be 10 mm may be with gray cement or with addition of pigment to match the shade of stone or in colour as specified. Type of pointing may be sunk in, raised or flush as specified and detailed in drawing.

Green work shall be protected from rains by suitably covering the same. Masonry shall be kept constantly moist for a period of 7 days.

Double legged steel scaffold (or as approved) shall be adopted. Scaffolding shall be strong and well anchored with building.

5.0 REINFORCED CONCRETE AND ALLIED WORKS

5.1 Scope:

This specification covers the general requirements for concrete jobs, using on-site production facilities including requirements in regard to the quantity, handling, storage of ingredients, proportioning, batching, mixing and testing of concrete and also requirements in regard to the quality. This also covers the transportation of concrete from the mixer to the place of final deposit and the placing, consolidation, curing, protecting, repairing ad finishing of concrete.

After award of the work, if so desired by the contractor, he / they may be allowed by the Engineer-in-charge till the designed mix is obtained, to carry out the reinforce concrete work In foundation and plinth as per equivalent nominal mix against the specified design mix concrete as per IS Codes. However, all other specification for design mix shall govern for nominal mix also and nothing extra shall be paid for use of extra cement on this account

whether the cement is supplied by the Department or procured by the contractor.

5.2 Cement Concrete (Plain and Reinforced):

The quality of materials and method and control of manufacture and transportation of all concrete work in respect of mix, where reinforced or otherwise, shall conform to the applicable portions of these specifications.

The Engineer-in-charge shall have the right to inspect the sources of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipments and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-in-charge's approval shall be obtained prior to starting the concrete work.

5.3 Materials for Standard Concrete:

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement, clean sand, natural coarse aggregate, clean water, ice and admixtures if specially called for as per drawings or schedule of quantities.

5.4 Cement:

Unless otherwise specified or called for by the Engineer-in-charge, cement shall be ordinary Portland cement in 50 kg bags. The use of bulk cement will be permitted only with the approval of the Engineer-in-charge. Changing of brands or type of cement within the same structure will not be permitted. Ordinary Portland cement (OPC) 43 grade manufactured as per I.S. specifications of reputed brands like ACC/Ultratech/Zuari/Coramendel/Malabar/Sankar or any other brands as approved by the Engineer-in-charge from time to time shall be procured and used on the work. Joint account of cement consumed at site for every day for items of work carried shall be maintained by the Contractor for verification to ensure effective control on quality of cement used in the work.

A certified report attesting to the conformity of the cement to IS specifications by the cement manufactures chemist shall be furnished to the Engineer-in-charge, if demanded. In case the cement is required to be arranged by the Contractor, the Contractor will have to make his own arrangement for the storage of adequate quantity of cement. Cement in bulk may be stored in bins or silos which will provide complete protection from dampness, contamination and minimize caking and false set. Cement bags shall be stored in a dry enclosed shed (storage under tarpaulins will not be permitted), well away from the outer walls and insulated from the floor to avoid contact with moisture from ground and so arranged as to provide ready access. Damaged or reclaimed or partly set cement will not be permitted to be used and shall be removed from the site. The storage bins and storage arrangements shall be such that there is no P -21 dead storage. Not more than 12 bags shall be stacked in any tier. The storage arrangement shall be got approved by the Engineer-in-

charge. Consignments in cement shall be stored as received and shall be consumed in the order of their delivery.

Contractor shall establish cement/concrete/soil testing laboratories at site of work with qualified person to handle the laboratory. Every consignment of cement procured shall accompany test certificate from the company indicating lot No etc. Sample shall be taken for each lot and sent to Standard Approved Material Testing Laboratory for physical and chemical analysis. The cost of testing shall be borne by the Contractor.

Cement held in store for a period of 90 (ninety) days or longer shall be retested before use in work. Should at any time the Engineer-in-charge have reasons to consider that any cement is defective, then irrespective of its origin and / or manufacturers test certificate, such cement shall be tested immediately at a National Test Laboratory / Departmental Laboratory or such approved laboratory, and until the results of such tests are found satisfactory, it shall not be used in any work.

5.5 Aggregates:

"Aggregate" in general designates both fine and coarse inert materials used in the manufacture of concrete.

"Fine Aggregate" is aggregate most of which passes through 4.75 mm I.S. sieve.

"Coarse Aggregate" is aggregate most of which is retained on 4.75 mm I.S. sieve.

All fine and coarse aggregates proposed for use in the work shall be subject to the Engineer-in-charge's approval and after specific materials have been accepted, the source of supply of such materials shall not be changed without prior approval of the Engineer-in-charge.

Aggregate shall, except as noted above, consists of natural sand, crushed stone and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, curable against weathering, of limited porosity and free from deleterious materials that may cause corrosion to the reinforcement or may impair the strength and / or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of and shall be based on the "mix design" and preliminary test on concrete specified hereinafter.

5.6 Sampling and Testing:

Sampling of the aggregates for mix design and determination of suitability shall be taken under the supervision of the Engineer-in-charge and delivered to the laboratory, well in advance of the schedule placing of concrete. Record of tests which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to the Engineer-in-

charge in advance of the work or use, in determining suitability of the proposed aggregate.

5.7 Storage of aggregates:

All coarse and fine aggregates shall be stacked separately in stock pile in the material yard near the work site in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign materials and earth during storage and while heaping the materials shall be avoided. The aggregate must be of specified quality not only at the time of receiving at site but also at the time of loading into mixer. Rakers shall be used for lifting the coarse aggregate from bins or stock piles. Coarse aggregate shall be piled in layers not exceeding 1.00 meters in height to prevent conning or segregation. Each layer shall cover the entire area of the stock pile before succeeding layers are started. Aggregates that have become segregated shall be rejected. Rejected materials after remixing may be accepted, if subsequent tests demonstrate conformity with required gradation.

5.8 Specific Gravity:

Aggregates having a specific gravity below 2.6 (saturated surface dry basis) shall not be used without special permission of the Engineer-in-charge. Fine Aggregate: Fine aggregate except as noted above, and for other than light weight concrete shall consist of natural or crushed sand conforming to IS 383. The sand shall be clean, sharp, hard, strong and durable and shall be free from dust, vegetable substances, adherent coating, clay, loam, alkali, organic matter mica, salt or other deleterious substances which can be injurious to the setting qualities / strength / durability of concrete.

5.9 Screening and Washing:

Sand shall be prepared for use by such screening or washing or both as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions.

Sand with silt content more than 3 percent will not be permitted to be used unless same is washed and silt content is brought within 3% by weight.

5.10 Fineness Modulus:

The sand shall have a fineness modulus of not less than 2.2 or more than 3.2 the fineness modulus is determined by adding the cumulative.

Percentages retained on the following IS sieve sizes (4.75 mm, 2.36 mm, 1.18mm, 600 micron, 300 micron and 150 micron) and dividing the sum by 100.

5.11 Coarse Aggregate:

Coarse aggregate for concrete except as noted above and for other than light weight concrete shall conform to IS 383. This shall consist of natural or

crushed stone and gravel, and shall be clean and free from elongated, flaky or laminated pieces, adhering coatings, clay lumps, coal residue, clinkers, sag, alkali, mica, organic matter or other deleterious matter.

The coarse aggregate and fine aggregate shall be tested from time to time as required by the Engineer-in-charge to ascertain its suitability for use in construction and the charges for testing aggregate shall be borne by the contractor as specified herein after.

5.12 Screening and Washing:

Crushed rock shall be screened and / or washed for the removal of dirt or dust coating, if so demanded by Engineer-in-charge.

5.13 Water:

Water used for both mixing and curing shall be free from injurious amount of deleterious materials; potable waters are generally satisfactory for mixing and curing concrete. In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS 456. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The samples shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water. Average 28 days compressive strength of at least three 150mm concrete cubes prepared with water proposed to be used shall not be less than 90% of the average strength of three similar concrete cubes prepared with distilled water. The initial setting time of test block made with the appropriate test cement and the water proposed to be used shall not be less than 30 minutes and shall not differ by more than (+) 30 minutes from the initial setting time of control test block prepared with the appropriate test cement and distilled water. The test blocks shall be prepared and tested in accordance with the requirements of IS 4031. Where water can be shown to contain an excess of acid, alkali, sugar or salt, Engineer-in-charge may refuse to permit its use. As a guide, the following concentrations represent the maximum permissible values.

5.14 Design Mix Concrete:

All reinforced concrete in the works shall be "Design Mix Concrete" as defined in I.S. 456-2000. All "Design Mix Concrete" work to be carried out under these specifications shall be in grades designated as per table below:

5.15 Grades of Concrete:

Grade Designation	Specified Characteristic compressive strength at 28 days (N/mm^2)
M 10	10
M 15	15
M 20	20
M 25	25
M 30	30
M 35	35
M 40	40

Note 1: The characteristic strength is defined as the strength for material below which not more than 5% of the test results are expected to fall.

Note 2: In the designation of a concrete mix, letter M refers to the mix and the number to the specified characteristic compressive strength of 15cm. cubes at 28 days. The mix shall be designed to produce the grade of concrete having the required workability and characteristic strength not less than appropriate values given in the table above.

5.16 Mix Design:

This is to investigate the grading of aggregates, water cement ratio, workability and the quantity of cement required to give works cubes of the characteristic strength specified. The proportion of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. **Mix proportioning shall be carried out according to the ACI standard designation ACI-613 or Design of concrete mixes – Road research Note No. 4, Department of Scientific and Industrial Research U.K. or I.S. 10262-1982.**

5.17 Selection of Water Cement Ratio:

Since different cements and aggregates of different maximum size, grading, surface texture, shape and other characteristics may produce concretes of different compressive strength for the same free water cement ratio, the relationship between strength and free water cement ratio should preferably be established for the materials actually to be used. In the absence of such data, the preliminary free water cement ration (by mass) corresponding to the target strength of 28 days may be selected from the relationship shown in Fig. 1 of IS. 10262- page 7.

Alternately, the preliminary free water ratio (by mass) corresponding to the target average strength may be selected from the relationship in Fig2-IS 10262-1982, Page 8 using the curve corresponding to the 28 days cement strength to be used for the purpose.

Other relevant items to be used with design of mix should strictly conform to the relevant clauses and appendices of IS 10262 – 1982. The calculated mix

proportions shall be checked by means of trial batches. The contractor should refer to the item no.4 page 12, and the Appendix D (clause no.4.1) of IS 10262-1982 for neat illustration.

The contractor may refer Appendix C, clause 3.8 page no. 16 of IS 10262-1982 for an example illustrating the mix design of M-20.

The free water cement ratio selected as above, should be checked against the limiting water cement ratio for the requirement of durability and the lower of the two values should be adopted.

Whenever there is a change either in required strength of concrete of water cement ratio or workability or the source of aggregates and / or cement, fresh tests shall be carried out to determine the revised proportion of the mix to suit the altered conditions. While designing mix proportions, over wet mixes shall always be avoided. While fixing the value for water cement ratio for Design Mix assistance may be derived from the standard graph showing the relationship between the 28 days compressive strength of concrete mixes with different water cement ratios and the 7 days compressive strength of cement tested in accordance with IS 269.

It will be contractors sole responsibility to establish the concrete mix designs for different grades of concrete specified in the work consistent with the workability required for nature of work and also taking into consideration the assumed standard deviation which will be expected at site or by establishing the standard deviation based on 30 test results at site for each grade of concrete so as to produce concrete of required strength, durability and surface finish. The materials and proportions used in making the tests to be carried out either at site or under laboratory, conditions shall be similar in all respects to those to be actually employed in the works, as the object of these test is to determine the proportions of cement, aggregates and water necessary to produce the concrete of the required consistency to give such specified strength.

5.18 Standard Deviation:

Standard deviation of concrete of each grade shall be determined separately as stated below. When results of sufficient number of tests (at least 30) are not available, than depending on the degree of quality control expected to be exercised at the site, the value of standard deviation given in the following table may be adopted for guidance.

5.19 Standard Deviation based on Test results:

5.19.1 Number of test results:

The total number of test results required to constitute and acceptable record for calculation 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.

5.19.2 Standard deviation to be brought up to date:

The calculation of the standard deviation shall be brought up to date after every change of mix design and at least once a month.

5.20 Proportioning, Consistency, Batching and Mixing of Concrete:

5.20.1 Proportioning:

(a) Aggregate:

The proportions which shall be decided by conducting preliminary tests shall be by weight. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete batching by means of weight batchers conforming to IS 2722, capable of controlling the weights within one percent of the desired value. Except where it can be shown to the satisfaction of the Engineer-in-charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stacked in separate stock piles. The grading of coarse and fine aggregates shall be checked as frequently as possible, as determined by the Engineer-in-charge, to ensure maintaining of grading in accordance with samples used in preliminary mix design. The materials shall be stock piled well in advance of use.

(b) Cement:

The cement shall be measured by weight. Every facility should be provided to the Engineer-in-charge for sampling and inspection of stored cement at site of work.

(c) Water cement ratio:

The actual water cement ratio to be adopted shall be determined in each instance by contractor and approved by the Engineer-in-charge.

5.20.2 Proportioning by water-cement ratio:

The W/C ratio specified for use by the Engineer-in-charge shall be maintained. Contractor shall determine the water content of the aggregate as frequently as directed by the Engineer-in-charge as the work progresses and as specified in IS 2386 part III and the amount of mixing water added at the mixer shall be adjusted as directed by the Engineer-in-charge so as to maintain the specified W/C ratio. To allow for the variation in their moisture content, suitable adjustments in the weights of aggregates shall also be made.

5.20.3 Consistency and slump:

Concrete shall be of a consistency and workability suitable for the conditions of the job. After the amount of water required is determined, the consistency of mix shall be maintained throughout the progress of the corresponding parts of the work and approved tests e.g. slump test, compacting factor tests etc. in accordance with IS 1199, shall be conducted from time to time to ensure the maintenance of such consistency.

5.21 Batching and mixing of concrete:

The material and proportions of concrete materials as established by the preliminary tests for the mix design shall be rigidly followed for all concrete on the project and shall not be changed except when specifically permitted by Engineer-in-charge.

Concrete shall be produced only by weigh batching the ingredients. The mixer and weigh batcher shall be maintained in a clean serviceable condition. The accuracy of weigh batches shall be periodically checked. They shall be set up in level on a firm base and the hopper shall be loaded evenly. The needle shall be adjusted to zero when the hopper is empty. Fine and coarse aggregates shall be weighed separately unless otherwise stated. Volume batching will be permitted only at the discretion of the Engineer-in-charge. Concrete shall be of strength stipulated, all concrete shall be mixed in mechanically operated batch mixers complying with IS 1791 and of approved make with suitable provision for correctly controlling the water delivered to the drum. The quantity of water actually entering the drum shall be checked with the reading of the gauge or valve setting, when starting a job. The test should be made while the mixer is running. The volume of the mixed material shall not exceed the manufacturers rated mixer capacity. The batch shall be charged into the mixer so that some water will enter the drum in advance of cement and aggregate. All water shall be in the drum by the end of the first 15 seconds of the specified mixing time. Each batch shall be mixed until the concrete is uniform in colour, for a minimum period of two minutes after all the materials and water are in the drum. The entire contents of the drum shall be discharged in one operation before the raw materials for the succeeding batches are fed into the drum.

5.22 Testing Charges:

Different tests required to be carried out for concrete works including the mix design, cube tested as per the above specifications shall be got done by the con tractor at his own cost in one of the approved laboratories. The choice of laboratory shall rest with Department. All incidental charges / cost shall be borne by the contractor.

5.23 Inspection and Testing of Structures

Inspection to ensure that the construction complies with the design an inspection procedure should be set up covering materials, records, workmanship and construction.

Tests should be made on reinforcement and the constituent materials of concrete in accordance with the relevant standards. Where applicable, use should be made f suitable quality assurance schemes.

Care should be taken to see that:

a) design and detail are capable of being executed to a suitable standard, with due allowance for dimensional tolerances;

b) There are clear instructions on inspection standards;

c) There are clear instructions on permissible deviations;

d) Elements critical to workmanship, structural performance, durability and appearance are identified; and

e) There is a system to verify that the quality is satisfactory in individual parts of the structure, especially the critical ones.

Immediately after stripping the formwork, all concrete shall be carefully inspected and any defective work or small defects either removed or made good before concrete has thoroughly hardened.

5.24 Testing-

In case of doubt regarding the grade of concrete used, either due to poor workmanship or based on results of cube strength tests, compressive strength tests of concrete on the basis of core test and / or load test may be carried out.

5.25 Admixtures:

(a) General:

Admixture may be used in concrete only with the approval of engineer-in-charge based upon evidence that, with the passage of time neither the compressive strength nor its durability reduced. When admixtures are used, the designed concrete mix shall be corrected accordingly. P -35 Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer-in-charge. rate quoted for concrete should include cost and labour for admixture. No extra payment will be made.

(i) **Calcium Chloride:** Calcium chloride shall not be used for accelerating set of the cement for any concrete containing reinforcement or embedded steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1.5 percent of the weight of cement in each batch of concrete.

(ii) **Air Entraining Agents:** Where specified and approved by Engineer-in-charge, neutralized vinsol resin or any other approved air entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6.260. Air Entraining admixtures for concrete. The recommended total air content of the concrete is 4% (+) 1%. The method of measuring air content shall be as per IS 1199.

(iii) **Retarding Admixtures:** Where specified an approved by Engineer-in-charge, retarding agents shall be added to the concrete mix in quantities specified by Engineer-in-charge.

(iv) **Water Reducing Admixtures:** Where specified and approved by Engineer-in-charge, water reducing lignosulfonate mixture shall be added in quantities specified by Engineer-in-charge. The admixtures shall be added in the form of a solution.

(v) **Water Proofing Agents:** Where specified and approved by Engineer-in-charge, chloride and sulphate free water proofing agents shall be added in quantities specified by Engineer-in-charge.

(vi) **Other Admixtures:** Engineer-in-charge may at his discretion, instruct contractor to use any other admixture in the concrete.

5.26 Inspection of Structures:

Immediately after stripping the form work, all concrete shall be carefully inspected and any defective work or small defects, either removed or made good before concrete has thoroughly hardened, as instructed by engineer-in-charge.

In case of doubt regarding the grade of concrete used or results of cube strength are observed to be lower than the designed strength as per specifications at 28 days, compressive strength test of concrete based on core test, ultrasonic test and / or load test shall be carried out by the digital Engineer-in-charge all at the cost of the contractor. In case these tests do not satisfy the requirements, the Department will be at liberty to reject the concrete, and the contractor, at his own cost, has to dismantle and re-do the same or carry out such remedial measures as approved by the Department.

5.27 Testing of Structures:

(a) Optional Tests:

Engineer-in-charge, if he so desires, may order for tests to be carried out on cement, sand, coarse aggregate, water etc. in accordance with the relevant Indian Standards.

Tests on Cement will be carried out by Department and shall include (i) Fineness test (ii) test for normal consistency, (iii) test for setting time (iv) test for soundness (v) test for P -36 compressive strength (vi) test for heat of hydration (by experiment and by calculations) in accordance with IS-269.

Tests on sand shall include (i) sieve test (ii) test for organic impurities (iii) decantation test for determining clay and silt content (iv)specific gravity test (v) test for unit weight and bulk age factor (vi) test for sieve analysis and fineness modulus.

Tests on coarse aggregate shall include (i) sieve analysis (ii) specific gravity and unit weight of dry, loose and rodded aggregate (iii) soundness and alkali aggregate reactivity (iv) petro graphic examination (v) deleterious materials and organic impurities (vi) test for aggregate crushing value.

The test on aggregate would normally be ordered to be carried out only if Engineer-in charge feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained and shall be performed by contractor at an approved test laboratory. Contractor shall have to pay all the charges of optional tests. If the work cubes do not give the stipulated strengths, Engineer-in-charge reserves the right to ask Contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standards stipulated at contractors cost.

The unit rate for concrete shall be all inclusive including making preliminary mix design and test cubes, works cubes, testing them as per specifications, slump tests, optional tests etc. Complete.

However, the Department will test the cubes departmentally. The contractor will have to make arrangements for transportation to the laboratory and testing charges will be borne by the contractor.

The contractor should also conduct conclusive tests such as ultrasonic pulse test, core test etc. to prove the suitability of concrete, in case cube tests give unsatisfactory results. The cost of the conclusive test should be borne by the contractor.

(b) Core test:

The points from which cores are to be taken and the number of cores required, shall be at the discretion of the whole of concrete concerned. In no case, however, shall fewer than three cores be tested. Cores shall be prepared and tested as described in IS 516-1959.

Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 80% of the cube strength of the grade of concrete specified for the corresponding age and no individual core has strength less than 75%.

In case the core test results do not satisfy the requirements as above or where such tests have not been done, load test (see 4:11:3) may be resorted to.

(c) Load tests on parts of structure:

Load tests 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 period of 24 hours and then the imposed load shall be removed.

Note: Dead load includes weight of the structural members plus weight of finishes and walls or partitions, if any, as considered in the design.

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% of the deflection under super imposed load, the test may be repeated after a lapse of 72 hours. If the recovery is less than 80% the structure shall be deemed to be unacceptable.

If the maximum deflection in mm shown during 24 hours under load is less than 40L2/D, where L is the effective span and D the overall depth of the section in mm, it is not necessary for recovery to be measured and the recovery provision above will not apply.

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

5.28 Testing of Underground Water Tank/Septic Tank/Underground structures:

The tank will be tested after the completion according to the procedure laid down here:

The middle compartment shall be filled first to its full height and the leakage if any shall be checked on its outer surfaces if found, the same shall be examined carefully and defects rectified / grouted if necessary. The drop in level exceeds 20mm and shows any leakage in the said walls, necessary steps shall be taken in consultation with the Engineer-in-charge.

After this compartment is tested to the satisfaction of the Engineer-in-charge, all water from middle compartment shall be stepped into side compartment to the full height and checked for water leakages from the outer surfaces of the tank and inner surface of the middle compartment. The drop in level of surface of water shall also be checked as stated and defects rectified.

The external surface of the tank shall be plastered and cured as per the specifications and back filling shall be taken up thereafter. The water from the compartments shall then be pumped out and the inner surface of the tank in all compartments then checked and defects rectified.

After satisfactory completion of checks, internal plaster shall be taken up as specified in the specifications.

The contractor shall be responsible for carrying out the complete test, rectifying the leakages if any. The cost of providing equipments, labour for carrying out tests shall be borne by the contractor. The rates quoted for concreting items for constructing underground water tank shall be inclusive of testing of RCC tank for water tightness as per above specifications. Contractor shall make his own arrangement for filling the tank. The contractor shall make his own arrangement for water required for construction and labour etc. as per contract conditions at his own cost.

5.29 Unsatisfactory Tests:

Should the results of any test prove unsatisfactory, or the structure shown signs of weakness, undue deflection or construction, contractor shall remove and rebuild the member or members involved to carry out such other remedial measures as may be required by Engineer-incharge. Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfill the test conditions is proved to be solely due to faulty design. The cost of load and tests shall be borne by contractor if the tests show unsatisfactory results; otherwise such cost will be borne by the Department.

5.30 Concrete in Alkali Soils and Alkaline Water:

Where concrete is liable to attack from alkali salts or alkaline water, special cements containing low amount of tri-calcium shall be used, if so specified on the drawings. Such concrete shall have minimum cement content, for different exposes attached as given in table 19 and 20 in appendix A of IS 456-2000. If specified by Department, additional protection shall be obtained by the use of chemically resistant stone facing or a layer of plaster of Paris covered with suitable fabric, such as jute thoroughly impregnated with tar.

5.31 Preparation Prior to Concrete Placement, Final Inspection & Approval:

Before the concrete is actually placed in position, the inside of the form work shall be inspected to see that they have been and oiled. Temporary openings shall be provided to P -38 facilitate inspection, especially at bottom of columns and wall forms, to permit removal of saw dust, wood shavings, binding wire, rubbish, dirt etc. Opening shall be placed or holes drilled so that these materials and water can be removed easily. Such openings/ holes shall be later suitable plugged.

The various traders shall be permitted ample time to install drainage and plumbing lines, floor and trench drain, conduits, hangers, anchors, inserts,

sleeves, bolts, frames and other miscellaneous embedment to be cast in the concrete as indicated on the drawing or as necessary for the proper execution of the work. All such embedment shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

Slots, openings, holes pockets etc. shall be provided in the concrete work in the positions indicated in the drawings or as directed by the Engineer-in-charge.

Reinforcement and other items to be cast in concrete shall have clear surfaces that will not impair bond.

Prior to concrete placement, all works shall be inspected and approved by Engineer-incharge, and if found unsatisfactory, concrete shall not be poured until all defects have been corrected at contractors cost.

Approval by Engineer-in-charge of any and all materials and work as required herein shall not relieve contractor form his obligations to produce finished concrete in accordance with the drawings and specifications.

5.32 Rain or Wash Water:

No concrete shall be placed in wet weather or on a water covered surface. Any concrete that has been washed by heavy rain shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixture. To guard against damage which may be caused by rain, the works shall be covered with tarpaulins immediately after the concrete has been placed and compacted before leaving the work unattended. Any water accumulating on the surface of the newly placed concrete shall be removed by approved means and no further concrete shall be placed thereon until such water is removed. To avoid sumps shall be provided.

5.33 Bonding Mortar:

Immediately before concrete placement begins, prepared surfaces, except form work, which will come in contact with concrete to be placed, shall be covered with a bonding mortar of same strength of concrete.

5.34 Transportation:

All buckets, containers or conveyers used for transporting concrete shall be mortar-tight. All means of conveyance shall be adopted to deliver concrete of the required consistency and plasticity without segregation or loss of slump whatever method of transportation is employed. Chute shall not be used to transport the concrete without the written permission of the Engineer in-charge and concrete shall not be re handled before placing.

5.35 Re-tempered or Contaminated Concrete:

Concrete must be placed in its final position before it becomes too stiff to work. On no account water shall be added after the initial mixing. Concrete which has become stiff or has been contaminated with foreign materials ad which has not been placed within half an hour of mixing water with cement shall be rejected.

5.36 Cleaning of Equipment:

All equipments used for mixing, transporting ad placing of concrete shall be maintained in clean condition. All pans, buckets, hoppers, chutes, pipe lines and other equipments shall be thoroughly cleaned after each period of placement.

5.37 Procedure for placing of concrete:

(a) **Engineers approval of Equipment and Methods:** Before any concrete is placed, the entire placing programme, consisting of equipment, layout proposed procedures ad methods shall be submitted to Engineer-in-charge and no concrete shall be of such size ad design to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job ad placement location.

(b) **Time Interval between Mixing ad Placing**: Concrete shall be placed in final position before the cement reaches its initial set and concrete shall normally be compacted in its final position within thirty minutes o leaving the mixer d once compacted it shall not be disturbed.

(c) **Avoiding Segregation:** Concrete shall in all the cases be deposited as nearly a practicable directly in its final position and shall not be re-handled or caused to flow in a manner which will cause segregation, loss of materials displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, contractor shall provide suitable prop and Elephant Trunks to confine the movement of concrete. Special care shall be taken when concrete is dropped from height, especially if reinforcement is in the way, particularly in columns and thin walls.

(d) **Placing by Manual Labour:** Except when otherwise approved by Engineer-in-charge, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height more than 1.0m or handle in a manner which will cause segregation.

(e) **Placing by Mechanical Equipment:** The following specifications shall apply when placing of concrete by sue of mechanical equipment is specially called for while inviting bids or is warranted, considering the nature of work involved. The control of placing shall begin at the mixer discharge. Concrete shall be discharged by a vertical drop into the middle of the bucket of hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in its final position.

5.38 Type of buckets:

All concrete shall be conveyed from the mixer to the place of final deposit in suitable buckets, dumpers, containers which shall be leak tight. All means of conveyance shall be adopted for delivering concrete to the required consistency / Workability d plasticity without segregation.

Central bottom dump buckets of a type that provides for positive regulation of the amount and rate deposition of concrete in all dumping position shall be employed.

5.39 Operation of Bucket:

In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1.0m. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.

5.40 Placement in restricted forms:

Concrete placed in restricted forms by borrows, buggies, cars, short chutes or hand shoveling shall be subject to the requirement for vertical delivery of limited height to avoid segregation and shall be deposited as nearly a practicable in its final position.

5.41 Chutting:

Where it is necessary to use transfer chutes, specific approval of Engineer-in-charge must be obtain dot type, length, slopes, baffles, vertical terming of operations. These shall be so arranged that almost continuous flow of concrete is obtained at the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mixes shall have less coarse aggregate.

During cleaning of chutes, the waste water shall be kept clear of the forms. The concrete shall not be permitted to fall from the end of the chutes by more than 1.0 m. chutes, when approved for use, shall have slopes not flatter than 1 vertical to 3 horizontal and not steeper than 1 vertical to 2 horizontal, chutes shall be of metal or metal lined of rounded cross section. The slopes of all chute sections shall be approximately same. The discharge end of the chutes shall be maintained above the surfaces of the concrete in the forms.

5.42 Placing by Pumping / Pneumatic Placers:

Concrete may be conveyed and placed by mechanically operated equipments e.g. pumps or pneumatic placers, only with the written permission of

Engineer-in-charge. The slums shall be held of the minimum, necessary for conveying concrete by this method.

When pumping is adopted, before pumping of concrete is started, the pipelines shall be lubricated with one or two batches of mortar composed of one part cement and two parts sand. The concrete mix shall be specially designed to suit pumping. Care shall be taken to avoid stoppages in work once pumping has started.

When pneumatic placer is used, the manufacturer's advice on layout of pipeline shall be followed to avid blockages ad excessive wear. Restraint shall be provided at the discharge box to cater for the reaction at the end.

Manufacturer's advice shall be followed regarding concrete quality and all other related matters when pumping / pneumatic placing equipments are used.

5.43 Concrete in Layers:

Concreting, once started, shall be continuous until the pour is completed. Concrete shall be placed in successive horizontal layers of uniform thickness ranging from 15cm to 90cm. a directed by Engineer-in-charge. These shall be placed as rapidly as practicable to prevent the formation of cold joints or places of weakness between each succeeding layers within the pour. The thickness of each layer shall be such that it can be deposited before the previous layer has stiffened. The bucket loads or other units of deposit, shall spotted progressively along the face of the layer with such overlap a will facilitate spreading the layer to uniform depth and texture with a minimum of shoveling stone into mortar rather than mortar on to stones. Such a condition shall be corrected by redesign of mix or other means, as directed by Engineer-in-charge.

5.44 Bedding of layers:

The top surface of each pour ad bedding places shall be approximately horizontal unless otherwise instructed.

5.45 Compaction:

Concrete shall be compacted during placing, with approved vibrating equipment, until the concrete has been consolidated to the maximum practicable density, is free of pockets of coarse aggregate ad fits tightly against all form surfaces, reinforcement ad embedded fixtures. Particular care shall be taken to ensure that all concrete placed against the form faces and into corners of forms or against hardened concrete at joints is free from voids or cavities. The use of P -41 vibrators shall be consistent with the concrete mix ad caution is to be exercised not to over vibrate the concrete to the point of segregation.

5.46 Type of Vibrators:

Vibrator shall conform to IS specifications. Type of vibrators to be used shall depend upon the structure where concrete is to be placed. Shutter vibrators, to be effective, shall be firmly secured to the form work which must be sufficiently rigid to transmit the vibrations strong enough not to be damaged by it. Immersion vibrator shall have No load frequency amplitude and acceleration a as per IS 2505 depending on the size of the vibrator. Immersion vibrators in sufficient numbers and each of adequate size shall be used to properly consolidate all concrete. Tapping or external vibrating of forms by hand tools or immersion vibrators will not be permitted.

5.47 Use of Vibrators:

The exact manner application d the most suitable machines for the purpose must be carefully considered ad operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450mm a part and withdrawn when air bubbles ceases to come to the surface.

Immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of lift, e.g. in a column or wall.

5.48 Melding successive batches:

When placing concrete in layers, which are advancing horizontally as the work progress, great care shall be exercised to ensure adequate vibration, blending and melding of the concrete between the successive layers.

5.49 Penetration of Vibrations:

The immersion vibrator shall penetrate the layer being placed and also penetrate the layer below the under layer is still plastic to ensure good bond and homogeneity between the two layers ad prevent the formation of cold joints.

5.50 Vibrating against reinforcement:

Care shall be taken to prevent contact of immersion vibrators against reinforcement steel. Immersion vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set.

They shall also not be allowed to come in contact with forms of finished surfaces.

5.51 Use of form attached Vibrators:

Form attached vibrators shall be used only with specific authorization of Engineer-in charge. Use of surface vibrators: The use of surface vibrators will not be permitted under normal conditions. However, for thin slabs, such as

highways, runways and similar construction, surface vibrators shall be specifically designed may be permitted, upon approval of Engineer-in-charge.

5.52 Stone Pockets and Mortar Pondages:

Formation of stone pockets or mortar pondages in corners and against faces of forms shall not be permitted, should these occur, they shall be dug out, reformed and refilled to a sufficient depth and shape for thorough bounding as directed by Engineer-in-charge.

5.53 Placement Interval:

Except when placing with slip forms, each placement of concrete in multiple lift work shall be allowed to set for at least 24 hours after the final set of concrete and before the start of a subsequent placement.

5.54 Special provision in placing:

When placing concrete in walls with openings, in floors of integral slab and beam construction and other similar conditions, the placing shall stop when the concrete reaches the top of the opening in walls or bottom horizontal surface of the slabs a the case may be. Placing shall be resumed before the concrete in place takes initial set, but not until it has had time to settle as determined by Engineer-in-charge.

5.55 Placing Concrete through reinforcing steel:

While placing concrete through reinforcing steel, care shall be taken to prevent segregation of the coarse aggregate. Where the congregation of steel make placing difficult, it may be necessary to temporally move the top steel aside to get proper placement and restore reinforcing steel to design position.

5.56 Bleeding:

Bleeding or free water on top of concrete being deposited into the forms shall be caused to stop the concrete pour ad the conditions causing this defect corrected before any further concreting is resumed.

5.57 Construction Joints and Keys:

Concrete shall be placed without interruption until completion of the part of the work between predetermined construction joints, as specified therein after. Time lapse between the pouring of adjoining units shall be as specified in the drawing or as directed by Engineer-in charge.

If stopping of concreting becomes unavoidable anywhere, a properly formed construction joint shall be made where the work is stopped. Joints shall be either vertical or horizontal, unless shown otherwise in drawings. In case of an inclined or curved member, the joints shall be at right angles to the axis of the member. Vertical joints in walls shall be kept to a minimum. Vertical joints

shall be formed against a stop board, horizontal joints shall be level and wherever possible, arranged, so that the joint lines coincide with the architectural features of the finished work. Battens shall be nailed to the form to ensure a horizontal line ad if directed, shall also be used to form a grooved joint. For tank walls, similar work joints shall be formed as per IS 3370. Concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering, horizontal and vertical construction joints and shear keys shall be located ad shall conform in detail to the requirements of the plans unless otherwise directed by Engineer-in-charge. Where not described, the joints shall be in accordance with the following:

5.58 Column Joints:

In a column, the joint shall be formed 75mm below the lowest soffit of the beams including haunches f any. In flat slab construction the joint shall be 75mm below the soffit of column capital. At least 2 hours shall elapse after depositing concrete in column, piers or walls, before depositing in beams, girders or slabs supported thereon.

5.59 Beam and Slab joints:

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 ad at the center or within the middle third of the span unless otherwise shown in drawings. Where a beam intersects a girder, the joints in the girder shall be offset a distance equal to twice the width of the beam and additional reinforcement provided for shear. The joints shall be vertical throughout the full thickness of the P -43 concrete member. A joint in a slab shall be vertical and parallel to the principal reinforcement where it is unavoidable at right angles to the principle reinforcement, the joint shall be vertical and at the middle of span.

5.60 Joints in Liquid Retaining Structures:

Vertical construction joints in watertight construction will not be permitted unless indicated on the drawings. Where a horizontal construction joint is required to resist water pressure, special care shall be taken in all phases of its construction to ensure maximum water tightness.

5.61 Dowels:

Dowels for concrete work, not likely to be taken up in the near future, shall be wrapped in tar paper and burlap.

5.62 Mass Foundations:

Mass foundations shall be poured in lifts not exceeding 1.5m in height unless, otherwise indicated on the drawings and approved by Engineer-in-charge.

5.63 Treatment of construction joints on resuming Concreting:

Drier shall be used for the top lift or horizontal pours to avoid a laitance. All laitance and loose stones shall be thoroughly and carefully removed by wire brushing / hacking ad surface washed.

Just before concreting is resumed, the roughened joint surface shall be thoroughly cleaned and loose matter removed and then treated with a thin layer of cement grout of proportion specified by Engineer-in-charge ad worked well into the surface. The new concrete shall be well worked specially against the prepared face before the grout mortar sets. Special care shall be taken to obtain thorough compaction ad to avoid segregation of the concrete along the joint plane.

5.64 Curing, Protecting, Repairing ad Finishing:

(a) Curing: All concrete shall be cured by keeping it continuously damp for the period of time required for complete hydration and hardening to take place. Preference shall be given to the use of continuous sprays or ponded water, continuously saturated covering of sacking, canvas, hessain or other absorbent materials, or approved effective curing compounds applied with spraying equipment capable of producing a smooth, even textured coat. Extra precautions shall be exercised in curing concrete during cold ad hot weather as outlined hereinafter. The quality of curing water shall be the same as that used for mixing concrete.

(b) Curing with Water: Fresh concrete shall be kept continuously wet for a minimum period of 14 days from the date of placing of concrete, following a lapse of 12to 24 hours after lying concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately the concrete has hardened. Water shall be applied to unformed concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms.

(c) Continuous Spraying: Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose sprinklers a spraying device. Continuous fine mist spraying or sprinkling shall be used, unless otherwise specified or approved by Engineer-in-charge.

(d) Alternate curing Methods: Whenever in the judgment of Engineer-in-charge, it may be necessary to omit the continuous spray method, covering of clear sand or other approved means such as wet gunny bags, which will prevent loss of moisture from the concrete, during or after the curing period, will not be permitted.
Conversing shall be kept continuously wet during the curing period.

For curing of curing of concrete in pavements, side-walks, floors, flat roofs or other level surfaces, the ponding method of cutting is preferred. The method of containing the ponded water shall be approved by Engineer-in-charge. Special attention shall be given to edges and corners of the slab to ensure proper protection to these areas. The ponded areas shall be continuously filled with water during the curing period.

5.64.1 Curing Compounds:

Surface coating type curing compound shall be used only on special permission of Engineer-in-charge.

Curing compounds shall be liquid type while pigmented, conforming to U.S. Bureau of Reclamation specification. No curing compound shall be used on surface where future blending with concrete, water or acid proof membrane or painting is specified.

5.64.2 Curing Equipment:

All equipments and materials required for curing shall be on hand ad ready for use before concrete is placed.

5.64.3 Protecting Fresh Concrete:

Fresh concrete shall be protected from the elements, from defacement sad damage due to construction operations by leaving forms in place for ample period as specified later in this specification. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by Engineer-in-charge, shall also be taken to protect immature concrete from damage by debris, excessive loading, vibrations, abrasion or contact with other materials etc. that may be warned against and prevented from disturbing green concrete during its setting period, if it is necessary may be warned against and prevented from disturbing green concrete during its setting period, if it is necessary that workmen enter the area of freshly placed concrete, Engineer-in-charge may require that bridges be placed over the area.

5.64.4 Repair and Replacement of unsatisfactory Concrete:

Immediately after the shuttering is removed, the surface of concrete shall be carefully gone over and all defective areas called to the attention of Engineer-in-charge who may permit patching of the defective areas or else reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by contractor at no additional expense to the Department. Holes left by form bolts etc. shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing through 2.36mm IS sieve after removing any loose stones adhering to the concrete Mortar filling shall be struck off flush at the face of the concrete. Concrete surface shall be finished as described under the particular item of work.

Superficial honey combed surfaces and rough patches shall be similarly made good immediately after removal of shuttering in the presence of Engineer-in-charge and superficial water ad air holes shall be filled in. The mortar shall be well worked into the surface with wooden float. Excess water shall be avoided. Unless instructed otherwise by Engineer-in-charge, the surface of the exposed concrete placed against shuttering shall be rubbed down

immediately on removal for shuttering to remove fine or other irregularities, care being taken to avoid damaging the surfaces. Surface irregularities shall be removed by grinding.

If reinforcement is exposes or the honey combing occurs at vulnerable position e.g. ends of beams or columns, it may be necessary to cut out the member completely or in part and reconstruct. The decision of Engineer-in-charge shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25mm), the edges being cut perpendicular to the affected surface or with a small undercut if possible, anchors, tees or dowels shall be provided in slots whenever necessary to attach the newly concrete securely in place.

An area extending several centimeters beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

5.64.5 Use of Epoxy:

The use of epoxy for bonding fresh concrete used for repairs will be permitted upon written approval of Engineer-in-charge. Epoxies shall be applied in strict accordance with the instruction of the manufacturer.

5.64.6 Method of repair:

Small size holes having surface dimensions about equal to the depth of the hole, holes left after removal of form holts, grout insert holes and slots cut for repair of cracks shall be repaired as follows:

The hole to be patched shall be roughened ad thoroughly soaked with clean water until absorption stops.

A 5mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched followed immediately by the patching concrete which shall be well consolidated with a wooden float and left slightly proud of the surrounding surface. The concrete patch shall be built up in 10mm thick layers. After an hour more, depending upon weather conditions, it shall be worked off flush with a wooden float and smooth finish obtained by wiping with hessian. Steel trowel shall not be used for this purpose. The mix for patching shall be of the same materials and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible.

Mortar filling by air pressure (guniting) shall be used for repair of areas to large and / or too shallow for patching with mortar. Patched surfaces shall be given a final treatment to match the colour and texture of the surrounding concrete. White cement shall be substituted for ordinary cement, if so directed by Engineer-in-charge, to match the shade of the patch with the original concrete.

5.64.7 Curing of Patched Work:

The patched area shall be covered immediately with an approved non-staining water saturated material such as gunny bags, which shall be kept continuously wet and protected against sun and wind for a period of 24 hours. Thereafter, the patched area shall be kept wet continuously by a fine spray of sprinkling water for not less than 10 days.

5.64.8 Approval by Engineer-in-charge:

All materials, producers and operations used in the repair of concrete and also the finished repair work shall be subject to the approval of Engineer-in-charge. All fillings shall tightly bonded to the concrete and shall be sound, free from shrinkage cracks after the fillings have been cured and dried.

5.64.9 Finishing:

This specification is intended to cover the treatment of concrete surfaces of all structures. P -46

(a) Finish for Formed surfaces: The type of finish for formed concrete surfaces shall be as follows, unless otherwise specified by the Engineer-in-charge. For surface below grade, which will receive waterproofing treatment, the concrete shall be free of surface irregularities which would interfere with proper application of the water proofing materials which is specified for use. Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repair of damaged or defective concrete, removal of fins and abrupt irregularities, filling of hole left by form ties and rods and cleanup of loose or adhering debris.

Surfaces which will be exposed to the weather and which would normally be leveled shall be sloped for drainage. Unless the drawing specify a horizontal surface or shows the slope required, the tops of narrow surfaces such as staircase treads, walls, curbs and parapets shall be sloped across the width approx. as 1 in 30, Broader surface such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub floors to be covered with concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth, screened and leveled to produce even surfaces. Surface irregularities shall not exceed 6mm. Surfaces which will not be covered by backfill, concrete or tile topping such a outside decks, floors of galleried and sumps, parapets, gutters, sidewalks, floors and slabs shall be consolidated, screened d floated. Excess water and laitance shall be removed before final finishing. Floating may be done with hand with hand or power tools and started a soon as the screeded surface has attained a stiffness to permit finishing operations and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints edges shall be tooled as called for on the drawings or as faceted by Engineer-in charge.

(b) Standard Finish for Exposed Concrete: Exposed concrete shall mea any concrete other than floors or slabs exposed to view upon completion of the job. Unless otherwise specified on the drawings, the standard finish for exposed concrete shall be of smooth finish. A smooth finish shall be obtained with use of lined or plywood form having smoothed and even surfaces and edges. Panels and form linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms, the joint marks shall be smoothed off and all blemished, projections etc. removed, leaving the surfaces reasonably smooth ad unmarred.

(c) Integral Cement concrete Finish: When specified on the drawings, an integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded, as specified in the drawings ad as per IS 2571. The surface shall be compacted and then floated with a wooden float or power floating machine. The surface shall be tested with a straight edge at any high and low spots eliminated.Floating or toweling of the finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

(d) Rubbed Finish: A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, off sets leveled and voids and/ or damaged sections immediately saturated with water and repaired by filling with water and repaired by filling with concrete or mortar of the same composition as was used in the surfaces. The surfaces shall then be thoroughly wetted and rubbed with carborandum or other abrasive. Cement mortar may be used in the rubbing, but the finished surfaces shall not be brush coated with either cement or grout after rubbing. The finished surfaces shall present a uniform a smooth appearance.

(e) Protection: All concrete shall be protected against damage until final acceptance by Engineer-incharge.

5.65 Foundation Bedding, Bonding and Jointing:

All surfaces upon or against which concrete will be placed shall be suitably prepared by thoroughly cleaning, washing and dewatering a may be indicated in the plans or as Engineer-in-charge may direct to meet the various situations encountered in the work.

Soft or spongy areas shall be cleaned out and back filled with either a soil cement mixture, lean concrete or clan sand fill compacted to minimum density of 90%. Modified proctor, unless otherwise mentioned in schedule of quantities. Prior to construction of form work for any item where soil will not act as bottom form, approval shall be obtained from Engineer-in-charge as to the suitability of the soil.

5.66 Preparation Rock Strata of Foundations:

To provide tight bond with rock foundations, the rock surface shall be prepared and the following general requirements shall be observed.

Concrete shall not be deposited on large sloping rock surface shall be prepared and the following general requirements shall be observed.

Concrete shall not be deposited on large sloping rock surface. Where required by Engineer-in-charge or as indicated on the plans, the rock shall be cut to form rough steps or benches to provide roughness or a more suitable bearing surface.

Rock foundation stratum shall be prepared by picking, barring, wedging and similar methods which will leave the rock in an entirely sound and unshattered condition.

Shortly before concrete is placed, the rock surface shall be cleaned with high pressure water and air jet even though it may have been previously cleaned in that manner.

Prior to placing concrete, the rock surface shall be kept wet for a period for 2 to 4 hours unless otherwise directed by the Engineer-in-charge.

Before placing concrete on rock surfaces, all water shall be removed from expressions to permit through inspection and proper bonding of the concrete to the rock.

5.67 Preparation of Earth Strata of Foundations:

All earth surfaces, upon which additional concrete is to be placed later, shall preferably be done by scarifying ad cleaning while the concrete is between its initial ad final set. This method shall be used wherever practicable and shall consist of cutting the surface with picks ad stiff brooms and by use of an approved combination of air and water jet as directed by Engineerin-charge. Great care shall be taken in performing this work to avoid removal of too much mortar and the weakening of the surface by loosening of aggregate. When it is not practicable to follow the above method, it will be necessary to employ air tools to remove laitance ad roughen the surface.

The final required result shall be pitted surface from which all dirt, unsound concrete, laitance and glazed mortar have been removed.

5.68 Bonding Treatment Mortar:

After rock or concrete surfaces upon which new concrete is to be placed have been scarified, cleaned and wetted specified herein, it shall receive a bonding treatment, immediately before placement of the concrete.

The bonding medium shall be a coat of cement sand mortar. The mortar shall have the same cement-sand proportion the concrete which shall be placed on it. The water cement ratio shall be determined by placing conditions and approved by Engineer-in-charge.

Bonding mortar shall be placed in sufficient quantity to completely cover the surface about 10mm thick for rock surface and about 5mm thick for concrete surfaces. It shall be brushed or broomed over the surface and worked thoroughly into all cracks, crevices and depressions. Accumulations or puddles of mortar shall not be allowed to settle in depressions ad shall be brushed out a satisfactory degree as determined by Engineer-in-charge.

Mortar shall be placed at such a rate that it can be brushed over the surface just in advance of placement of concrete. Only as much area shall be covered with mortar as can be covered with concrete before initial set in the mortar takes place. The amount of mortar that will be permitted to be placed at any one time, or the area which is to cover, shall be in accordance with Engineer-in-charge.

5.69 Cleaning and Bonding of formed Construction Joints:

Vertical construction joints shall be cleaned as specified above or by other methods approved by Engineer-in-charge in placing concrete against formed construction joints, the surfaces of the joints, where accessible, shall be coated thoroughly in the specified bed-joint bonding mortar immediately before they are covered with concrete or by scrubbing with wire brooms, dipped in to the fresh converter. Where it is impracticable to apply such a mortar coating, special precautions will be taken to ensure that the new concrete is brought into intimate contact with the surface of the joint by carefully paddling ad spading with aid of vibrators and suitable tools.

5.70 Expansion and Contraction:

Provision shall be made for expansion a contraction in concrete by use of special type joints located as shown in the drawings. Construction joint surfaces shall be treated as specified in the specification, shown in the drawings a directed by Engineer-in-charge.

5.71 Hot Weather Requirements:

All concrete work performed in hot weather shall be in accordance with IS 56, except as herein modified. Admixtures may be used only when approved by Engineer-in-charge. Adequate provision shall be made to lower concrete temperatures by cool ingredients, eliminating excessive mixing, preventing exposure of mixers and conveyors to direct sunlight and the use for reflective paint, on mixers etc. The temperature of the freshly placed concrete shall not be permitted to exceed 300o C.

Consideration shall be given to shading aggregate stock piles from direct rays of the sun and spraying stock piles in water, use of cold water available and

burying, insulation, shading and / or painting white the pipe line sand water storage tanks and conveyances.

In order to reduce loss of mixing water, the aggregates, wooden forms, sub grade, adjacent concrete and other moisture absorbing surfaces, shall be well wetted prior to concreting, placement ad finishing shall be done as quickly as possible.

Extra precautions shall be taken for the protection and curing of concrete. Consideration shall be given to continuous water curing and protection against high temperature and drying hot wind for a period of at least 7 days immediately after concrete has set and after which normal curing procedures may be resumed.

5.72 Placing concrete under Water:

Under all ordinary conditions all foundations shall be completely dewatered and concrete placed in the dry. However, when concrete placement under water is necessary, all work shall conform to IS 456 and procedure shall be as follows:

5.73 Method of placement:

Concrete shall be deposited under water by means of termite or drop bottom buckets of approved type.

5.74 Direction, Inspection and Approval:

All work requiring placement of concrete underwater shall be designed, directed ad inspected with regard to the local circumstances ad purposes. All under water concrete shall be placed according to the plans or specifications ad as directed and approved by Engineer in-charge.

5.75 Pre cast Concrete and Pre cast Reinforced concrete:

Pre cast concrete & pre cast reinforced concrete shall comply with IS 456 and with the following requirements:

5.76 General requirements:

Pre cast reinforced concrete units such as columns, fencing posts, door window frames, lintels; Chajjas, copings, stills, shelves, slabs, louvers etc. shall be of grade of mix as specified and cast in forms or moulds. The forms/moulds shall be of fiber glass or of steel sections for better finish. Provision shall be made in the forms and mould store accommodate fixing devices such as nibs, clips, hooks, bolts and forming of notches and holes, Pre cast concrete shall be cast on suitable bed or platform with firm foundation ad free from wind. The contractor may pre cast the units on a cement or steel platform which shall be adequately oiled provided the surface finish is of the same standard as obtained in the forms. Each unit shall be cat in one operation Contractor shall be responsible for the accuracy of the level

or shape of the bed or platform. A suitable serial number and the date of casting shall be impressed or painted on each unit.

Concrete used for pre casting the units should be well proportioned, mixed, placed ad thoroughly compacted by vibrations or tamping to give a dense concrete free from voids ad hone combing.

Pre cast articles shall have a dense surface finish showing no coarse aggregate and shall have no cracks or crevices likely to assist in disintegration of concrete or rusting of steel or other defects that would interfere with the proper placing of the units. All angles of the pre cast units with the exception of the angles resulting from the splayed or chamfered faces shall be true right angles. The areas shall be clean and sharp except those specified or shown to be rounded. The wearing surface shall be true tot eh lines. On being fractured, the interior of the units should present a clean homogenous appearance.

The longitudinal reinforcement shall have a minimum cover of 12mm or twice the diameter of the main bar whichever is more, unless otherwise directed in respect of all items except fencing posts or electric posts where the minimum cover shall be 25mm.

5.77 Curing:

After having been cast in the mould or form the concrete shall be adequately protected during setting in the first stages of hardening from shocks ad from harmful effects of frost, sun shine, drying windows d cold. The concrete shall be cured at least for 7 days from the date of casting.

The pre cast articles shall be matured for 28 days before erection or being built in so that the concrete shall have sufficient strength to prevent damage built when first handled. Side shutters shall not be struck in less than 24 hours after depositing concrete ad no pre cast unit shall be lifted until the concrete reaches strength of at least twice the stress to which the concrete may be subjected at the time of lifting.

5.78 Marking:

Pre cast units shall be clearly marked to indicate the top of member and its location and orientation in the structure.

Pre cast units shall be stored, transported and placed in position in such a manner that they will not be overstressed or damaged. The lifting and removal of pre cast units shall be undertaken without causing shocks, vibration or under bending stress or in the units. Before lifting and removal takes place, contractor shall satisfy Engineer-in-charge or his representative that the methods he proposes to adopt for these operations will not overstress or otherwise affect seriously the strength of the pre cast unit. The reinforced side of the units shall be distinctly marked.

5.79 Plain Cement Concrete for General Work:

For plain cement concrete work, the specification for materials viz., cement, sand, fine and coarse aggregates and water shall be the same as that specified in reinforced concrete work specification. But the proportion of mix will be nominal and the ratio of fine and coarse aggregate may be slightly adjusted within limits, keeping the total value of aggregates to a given volumes of cement constant to suit the sieve analysis of both the aggregates. Cement shall on no account be measured by volume, but it shall always be used directly from the bags (i.e. 50kg/ bag). The proportion of cement, sand, aggregate and water for concrete of proportion 1:5:10, 1:4:8, 1:3:6 & 1:2:4 by volume shall generally consist of quantities as given below:

Proportion of Ingredients	Quantity of material used per bag of cement				
	Cement	Fine aggregate (Sand)	Coarse aggregate	Total of fine and coarse aggregates	Water
1:5:10	1	170 litres	340 litres	800 kgs	60 litres
1:4:8	1	130 litres	272 litres	625kgs	54 litres
1:3:6	1	102 litres	204 litres	480 kgs	31 litres
1:2:4	1	68 litres	136 litres	350 kgs	32 litres

The quantity of water used shall be such as to produce concrete of consistency required by the particular class of work and shall be decided by the use of a slump cone. Sufficient care should be taken to see that no excess quantity of water is used. The final proportion of the aggregate and quantity of water shall be decided by the Engineer-in-charge on the basis of test in each case.

The slump shall be specified for each class of work and shall be general be as follows:

Type of Concrete	**Max. slump (in mm)**
Mass concrete	50
Concrete below water proofing treatment	50
Coping	25
Floor paving	50

All plain concrete should be preferably mixed in a drum type powder driven machine with a loading hopper which will permit the accurate measure of various ingredients. If hand mixing is authorized, it should be done on a water tight platform.

The mixing of each batch in the concrete mixer shall continue for not less than 1.5 minutes after the materials and water are in the mixer. The volume is mixed materials per batch shall not exceed the manufacturers rated capacity of the mixer. The mixer shall rotate at a peripheral speed of about 60 metres per minute.

Concrete shall be poured and consolidated in its final position within half an hour of mixing. The re-tempering of concrete which has partially hardened, that is remixing with or without additional cement aggregate or water shall not be permitted. Concrete of mix 1:3:6 and 1:2:4 will be required to be vibrated if specified and directed by the Engineer. In case of the thickness of concrete is more than 150mm, it may be vibrated as directed by the Engineer.

The concrete shall be cured for 10 days in ordinary weather and 15 days in hot weather.

Measurements for the work done shall be exact length, breadth and depth shown in figures on the drawings or as directed by the Engineer and after the concrete is consolidated. NO extra shall be paid for excess quantity resulting from faulty workmanship.

5.80 Specific Requirements for concrete and allied works:

The following specific requirements shall be met within addition to those provided in the clause of specification for concrete and allied works:

(a) **General:**

If so specified in Schedule 'A' for the work, the Department shall supply with specification for "Concrete and Allied works" and the contractor shall be solely responsible for supplying mixed concrete in accordance with the specification for concrete and allied works and also this specification. The rates for the reinforced concrete work shall be based on the issue rates of cement and steel as given in the schedule "A".

(b) **Water:**

Clean water in pipes under pressure shall be provided by the contractor with all necessary equipment for giving a nozzle pressure of not less than 2.0 kg/ sq.cm for the convenient and effective jetting of rock foundations and concrete surfaces, for cooling aggregate required for concrete, for curing concrete and other requirements.

(c) **Fire protection System:**

The contractor shall provide and maintain at all times in adequate fire protection system to protect his equipment, material and construction. In case of an emergency, the contractor shall permit the Engineer-in-charge to use the system for protecting equipment, works etc. on the project.

(d) **Concrete:**

The rates for all concrete work should be based as per specifications and taking into consideration the guidelines indicated in special instruction under relevant clause.

(e) **The placement Intervals:**

Each placement of concrete shall be allowed to set for a period of 48 hours and longer when required before the start of subsequent placement. A time gap between the two adjoining pours in the horizontal plane and the two adjacent pours in the vertical plan shall be 7 days and 3 days respectively.

5.81 Mode of Measurement for concrete work:

(i) General:

Concrete as actually done shall be measured for payment, subject to the following tolerances, unless otherwise stated hereinafter. Any work done extra over the specified dimensions shall not be measured for payment.

a. Linear dimensions shall be measured in full centimeters except for the thickness of slab which shall be measured to the nearest half centimeter.

b. Areas shall be worked out to the nearest 0.01 sqm.

c. Cubic contents shall be worked out the nearest 0.001 cum.

d. The concrete shall be measured for its length, breadth and height/depth limiting dimensions to those specified on drawings or as directed by the Engineer-in charge.

Note: The sizes of RCC members as assumed in to estimate are based on preliminary drawings and are likely to be changed. The contractor is not entitled to any extra claim due to such changes.

(ii) **Deductions:**

No deduction shall be made for the following:

a. Ends of dissimilar materials e.g. joists, beams, posts, girders, rafters, purlins, trusses, corbels, steps etc. up to 500 sq.cm in cross section.

b. Opening up to 0.1 sqm. (1000 sq.cm).

c. Volume occupied by reinforcement.

d. Volume occupied by pipes, conduits, sheathing etc. not exceeding 25sq.cm. each in cross sectional area. Nothing extra shall be paid for leaving ad finishing such cavities and holes.

(iii) Column Footing:

R.C.C. in foundation and footings shall be measured for its length, breadth and depths limiting dimensions to those specified in drawing or as ordered in writing by the Engineer-in-charge. In case of tapering portions of column footings, the quantities shall be calculated by Prismoidal Formula.

(iv) Column:

Column shall be measured from top footings to the plinth level and from plinth level to the structural slab level and to the subsequent structural slab levels. Measurements for higher grade concrete in column at its junction with lower grade concrete beams shall be restricted to the column section supporting the beam in question.

(v) Wall:

All walls shall be measured from top of the wall footing to the plinth level and from plinth level to the top of structural first floor and to subsequent floors.

(vi) Beam and Lintel:

Beam shall be measured from face to face of the columns, walls, cross beams including haunches if any. The depth of the beams shall be measured from the top of the slab to the bottom of the beam except in the case of inverted beam where it shall be measured from top of slab to top beams. The beams and lintels with narrow width even though acting as facia in elevation in some cases will be measured as beams and lintels only.

(vii) Slab:

The length and breadth of slab laid to correct thickness as shown in the detailed drawing for as ordered by the Engineer-in-charge shall be measured between beams, walls and columns.

(viii) Chajjas, Facias, Fins and Mullions:

a. Chajjas shall be measured net from supporting faces upto the edges of chajjas without any facia.
b. Facia shall be measured full excluding chajja thickness.
c. End fins shall be measured full.
d. Intermediate fins, mullions shall be measured between chajjas or other supporting structural members.
e. Parapets shall be measured from top of slab / chajja.

(ix) Staircase:

The concrete in all members of staircase like waist slabs, steps, cantilever steps, stringer beams etc. shall be measured for their length, breadth and depth, limiting dimensions to those specified on drawings. No deductions shall be made for embedded plugs, pockets.

(x) Rates:

The rate for PCC / RCC shall include the cost of all materials, labour, transport, tools and plants and all the operations mentioned hitherto, including or excluding the cost of form work and / or reinforcement as mentioned in the schedule for quantities. The rates also shall include the cost of testing material, mix design; cube test and allied incidental expenses.

The reinforcement steel used in the works shall be measured and paid for separately under relevant item.

6.0 FORM WORK

6.1 General:

The form work shall consist of shores, bracings, sides of beams and columns, bottom of slabs etc, including ties, anchors, hangers, inserts etc. complete which shall be properly designed and planned for the work. The false work shall be so constructed that up and down vertical adjustment can be made smoothly. Wedges may be used at the top or bottom of timber shores, but not at both ends, to facilitate vertical adjustment and dismantling of form work.

6.2 Design of Form Work

The design and engineering of form work as well as its construction shall be the responsibility of Contractor. The drawings and calculations for the design of the form work shall be submitted well in advance to the Engineer-in-charge for approval before proceeding with work, at no extra cost to the Department. Engineer-in-charge's approval shall not however, relieve Contractor of the full responsibility for the design and construction for the form work. The design shall take into account all the loads vertical as well as lateral that the forms will be carrying including live and vibration loadings.

6.3 Tolerances:

Tolerances are specified permissible variation from lines, grade or dimensions given in drawings. No tolerances specified for horizontal or vertical buildings lines or footings. Unless otherwise specified, the following tolerances will be permitted.

6.3.1 Tolerances for R.C. Buildings:

I) Variation from the plumb:

a) In the line ad surfaces of columns, piers, walls and in buttresses: 5 mm per 2.5m, but not more than 25 mm.

b) For exposed corner columns and other conspicuous lines In any bay or 5 m, maximum : (+) 5 mm In 10 m or more: (+) 10mm

ii) Variation from the level or from the grades indicated on the drawings.

(a)In slab soffits, ceilings, beam soffits and in arises.
(b)In 2.5m (+) 5mm In any bay or 5m maximum (+) 8 mm In 10 or more (+) 15mm

(c)For exposed lintels, sills, parapets, horizontal grooves and conspicuous lines

iii) Variation of the linear building lines from established position in plan and related position of columns, walls and partitions.

(a)In any bay or 5m maximum (+) 10 mm

(b)In 10 or more (+) 20mm

iv) Variation in the sizes and locations of sleeves, openings in walls and floors except in the case of and for anchor bolts: (+) 5mm

v) Variation in cross sectional dimensions of columns and beams and in the thickness of slabs and walls: (+) 10 mm/(-)5mm

vi) Footing:

(a)Variation in dimensions in plan (+) 50mm/(-) 5mm.

(b)Misplacement or eccentricity: 2% of footing within the direction of misplacement but not more than 50mm.

(c)Reduction in thickness (-) 5% of specified thickness subject to maximum of 50mm.

vii) Variation in steps:
In a flight of stairs Rise (+) 3.0 mm
Tread (+) 5.0 mm
Consecutive steps Rise (+) 1.5 mm
Tread (+) 3.0 mm

6.3.2 Tolerances in other concrete structure

(A)Structures :

Variation of the constructed liner outline from established position in plan
In 5 m … … … (+) 10mm In

10 m or more … (+) 15 mm

Vacation of dimensions to individual structure features from established position in plan
In 20m or more … (+) 25 mm

In buried constructions … (+) 150 mm
Variation from plumb, from specified batter or from curved surfaces of all structures.

In 2.5m … … … (+) 10 mm

In 5.0m … … … (+) 15 mm

In 10.0mor more … (+) 25 mm

In buried constructions (+) Twice the above limits

Variation from level or grade indicated on drawings in slabs, beams, soffits, horizontal grooves.

In 2.5m … … … (+) 5 mm

In 7.5m … … … (+) 10 mm

In buried constructions (+) Twice the above limits

Variation in cross-sectional dimensions of columns, beams, buttresses, piers of similar members (+) 10mm / (-) 5mm

Variation in the thickness of slabs, walls, arch sections of similar members (+) 10mm / (-) 5mm

B) Footings for columns, piers, walls, buttresses and similar members:

Variation of dimensions in plant (+) 50mm/(-) 10 mm

Misplacement of eccentricity: 2% of footing within the direction of misplacement but not more than 50 mm

Reduction in thickness : 5% of specified thickness subject to maximum of 50mm.

Tolerances in other type of structures shall generally conform to those given in clause 2.4 of Recommended Practice for concrete form work (ACI 347)

6.4 Type of Form work:

Form work may be of timber, plywood, Acrow spans, Acrow pipe (or) Doka type formwork. For special finishes, the form work may be lined with plywood, steel, sheets, oil tempered hard board etc. Sliding forms and slip forms may be used with the approval of Engineer-in-charge. P -60

6.5 Form work requirements:

Forms shall conform to the shapes, lines grades and dimensions including camber of the concrete as called for in the drawings. Ample studs, water braces, straps, shores etc. shall be used to hold the forms in proper position without any distortion whatsoever until the concrete has set sufficiently to permit removal for forms. Forms shall be strong enough to permit the use of immersion vibrators. In special cases, form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight to prevent loss of water and fine material from concrete.
Plywood shall be used for exposed concrete surfaces, where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Form work with lining will be permitted.

All new and used form lumber shall be maintained in a good condition with respect to shape, strength, rigidity, water tightness, smoothness ad cleanliness of surfaces. Form lumber unsatisfactory in any respect shall not be used and if rejected by Engineer-in-charge shall be removed from the site.

Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contour indicated on the drawings, shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be entirely removed and formwork corrected prior to placing new concrete.

Excessive construction camber to compensate for shrinkage settlement etc. that may impair the structural strength of members will not be permitted.

Forms shall be so designed and constructed that they can be striped in the order required and their removal do not damage the concrete. Face formwork shall provide true vertical and horizontal joints shall be as directed by Engineer-in-charge.

Where exposed smooth or rubbed concrete finishes are required, the forms shall be constructed with special care so that the desired concrete surfaces could be obtained which require minimum finish.

6.6 Bracings, Struts and Props:

Shuttering shall be braced, strutted, propped and so supported that it shall not deform underweight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bracings. The shuttering for beams and slabs shall be so erected that the shuttering on the sides of beams and under the soffit of slab can be removed without disturbing the beam bottoms.

Re-propping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be gently lowered vertically while striking the shuttering.

If the shuttering for a column is erected for the full height of the column, one side shall be left open and built upon sections as placing of concrete proceeds, or windows may be left for P -61 pouring concrete from the sides to limit the drop of concrete to 1.0 m or as directed by Engineer-in-charge.

6.7 Inspection of Formwork:

Following points shall be borne in mind while checking during erection of form work and formwork got approved by the Engineer-in-charge before placing of reinforcement bars:

a) Any member which is to remain in position after the general dismantling is done, should be clearly marked.

b) Material used should be checked to ensure that, wrong items/ rejects are not used.

c) If there are any excavations nearby which may influence the safety of form works, corrective and strengthening action must be taken.

d) (i) The bearing soil must be sound and well prepared and the sole plates shall bear well on the ground.
(ii) Sole plates shall be properly seated on their bearing pads or sleepers.

(iii) The bearing plates of steel props shall not be distorted.

(iv) The steel parts on the bearing members shall have adequate bearing areas.

e) Safety measures to prevent impact of traffic; scour due to water etc should be taken. Adequate precautionary measures shall be taken to prevent accidental impacts etc.

f) Bracing, struts and ties shall be installed along with the progress of form work to ensure strength and stability of form work at intermediate stage. Steel sections (especially deep sections) shall at adequately restrained against tilting, overturning and form work should be restrained against horizontal loads. All the securing devices and bracing shall be tightened.
g) The stacked materials shall be placed as catered for, in the design.

h) When adjustable steel props are used, they should:
(i)Be undamaged and not visibly bent.
(ii)Have the steel pins provided by the manufacturers for use
(iii)Be restrained laterally near each end.
(iii)Have means for centralizing beams placed in the fork heads.

(i)Screw adjustment of adjustable props shall not be over extended.

(j)Double wedges shall be provided for adjustment of the form to the required position wherever any settlement / elastic shortening of props occurs. Wedges should be used only at the bottom end of single prop. Wedges should not be too steep and one of the pair should be tightened / clamped down after adjustment to prevent other shifting.

(k)No member shall be eccentric upon vertical member

(l)The number of nuts and bolts shall be adequate

(m)All provision of the design and / or drawings shall be complied with

(m)Cantilever supports shall be adequate

(o)Props shall be directly under one another in multistage constructions as far as possible.
(p)Guy ropes or stays shall be tensioned properly.

(q)There shall be adequate provision for the movement and operation of vibrators another construction plant and equipment.

(r)Required camber shall be provided over long spans.

(s)Supports shall be adequate and in plumb within the specified tolerances.

6.8 Form Oil:

Use of form oil shall not be permitted on the surface which require painting. If the contractor desire to use form oil on the inside of formwork of the other concrete structures, a non-staining mineral oil or other approved oil CEMOL-35 of Ms. Hindustan Petroleum Co. Ltd may be used, provided it is applied

before placing reinforcing steel and embedded parts. All excess oil on the form surfaces and any oil on metal or other parts to be bedded in the concrete shall be carefully removed. Before treatment with oil, forms shall be thoroughly cleared of dried splatter of concrete from placement of previous lift, wooden shavings and other unwanted materials.

6.9 Chamfers and Fillers:

All corners and angles exposed in the finished structure shall be formed with moldings to form chamfers or fillers on the finished concrete. The standard dimensions of chamfers and fillers, unless otherwise specified, shall be 20 X 20 mm. Care shall be exercised to ensure accurate mouldings. The diagonal face of the mounding shall be planed or surfaced to the same texture as the forms to which it is attached.

6.10 Vertical Construction Joint Chamfers:

Vertical construction joints on faces which will be exposed at the completion of the completion of the work shall be chamfered as above accept where not permitted by Engineer-in-charge.

6.11 Wall Ties:

Wire ties passing through the walls, shall not be allowed. Also through bolts shall not be permitted.

For fixing of formwork, alternate arrangements such as coil nuts shall be adopted at the contractors cost.

6.12 Reuse of forms:

Before reuse, all forms shall be thoroughly scrapped, cleaned, nails removed, holes that may leak suitably plugged and joints examined and when necessary repaired and the inside retreated to prevent adhesion, to the satisfaction of Engineer-in-charge. Warped lumber shall be resized.

Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

6.13 Removal of forms:

Contractors shall record on the drawings or a special register, the date upon which the concrete is placed in each part of the work and ht date on which the shuttering is removed there from.

In no circumstances shall forms be struck until the concrete reaches a strength of the at least twice the stress due to self weight and any construction erection loading to which the concrete may be subjected at the time of striking form work. P -63

In normal circumstances (generally where temperature are above 20o C) forms may be struck after expiry of the following periods :

Sl. No.	Type of formwork	Minimum Period Before striking Formwork (For OPC Cement)
a)	Vertical formwork to columns, walls, beams	16 – 24hrs
b)	Soffit formwork to slabs (Props to be re-fixed immediately after removal of formwork)	3 days
c)	Soffit formwork to beams (Props to be re-fixed immediately after removal of formwork)	7 days
d)	Props to slabs: I) Spanning up to 4.5 m II) Spanning over 4.5 m	7 days 14 days
e)	Props to beams and arches: I) Spanning up to 6 m II) Spanning over 6 m	14 days 21 days

Striking shall be done slowly with utmost care to avoid damage to arise and projection a without shock or vibration, by gently easing the wedges. If after removing the formwork, it is found that timber has been embedded in the concrete, it shall be removed and made good as specified earlier.

Reinforced temporary opening shall be provided, as directed by Engineer-in-charge, to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts etc. which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours or later than 40 hours after concrete has been deposited.

Ties, except those required to hold forms in place, may be removed at the same time. Ties withdrawn from walls and grade beams shall be pulled towards the inside face. Cutting ties back from the faces of walls and grade beams will not be permitted. Work damaged due to premature or careless removal of forms shall be reconstructed at contractors cost.

6.14 Mode of measurement:

The form work measured shall be the area of concrete in contact with concrete only.

In case the item of concreting is inclusive of cost of form work, it shall not be measured separately.

All temporary form work such as bulk heads, stop boards provided at construction joints which are not shown in the drawings shall not be measured.

No deduction shall be made for opening / obstructions upto an area 0.1 sqm. and nothing extra shall be paid for forming such openings.

The rate shall include the cost of erecting, centering, shuttering materials, transport, de shuttering and removal of materials from site and labour required for all such operations etc.

7. STEEL REINFORCEMENT

Steel reinforcement bars, if supplied or arranged by contractor, shall be either plain round mild steel bars grade as per IS 432 (part-I) or medium tensile steel bars as per IS 452 (part-I) or hot rolled mild steel and medium tensile steel deformed bars as per IS 1139 or cold twisted steel bars and hot weld strength deformed bars as per IS 1786, as shown and specified on the drawings. Wire mesh or fabric shall be in accordance with IS 1566. Substitution of reinforcement will not be permitted except upon written approval from Engineer-in-charge.

7.1 Storage :

The reinforcement steel shall not be kept in direct contact with ground but stacked on top of an arrangement of timber sleepers or the like. Reinforcement steel shall be with cement wash before stacking to prevent scale and rust. Fabricated reinforcement shall be carefully stock to prevent damage, distortion, corrosion and deteriorations.

7.2 Quality :

All steel shall be grade I quality unless specifically permitted by the Engineer-in-charge. No rolled material will be accepted. If demanded by the Engineer-in-charge. Contractor shall submit the manufacturers test certificate for steel. Random tests on steel supplied by contractor may be performed by Department as per relevant Indian Standards. All costs incidental to such tests shall be at contractors expense. Steel not conforming to specifications shall be rejected. All reinforcement shall be clean, free from grease, oil, paint, dirt loose mill, scale dust, bituminous materials or any other substances that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated. Pitted and defective rods shall not be used. All bars shall be rigidly held in position before concreting. No welding of rods to obtain continuity shall be allowed unless approved by the Engineer-in-charge. If welding is approved, the work shall be carried as per 2751, according to best modern practices and as directed by the Engineer-in-charge in all cases of important connections, tests shall be made to prove that the joints are of the full strength of bars welded. Special specifications, as specified by the Engineer-in-charge, shall be adhered to in the welding of cold worked reinforcing bars and bars other than mild steel.

7.3 Laps :

Laps and splices for reinforcement shall be shown in the drawings. Splices, in adjacent bars shall be staggered and the locations of all splices, except those specified on the drawing shall be approved by the Engineer-in-charge. The bars shall not be lapped unless the length required exceeds the maximum available length of bars at site.

7.4 Bending:

All bars shall be accurately bent according to the sizes and shapes shown on the detailed working drawings/ bar being schedules. They shall be bent gradually by machine or other approved means.

Reinforcing bars shall not be straightened and rebent in a manner that will injure the materials. Bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 25mm in diameter which may be bent hot if specifically approved by the Engineer-in-charge. Bars bent hot shall not be heated beyond cherry red colour (not exceeding 645^0 C) and after bending shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only of the means used for straightening and rebinding be such as shall not, in the opinion of the Engineer-in-charge injure the material. NO reinforcement bar shall be bent when in position in the work without approval, whether or not it is partially embedded in hardened concrete. Bars having links or bends other than those required by design shall not be used. P -65

7.5 Bending at Construction Joints:

Where reinforcement bars are bent aide at construction joints and afterwards bent back into their original position, care should be taken to ensure that no time the radius of the bend is less than 4 bar diameters for plain mild steel or 6 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.

7.6 Fixing / placing and Tolerance on Placing:

Reinforcement shall be accurately fixed by any approved means maintained in the correct position as shown in the drawings by the use of blocks, spacer and chairs as per IS: 2502 to prevent displacement during placing and compaction of concrete. Bar intended to be in contact at crossing point shall be securely bound together at all such points with number 16 gauge annealed soft iron wire. The vertical distances required between successive layers of bars in beams or similar members shall be maintained by the provision of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.

7.7 Tolerance on placing of reinforcement:

Unless otherwise specified by the Engineer-in-charge, reinforcement shall be placed within the following tolerances:

Tolerance in spacing

a).For effective depth, 200 mm or less + 10 mm
b).For effective depth, more than 200 mm + 15 mm

7.8 Cover to Reinforcement:

The cover shall in no case be reduced by more than one third of specified cover or 5mm whichever is less. Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish shall be as follows) :

a) At each end of reinforcing bar not less than 25 mm, nor less than twice the diameter of such bar.
b) For a longitudinal reinforcing bar not less than 25 mm, nor more than 40 mm, nor less than the diameter of such bar. In the case of column of maximum dimensions of 200mm or under, whose reinforcing bars do not exceed 12mm, a cover of 25mm may be used.
c) For longitudinal reinforcing bar in a bar, not less than 25 mm nor less than the diameter of such bar and.
d) For tensile, compressive, shear, or other reinforcement in a slab, not less than 25mm, nor less than the diameter of such bar and.
e) For any other reinforcement not less than 15mm, nor less than the diameter of such bar.
f) Increased cover thickness may be provided when surfaces of concrete members are exposed to the action of harmful chemicals (as in the case of concrete in contact with earth faces contaminated with such chemicals), acid, vapour, saline, railways) etc. and such increase of cover may be between 15mm and 50 mm beyond the figures given in (a to e) above as may be specified by the Engineer-in-charge.
g) For reinforced concrete members, totally immersed in sea water the cover shall be 40mm, more than specified (a to e) above.
h) For reinforced concrete members, periodically immersed in sea water or subject to sea spray, the cover of concrete shall be 50 mm more than that specified (a to e) above.
i) For concrete of grade M25 and above, the additional thickness of cover specified in (f), (g) and (h) above may be reduced to half. In all such cases the cover should not exceed 75mm.
j) Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coating as specified on the drawings. In such case, the extra cover, mentioned in (h) and (i) above, may be reduced by the Engineer-in-charge, to those shown on the drawing.
k) The correct cover shall be maintained by cement mortar briquettes or other approved means. Reinforcement for footings, grade beams ad slabs on sub grade shall be supported on precise concrete blocks as approved by the Engineer-in-charge. The use of pebbles or stones shall be permitted.
l) The minimum clear distance between reinforcing bars shall be in accordance with IS 456 or as shown in drawings.

7.9 The Bars shall be kept in correction position by the following methods:

(a) In case of beam and slab construction precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4X4 cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcement.
(b) In case of cantilevered and doubly reinforced beams or slabs, the vertical distance between the horizontal bars shall be maintained by introducing chairs, spacers or support bars of steel at 1.0 metre or at shorter spacing to avoid sagging.
(c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in theme or with block of cement mortar 1:2 (1 cement : 2 coarse sand) of required size suitably tied to the reinforcement to ensure that they are in correct position during concreting,
(d) In case of other RCC structure such as arches, domes, shells, storage tanks etc. a combination of cover blocks, spacers and templates shall be used as directed by Engineer-in-charge.

7.10 Inspection:

Erected and secured reinforcement shall be inspected and approved by Engineer-in charge prior to placement of concrete.

7.11 Mode of Measurement for reinforcement for R.C.C Works:

Reinforcement a detailed in schedule of quantities shall be measured for payment lineally as per the cutting length nearest to a centimeter shown in bar bending schedule submitted by the contractor and approved by the Engineer-in-charge and weight calculated based on the standard weights as per I.S.S. per meter length. No allowance shall be measured. The cost of steel used by the contractor in the reinforcement only upto the extent shown in the drawings. As far as possible, laps in bars shall be avoided. Any laps and hooks provided by the contractor other than authorized as per approved bar bending schedule will be considered to have been provided by the contractor for his own convenience and shall not be measured for payment. Pins, chairs, spacers shall be provided by the contractor wherever required as per drawing and bar bending schedule and as directed by the Engineer-in-charge and shall be measured for payment. Fan hooks as required shall be provided by the contractor as per direction of Engineer-in-charge and shall be measured for payment.

The rate shall include the cost of all materials and labour required for all above operation including transport, wastage, straightening, cutting, bending, binding and the binding wire as required.

8.0 CEMENT PLASTERING WORKS

8.1 Scope of work:

The work covered under these specification consists of supplying all material for rendering all types of plaster / pointing finishes strictly in accordance with these specifications, applicable drawings etc.

8.2 General:

Cement, sand and water required for the work shall conform to specifications laid down herein before under section cement concrete (plain and reinforced), except that sand for finishing coat shall generally conform to IS 1542-1960. the plastering works shall generally conform to IS 1661-1987(pt.III) Code of practice for cement plaster finish on walls and ceilings). All general precautions as specified in I.S. 1661-1987 (pt.III) clause 8, shall be taken and preparation of the background shall be done as laid down in IS 1661 clause 12 and IS 2402-2963 shall be generally followed for sand faced plaster work. Scaffolding required for facility of working shall be provided by the contractor at his own cost. This may be double or single according to the requirement and shall be approved by the Engineer-in-charge stage scaffolding shall be erected when ceiling plastering is done. The contractor shall be responsible for accidents if any, take place. The contractor shall co-operate with the other agencies for fixing switch boxes at specified locations so that the boxes are fixed properly in line with finished plaster surface. All finishing in and around these boxes as also around the conduit boxes in ceiling shall be done by plastering contractor without any extra cost to the Department. The decision of the Engineer-in charge in this regard shall be final and binding on the contractor.

8.3 Preparation of Surface:

The surface to be plastered shall first be thoroughly cleaned of all muck and cleaned down. All joints shall be racked to in case of brick work / stone masonry and closely hacked in case of concrete as the work proceeds. The surface to be plastered shall be well wetted for a minimum period of 6 hours before commencing to work. The mortar for all plaster work shall be cement mortar of mix as specified in the schedule of quantities.

After erection of scaffolding and before commencement of plastering work, top most junctions / joints / sides with beam / column shall be thoroughly packed with cement mortar to prevent cracks.

Before commencement of plastering operation, the contractor shall ensure that all the service pipes, electrical conduits, boxes, switch boxes etc. have been installed in position by other agencies and the plastering surface is duly approved by the Engineer-in-charge. In order to enable other service contractors to fix the electrical conduit boxes, EDB's, pipes, outlets etc. in proper level and line with reference to the finished surface of the plaster. Thiyyas and Tapanis i.e. finished plaster patches shall be given by the main civil contractor on walls, ceiling at regular intervals well in advance of his plaster work at no extra cost to the Department. The entire work of preparation of

surface before plastering shall thus be co-ordinated by the main civil contractor with all other agencies working at site.

Just before actual plastering work is taken up in hand, all the ceilings and walls etc. shall be marked with plaster buttons indicating the thickness of plaster required and which shall be in true line, level and plumb. The contractor shall get these marks approved by the Engineer-in charge before starting the plastering work. The contractor shall also be responsible to render the final surface true to line, level and plumb etc.

All building operations like construction of walls, concreting etc. shall have been completed before plastering is taken up. The plastering operation should be taken up only after the service pipes etc. that are to embedded in the wall or ceiling are completed and suitably protected against corrosion by other agencies and okayed by the Engineer-in-charge. Damage if caused to any of the existing fittings, fixtures, including doors and windows etc. during the plastering operation shall be made good by the contractor at his own cost.

If the surface which is to be plastered either internally or externally is out of plumb and not in lien and level and if the plastering to be done is more than specified thickness to bring the plastered surface to perfect lien and levels in such specific cases, chicken wire mesh is to be provided by the on contractor at his own cost and the plaster should be done to required line and level with no extra cost whatsoever.

The finished plastered surface shall be free from cracks, fissures, crevices, hair cracks, blistering, local swellings and flaking. The finished surface shall be true to line, level, plumb and plain and durable. The adhesion of the mortar with the background surface is of prime importance as this affects durability of plaster. Preparation of surface which has to take plastering work the surface should be got approved by the Engineer-in-charge.

In order to avoid the formation of deep and side cracks and for dispersion for cracks at the junctions between concrete surfaces and brick masonry works, cautionary measures such as fastening and lapping of chicken mesh over the junction areas should be carried out over which the plastering work has to be taken up as required by the Engineer-in-charge.

The minute gap between window / door frames with sills and jambs should be filled up / caulked by plaster of Paris / epoxy putty / silicon sealants, Rubber based sealants (brand name TECHMAT /TECHCOAT) by caulking guns or by approved methods as instructed / approved by Engineer-in-charge.

8.4 Groves :

The grooves shall be of required dimensions. The same shall be made to turn wherever necessary. The finish, inside, shall be of the same finish as that of the plaster. The lines of the grooves shall be well defined and rounded. The grooves are to be provided in plastering in internal and external surfaces shall be included in the rates wherever mentioned in the schedule of quantities.

8.5 Mix Proportion :

The mortar for plastering shall be of proportion as specified in the item schedule. The mixes specified in the schedule are volumetric.

8.6 Mixing :

Cement and fine aggregates shall be mixed dry in the required proportions to obtain a uniform colour. Water shall then be added to get the required consistency for the plaster.

Mixing shall be done mechanically. However, manual mixing will be allowed only in exceptional circumstances at the discretion of the Engineer-in-charge. Manual mixing, where adopted, shall be carried out on a clean water tight platform. After water is added during mixing, the mix shall be held back and forth for 10 to 15 minutes.

In machine mixing, the mixer shall run at least placing all the ingredients in the drum. Only so much quantity of mortar which can be used within half an hour after the addition of water shall be prepared at a time. Any mortar for plaster which is set or partially set shall be rejected and shall be removed for with from the site.

6mm Plaster :

The plaster shall be laid with somewhat more than 6mm, thickness and pressed and leveled with wooden ruler to a finished thickens of 6mm. Straight edges shall be freely used to ensure a perfectly even surface. All exposed angles and junctions of walls, doors, windows, beams, slabs etc. shall be carefully finished so as to furnish a neat and even surface.

12mm Plaster :

The plaster shall be laid with somewhat more than 12mm, thickness and pressed and leveled with wooden ruler to a finished thickens of 12mm. Straight edges shall be freely used to ensure a perfectly even surface. All exposed angles and junctions of walls, doors, windows, beams, slabs etc. shall be carefully finished so as to furnish a neat and even surface.

15mm Plaster:

The proportions of sand and cement shall be as specified and shall cover all irregularities, undulations, depressions due to chasing etc. in the surface to be plastered. The mortar shall be applied slightly more than 15mm thick and pressed and leveled with wooden ruler or straight edge to finished thickness of 15mm. Straight edges shall be freely used to ensure a perfectly even surface. The finished surface shall be true and even and present uniform texture throughout and all joining marks shall be eliminated. All corners, edges and angles shall be made perfectly to line, place and plumb. All exposed angles and

junction of walls, doors, windows, beams, slabs etc. shall be carefully finished so as to furnish a neat and even surface.

Plastering items amongst all other things as described in various items also include:

1) Preparation of surface to receive the plaster, providing cement plaster of he specified average thickness and proportions with specified number of coats.

2) All labour, materials, scaffolding, use of tools and equipment to complete the plastering work as per specifications.

3) Curing for 10 days.

4) Cleaning the surface of doors, windows, floors or any other surfaces where plastering might have splashed.

5) Finishing the portion of plaster left above the terrazzo, Plain cement tiles, ironite or any type of skirting work to be finished rounded or as directed by the Engineer-in-charge, in a separate operation after laying of floor tiles skirting.

8.7 Sand Faced Cement Plaster :

8.7.1 General :

Materials and preparation of surfaces and scaffolding etc. for sand faced plaster wherever applicable shall conform to specification laid down herein before under section cement plastering and the following specifications are also to be complied with.

8.7.2 Preparation of Surface :

The surface to be plastered shall first be thoroughly cleaned down. All joints shall have been raked out in case of brick work/stone masonry as the work proceeds. Concrete surface shall also be clearly hacked and wire brushed if not already done before plastering is taken up. The surface to be plastered shall be well wetted for a minimum period of 6 hours before commencing the work. The mortar for all plaster work shall be cement sand mortar of mix as specified in the schedule of quantities.

Double scaffoldings required for facility of construction shall be provided by the construction at his own expenses wherever directed by the Engineer-in-charge, Scaffolding shall be erected with pipes or bellies or bamboos of adequate strength so as to be safe for all the dead, live and impact loads likely to sustain by it during construction operations. The contractor shall take all measures to ensure the safety of the work and workmen. Any instruction of the Engineer-in-charge in this respect shall also be complied with. The contractor shall be entirely responsible for any damage to Government property or injury to persons, resulting from faulty scaffolding, defective ladders and materials or otherwise arising out of his default in this respect. Proper scaffolding shall be provided to allow easy approach for workmen and supervisory staff to every

part of the work Ballies, Bamboos etc. for scaffolding shall not be tied to the windows, doors, mullions, ventilators etc. Any damage done to the windows, doors, etc. shall be made good by the contractor to the original conditions at his own cost. For better safety, steel pipe scaffolding is preferred.

8.7.3Workmanship :

The surface to be plastered shall first be dubbed out with cement mortar to cover all irrgulatities and faces upto proudest part. The dubbing coat which shall be of proportion as specified in schedule and a 12mm thick (1/2") layer shall then be applied/scored and keys shall be formed on the surface by thoroughly combing it with heavy horizontal lines about 12mm (1/2") apart and about 3mm (1/8") deep when mortar has just set.

The cement mortar for sand faced plaster shall have washed and approved sand with slightly larger proportions of course materials, but not exceeding 3mm. The proportion of cement to sand shall be as specified in the schedule. The water is gradually added to make the mixture homogenous. The thickness of finishing coat excluding key shall be 8mm (about 5/16"). After application the surface should be finished with a wooden float lined with a wooden float lined with cork closely pricked on with a wet sponge tapped gently to bring sand particles into prominence.

The chajjas and any other horizontal portions shall be cleaned and set mortar that might have been fallen at the time of plastering at higher elevation, before plastering the same is taken up. Vatas shall be done simultaneously with chajja plaster.

8.8 Mode of Measurement :

Area of plastering will be measured net and shall be paid for. The measurement of length of wall plastering shall be taken between walls or partitions (dimensions before plastering shall be taken) for the length and from top of the floor or skirting or dado as the case may be to the underside of ceiling for the height. All openings more than 0.1 sqm. shall be deducted and all jambs, so fits, sills of these openings if done, will be measured to arrive to the net area for payment. No opening less than 0.1 sqm. shall be deducted and no jambs etc. for such openings shall be measured for payment.

The rate hall include the cost of finished all the edges, corners, cost of all materials, labour, scaffolding, transport, curing etc. The rate shall include the cost of finishing all the edges, corners, cost of all materials, labour, transport, scaffolding, curing etc. and grooves if so specified in the item of schedule of quantities.

The rate for plastering should include the cost of work towards the following items for co-ordination with electrical item:

Neatly plastering around DB's junction boxes, M.S. boxes etc. should be done and made matching with the wall finish after installation of electrical equipments.

All BD's service boxes, covers etc. should be covered by a plastic cloth of other suitable covering material such that water or materials should not splash the same during brick work and plastering work. This is to be done in such a way that electrical equipments as well as painted surfaces are not spoiled.

For fixing M.S. boxes, DB's etc. Thiya should be given such that the required face of the M.S. box, DB covers etc. in line with final finished plastered surface.

The rate for the item shall also include rounding up of corner and angles making sharp corners and angles finishing around ceiling rose and electrical fittings etc. fixed by other agencies, finishing of top of dado and skirting (zad finishing), junctions of roof and wall or beam with the finish as specified in the item. Plastering of brick and concrete cornice and copings and plastering in restricted areas if any shall not be measured separately. Architectural bands and narrow widths of plaster over structural as well as non-structural and the line when prepared in the same thickness of plaster shall not be measured separately and shall be covered by respective plaster items.

9. PAINTING WORKS

9.1 Scope of work:

The work covered under these specifications consist of furnishing the various types of paints and also the workmanship for these items, in strict compliance with these specifications, which are given in detail hereinafter with the item of schedule of quantities.

9.2 Materials:

Paints, oils varnishes etc. of approved brand and manufacture shall be used. Ready mixed paints as recovered from the manufacturer without any admixture shall be used.

If for any reason, thinning is necessary in case of ready mixed paint, the brand of thinner recommended by the manufacturer or as instructed by the Engineer-in-charge shall be used. Approved paints, oils or varnishes shall be brought to the site of work by the contractor in their original containers in sealed condition. The materials shall be brought in at a time in adequate quantities to suffice for the whole work or atleast a fortnights work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-charge. The empties shall not be removed from the site for work, till the relevant item of work has been completed and permission obtained from the Engineer-in-charge.

The contractor shall associate the chemist of paint manufacturers before commencement of work, during and after the completion of work who shall certify the suitability of the surface to receive painting and the paint before use etc.

9.3 Commencing Work:

9.4 Scaffolding:

Wherever scaffolding is necessary, it shall be erected on double supports ties together by horizontal pieces, over which scaffolding planks shall be fixed. No bellies, bamboos or planks shall rest on or touch the surface which is being painted.

Were ladders are used, pieces of old gunny bags shall be ties on their tops to avoid damage or scratches to walls.

For painting of the ceiling, proper stage scaffolding shall be erected.

Painting shall not be started until and unless the Engineer-in-charge has inspected the items of work to be painted, satisfied himself about their proper quality and given his approval to commence the painting work.

Painting, except the priming coat, shall generally be taken in hand after all other builders work, practically finished.

The rooms should be thoroughly swept out entire building cleaned up at least one day in advance of the paint work being started.

9.5 Preparation of Surface:

The surface shall be thoroughly cleaned. All dirt, rust, scales, smoke and grease shall be thoroughly removed before painting is started. Minor patches if any in plastered / form finished surfaces shall be repaired and finished in line and level in C.M/ 1:1 and cracks and crevices shall be filled with approved filler, by the contractor at no extra cost to the Department. The prepared surface shall have received the approval of the Engineer-in-charge after inspection, before painting is commenced.

9.6 Application:

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its containers. When applying also, the paint shall be continuously stirred in the smaller containers so that consistency is kept uniform.

The external surfaces of the buildings under reference including the R.C.C. Jalli, fins and the panels above and the panels above and below the window etc. shall be finished in different colours of approved shade. The contractor will make suitable samples at site for Departments approval before taking up the work in hand and they will be allowed to proceed with the work only after getting Departments approval for the same.

The painting shall be laid on evenly and smoothly by means of crossing and laying off, the later in the direction of the grain in case of wood. The crossing and laying off consists of covering the area with paint, brushing the surface hard for the first time and then brushing alternately in opposite directions two or three time and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying will constitute one coat.

Where so stipulated, the painting shall be done with spraying. Spray machine used may be (a) a high pressure (small air aperture) type or (b) a low pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner. Spraying should be done only when dry condition prevails.

Each coat shall be allowed to dry cut thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation.

Each coat except he last coat, shall be tightly rubbed down with sand paper or fine pumice stone and cleaned of dust before the next coat is laid.

No left over paint shall be put back into the stock tins. When not in use, containers shall be kept properly closed.

The final painted surface shall present a uniform appearance and no streaks, blisters, hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.

In case of cement based paints / primers, the absorbent surfaces shall be evenly damped so as to give even suction. In any weather, freshly painted surfaces shall be kept damp for atleast two days.

In painting doors and windows, the putty around the glass panes must also be painted, but care must be taken to see that no paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out while painting. Prospect covers of electrical switch boxes have to be painted from inside by removing them. Care shall be taken while removing them in position after painting with respective approved paints. In painting steel work, special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

The additional specifications for primer and other coats of paints shall be as in accordance to the detailed specifications under the respective headings.

Any damage caused during painting work to the existing works / surfaces shall be made good by the contractor at his own cost.

9.7 Brushes and Containers:

After work, the brushes shall be completely cleaned off paint and linseed oil by rinsing with turpentine. A brush in which paint has dried up is ruined and shall be kept at a place free from dust. When the paint has been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, so that they are clean and can be used again.

9.8 Measurement :

Painting, unless otherwise stated shall be measured by area in square metre. Length and breadth shall be measured correct upto two places of decimal of a metre.

No deduction shall be made for opening not exceeding 0.05 sqm. and no addition shall be made for painting to the beading, moulding edges, jambs, soffits, sills, architraves etc. of such openings.

In measuring painting, varnishing, oiling etc. of joinery and steel work etc. the coefficient as in the following table shall be used to obtain the areas payable. The co-efficient shall b applied to the areas measured flat and not girthed in all cases.

In case of painting of door shutter with push plates in plastic laminate, deduction will be made for area of such laminations.

9.9 Precautions:

All furniture, lightings, fixture, sanitary, fittings, glazing, floors etc. shall be protected by covering and stains, smears, splashing, if any shall be removed and any damage done shall be made good by the contractor at his cost.

9.10 Rates :

Rates shall include cost of all labour and materials involved on all the operations described above and in the particular specifications given under the several items.

9.11 Painting, Priming coat on Wood, Iron of Plastered Surfaces

9.11.1 Primer

The primer for wood work, iron work or plastered surface shall be as specified in the description of the item. Primer for wood work / Iron & Steel / Plastered / Aluminium surfaces shall be as specified below:

Sl.No.	Surfaces	Primer to be used
a)	Wood work (hard and soft wood)	Pink conforming to IS 3536 – 1966
b)	Resinous wood and ply wood	Aluminium Primer
c)	Iron & Steel, aluminium and galvanized steel Work	Zinc chromate primer conforming to IS104-1962
d)	Plastered surfaces, cement brick work, bestos surfaces for oil bound distemper and paint	Cement primer

The primer shall be ready mixed primer of approved band and manufacture.

10.11.2 Preparation of Surface

10.11.2.1 Wood work:

The wood work to be painted shall be dry and free from moisture.

The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any, shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material with same shade as paint shall be used where so desired by the Engineer-in-charge.

The surface treated for knotting shall be dry before painting is applied. After the priming coat is applied, the holes and indentation on the surface shall be stopped with glaziers putty or wood putty (for specifications for glaziers putty and wood putty – refer as mentioned herein before). Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in the stopping and the latter is therefore liable to crack.

10.11.2.2 Iron and Steel Work:

All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting, shall be removed.
All dust and dirt shall be thoroughly wiped away from the surface.

If the surface is wet, it shall be dried before priming coat is undertaken.

10.11.2.3 Plastered Surface:

The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactory,

painting shall be taken in hand. Before primer is applied, holes and undulations, shall be filled up with plaster of Paris / putty and rubbed smooth.

10.11.3 Application:

The primer shall be applied with brushes, worked well into the surface and spread even and smooth. The painting shall be done by crossing and laying off as described here in before.

10.11.4 Other details:

The specifications for Painting (General) shall hold well so far it is applicable.

10.12 Painting with superior quality and Flat Oil ready mixed paints on new Surface

10.12.1 Paint:

Ready mixed paints shall be of approved brand and manufacture and of the required shades. They shall conform in all respects tot eh relevant IS specifications.

10.12.2 Preparation of Surface

10.12.2.1 Iron and Steel work:

The primer coat shall have dried up completely before painting is started. Rust and scaling shall be carefully removed by scraping or by brushing with steel wire brushes. All dust and dirt shall be carefully and thoroughly wiped away.

10.12.2.2 Plastered Surfaces:

The priming coat shall have dried up completely before painting is started. All dust or dirt that has settled on the priming coat shall be thoroughly wiped before painting is started.

10.12.3 Application:

The specifications mentioned herein before shall hold good as far as applicable. The number of coats to be applied will be as stipulated in the item. The painted surface shall present a uniform appearance and glossy / semi glossy finish, free from streaks, blisters etc.

10.12.4 Other Details:

The specifications for painting (general) specified herein before shall hold good in so far as they are applicable.

10.13 Painting with synthetic enamel / Semi glossy Paint on new work Paint :

Synthetic enamel / semi glossy paint of approved brand and manufacture and required shade shall be used for the top coat and an under coat of shade to match the top coat as recommended by the manufacturer shall be used. The paint shall be conforming to IS : 1932-1964.

10.13.1Preparation of Surface:

This shall be as per painting with superior quality ready mixed paint as mentioned herein before.

10.13.2 Application:

The number of coats including the under coat shall be as stipulated in the item.

10.13.3 Under Coat:

The coat of the specified paint of shade suited to the shade of the top coat shall be applied and allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface free from brush marks and all loose particles shall be dusted off. All the cracks, crevices, roughness etc. will be filled with approved putty as per manufacturers recommendations.

10.13.4 Top coat :

Finishing coats of specified paint of the desired colour and shade shall be applied after the under coat is thoroughly dried. Additional finishing coats shall be applied if found necessary to ensure a proper and uniform semi glossy surface.

10.13.5 Other Details :

The specifications for "Painting (General)" mentioned herein before shall hold good as far as they are applicable.

10.14 Painting with Acrylic Emulsion/Plastic Emulsion Paint

This shall be polyvinyl based Acrylic / plastic emulsion paint of approved manufacture of the required shade conforming to IS 5411-1969.

10.14.1 Primer :

The primer to be sued for the painting with acrylic emulsion on cement concrete surfaces, plastered surfaces, A.C. sheets, timber and metal surfaces, if necessary shall be of approved base and as per recommendations of the manufacturers.

10.14.2 Putty:

Plaster filler to be used for filling up (putting) uneven surfaces, small cracks and holes etc. shall be of approved compound and as per recommendations of the manufacturers. No oil based putty shall be used. The putty should be made from a mixture of whiting and plastic emulsion paint or as per manufacturers recommendations.

10.14.3 Finishing coats:

All the finishing coats shall be of matt finish or any other finish as required by the Engineer-in-charge. The number of finishing coats shall be as specified in the item.

10.14.4 Mode of measurement:

All the measurements for payment shall be taken on net surface area actually painted, unless otherwise specified. Deduction will be made from the areas for fixtures, frills, ventilation, outlets, electrical boxes and such obstructions not painted, if they are individually more than 0.05 sqm.

Acrylic emulsion paint is required to be provided on plastered and concrete surfaces in portions of the building. The Department shall reserve the option to delete or increase quantities in full or part from the scope of contract during progress of work.

All wood surfaces are to be pointed with semi glossy synthetic enamel paint with an approved primer.
All shades and colours of paints shall be subjected to review and prior approval of Engineer-in-charge shall be taken before the application.

10.15 Distempering

10.15.1 Oil Emulsion (oil bound) Distempering / Acrylic Distemper

10.15.1.1 Oil bound distemper:

(IS 428-1969) of approved brand and manufacture, colour and required shade shall be used. The primer where used as on new work shall be cement primer or distemper primer as specified in the item. These shall be of the same manufacture as distemper. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by manufacture. Only s quality of distemper required for days work shall be prepared.

10.15.1.2 Preparation of surfaces :

The surface shall be prepared as described herein before for painting work in so far as it is applicable and approved putty / filler shall be applied to the entire area to get uniform and smooth surface before application of primer.

10.15.1.3 Application :

The cement primer or distemper primer shall be applied by brushing and not by spraying. Hurried priming work shall be avoided, particularly on absorbent surfaces. New plaster patches in old work before applying oil bound distemper primer. The surfaces shall be finished as uniformly as possible leaving no brush marks, priming coat shall be allowed to dry for at least 48 hours before oil bound is temper is applied. Before applying distemper, the surface shall be lightly sand prepared to make it smooth for receiving, the oil bound distemper, taking care not to rub out the priming coat. A time interval of at least 24 hours shall be allowed between consecutive coats to permit the proper drying of the preceding coat. Two or more coats of distemper as are found necessary shall be applied over the priming coat to obtain an even shade.

10.15.1.4 Other details :

The specifications for "Painting (General)" mentioned herein before shall hold good as far as it is applicable.

10.16 Water Proofing Cement based paint

10.16.1 Material :

Cement based paint (IS 5410-1969) of approved manufacture, quality, shade and colour only shall be used. b)

10.16.2 Preparation of surfaces:

The surface shall be thoroughly cleaned off all mortar dropping, dirt, dust, algae, grease and other foreign matter by brushing and washing the surfaces. The surface shall be thoroughly wetted with clean water before the water proof cement paint is applied. The prepared surfaces shall be got approved before painting is commenced.

The water proof cement paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish.

Water proof cement paint shall be mixed with in two stages. The first stage shall comprise of 2 parts of water proof cement paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the water proof cement paint gradually to the water and not vice versa. The second stage shall comprise of adding further one P -107 part of water to

the mix and stirring thoroughly to obtain liquid of workable and uniform consistency. In all cases the manufacturers instruction shall be followed meticulously.

10.16.3 Application:

The solution shall be applied on the clean and wetted surface with brushes spraying machine. The solution shall be kept well stirred during the period of application. To avoid direct heat of the sun during painting, the cement based paint shall be applied on the surfaces already treated with white wash, dry or oil distemper, varnishes, paints etc. it shall not be applied on gypsum, wood and metal surfaces.

10.16.4 Other details:

The specifications for painting (general) mentioned herein before shall hold good as far as they are applicable.

10.17 Mode of measurement for dry distemper, oil bound distemper and water proof cement Paint:

All measurement for payment shall be taken on net surface area actually paint unless otherwise specified and no co-efficient shall be applied for working to areas. Deduction will be made from areas for opening / obstructions not painted, if they are individually more than 0.05 sq.m. Length and breadth shall be taken correct upto two places of decimal of a meter and areas shall be worked out correct upto two places of decimal of a square meter.

Corrugated surfaces shall be measured flat as fixed and the area so measured shall be increased by the following percentage to allow the girthed area a) Corrugate asbestos cement sheets – 20% b) Semi corrugated asbestos cement sheets – 10%. The number of coats of each treatment shall be stated in the schedule of quantities. The whole surface shall be applied with approved putty / filler to get uniform and smooth surface at no extra cost to the Department.

10.18 Rates :

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

Consumption of paint for different Painting items:

Sl. No.	Brief description of painting work	Consumption per 10 sqm. of net area
1	**Oil Bound Distemper on plastered surfaces:**	
a	Cement primer (one coat)	0.91 Litre
b	Two finishing coats	1.60 Kgs.
c	Three finishing coats	2.4 Kgs.
2	**Flat oil paint to plastered surfaces**	

a	Cement primer (one coat)	0.91 Litre
b	Cement primer (two coats)	1.82 Litres
c	Two finish coats	1.72 Litres
3	**Acrylic Emulsion paint**	
a	Cement primer (one coat)	0.91 Litre
b	Cement primer (two coats)	0.87 Litre
c	Two finish coats	1.30 Litres
4	**Cement Paint (old surface)**	
a	Two coats on sand faced plastered surface	4.10 Kgs
b	Two coats on rough cast plastered	7.70 Kgs
5	**Cement paint (old surface)**	
a	Two coats on sand faced plastered surface	4.50 Kgs
b	Two coats on rough cast plastered surface	8.50 Kgs.
6	**Enamel paint to wood / steel**	
a	Wood primer (one coat)	0.90 Litre
b	Steel primer (one coat)	0.75 Litre
c	Two finishing coats on wood	1.40 Litres
d	Two finishing coats on steel	1.35 Litres
7	**Flat oil paint to wood / steel work**	
a	Wood primer (one coat)	0.90 Litre
b	Steel primer (one coat)	0.75 Litre
c	Two finishing coats on wood	1.70 Litres
d	Two finishing coats on steel	1.75 Litres
8	**External painting with flat oil paint**	
a	Cement primer (one coat)	1.00 Litre
b	Two finishing coats	1.74 Litres
9	**Repainting old painted surface**	
a	Two coats of emulsion paint	0.86 Litre
b	Two coats of flat oil paint	1.59 Litres
c	Two coats of enamel paint	1.35 Litres

11. STEEL FABRICATION WORKS

11.1 General

This specification covers the fabrication and transportation to site and erection on prepared foundations. Fabrication, erection and approval shall be in compliance with General Specifications and IS: 800-1984 and Drawings to be supplied to the contractor during execution of the work.

11.2 Scope

The fabrication and erection of the steel work consists ofaccomplishing of all jobs here-in enumerated including providing all labour, tools and plant all materials and consumables such as welding electrodes, bolts and nuts, oxygen and acetylene gases, oils for cleaning, etc. of approved quality as per relevant IS. The work shall be executed according to the drawings, specifications, relevant codes etc. in an expeditious and work man like manner, as detailed in the specifications and the relevant Indian Standard Codes and Standard Practice and to the complete satisfaction of the Institute.

11.3 Materials

11.3.1Rolled Sections

Fabrication steel will generally be of standard quality conforming to IS: 226.

11.3.2Welding Materials

Welding electrodes shall conform to IS: 814. Approval of welding procedures shall be as per IS: 823.

11.3.3Bolts, 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. Washers shall be as per IS: 2016.

11.3.4 Galvanized work

All Galvanized items shall comply with IS: 4736-1986 entirely coated with zinc after fabrication by hot dip process in one operation. The surfaces shall be clear and smooth.

11.4 Material Tests

The contractor shall be required to produce manufacturer’s quality certificate for the materials supplied by the contractor. Notwithstanding the manufacturer’s certificates, the Institute may ask for testing of materials in approved test houses. The test results shall satisfy the requirements of the relevant Indian Standards.

11.5 Fabrication

Fabrication shall be in accordance with IS: 800 section v in addition to the following:

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawings. Any defective materials used shall be replaced by the contractor at his own expense. 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.

11.6 Preparation of Materials

Prior to release for fabrication all rolled sections warped beyond allowable limit shall be pressed or rolled straight and freed from twists, taking care that a uniform pressure is applied.

11.6.1Marking

Marking of members shall be made on horizontal pads of an appropriate racks or supports in order to ensure horizontal and straight placement of such members. Marking accuracy shall be at least +/-1 mm.

11.6.2Cutting

Members shall be cut mechanically (by saw or shear or by oxyacetylene flame).

11.6.3Drilling

Bolts holes shall be drilled.

11.7 Welding procedures

Welding shall be carried out only by fully trained and experienced welders. Before beginning the welding operation each joint shall be checked to ensure that the parts to be welded are clean and root gaps provided as per IS:823., the welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other method. The order and method of welding shall be so that:

No unacceptable deformation appears in the welded parts. Due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses. The defects in welds must be rectified according to IS: 823 and as per instruction of Institute.

11.8 Weld Inspection

The weld seams shall satisfy the following:

- shall correspond to design shapes and dimensions.
- shall not have any defects such as cracks, incomplete Penetration and fusion, under cuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible limits.

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

11.9 Bolting up

Final bolting of the members shall be done after the defects have been rectified and approval of joints obtained. The bolts shall be tightened starting from the centre of joint towards the edge.

11.10 Painting

Painting shall consist of providing one coat of red oxide zinc-chromate primer to steel members before dispatch from shop. Primer coat shall not be applied unless:

- Surface have been wire brushed, cleaned of dust, oil, rust etc.
- Erection gaps between members, spots, which cannot be painted, or where moisture or other aggressive agents may penetrate, have been filled with an approved type of oil and putty.
- The surfaces to be painted are completely dry.
- Members and parts have been inspected and accepted.
- Welds have been accepted.

11.11 Packing, Transportation & Delivery

After final shop acceptance and making, the item shall be packed and loaded for transportation.
Packing must be adequate to protect item against warping during loading and unloading.
Loading and transportation shall be done in compliance with transportation rules, etc.

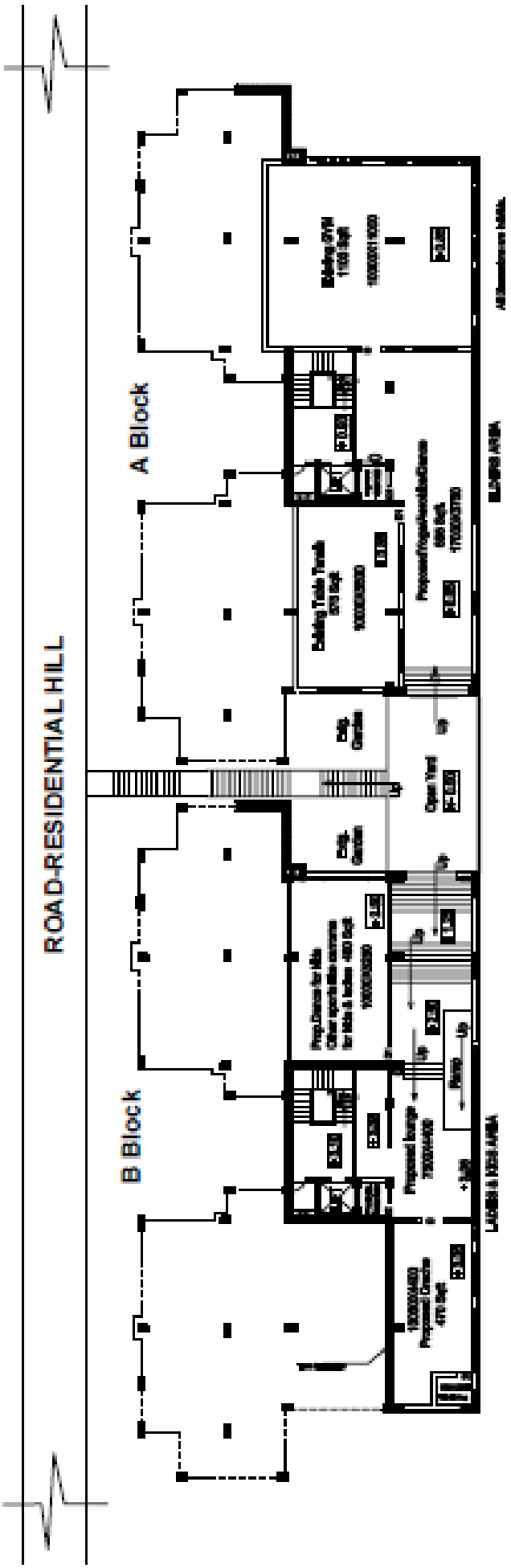
11.12 Field Erection

Erection in general shall be carried out as required and approved by the Institute. Positioning and leveling of the fabricated fencing / rails shall be in accordance with the relevant drawings and to complete satisfaction of the Institute.

VII. LIST OF APPROVED MAKES OF MATERIALS

Sl. No.	Item	Brand/ Make
a	Cement	Ultra Tech/Malabar/ACC/or approved equivalent*
b	Reinforcement Steel	Peekay/TATA/VIZAG/SAIL/ Approved Equivalent*
c	Emulsion, Distemper, Polish, Enamel, Floor Guard Exterior Paints	ASIAN/BERGER/NEROLAC/ICI/ Approved Equivalent*
d	Primer	
e	Putty for Paint	RJ LONDON/BOSNY WALL/BIRLA WHITE
f	White Cement	BIRLA WHITE/JK WHITE/Approved Equivalent*
g	FPS Bricks	Approved Make/Brand*
h	Water-proofing Materials/ Silicon Sealant	Bostik/BASF/GE/Dr. Fixit/Approved Make*
i	Anti-Termite Treatment	PCI/Approved Make*
j	False Ceiling	India Gypsum/Saint – Gobain or Approved Equivalent*
k	Roofing Sheets	TATA/Approved Equivalent*
l	MP Roof Tile (Double Grooved) & Terracota Ceiling Tiles	Commonwealth/Approved Make*
m	CPVC/PVC Pipes	Approved Make*
n	Ceramic/Vitrified Floor & Wall Tiles	Kajaria/Somany/H&R Johnson/Approved Equivalent*
o	MS/GI Steel Sections/GI Welded Mesh	TATA/Jindal/ Approved Equivalent*
p	Sanitary & Plumbing Fittings/fixtures	Hindware/Parryware/Jaquar/ Approved Equivalent*
q	Stainless Steel (SS) Items	TATA/Jindal/ Salem/Approved Equivalent*
r	Glass	Saint – Gobain / Modi /Asahi or Approved Equivalent*
s	Hardware Fittings/Fixtures	Hettich/Ebco/Closma/Dorma or Approved Equivalent*
t	Aluminium Sections/ ACP Sheets	Hindalco/Jindal/Approved Equivalent*
(* to be approved by the Engineer-in-Charge)		

VIII. DRAWINGS



LAYOUT SKETCH OF RECREATION CENTRE
at Basement Floor of Faculty Apartment # 2