Centre for Development of Advanced Computing

Ministry of Electronics & Information Technology
Government of India
Innovation Park, Panchavati, Pashan Road,
Pune - 411008

Public Tender for appointment of Contractor for constructing a Compound Wall

Tender No.: CDACP/Compound Wall/2020/302, dated 22nd June, 2020

TENDER ACTIVITY SCHEDULE

Name of the Institute	Centre for Development of Advanced Computing, Innovation Park, Panchavati, Pashan Road, PUNE 411008.
Site Address where compound wall is to be erected	Centre For Development of Advanced Computing, Sector 12 of PCNTDA, Village Bhosari, Tal. Haveli, Pune
Date of Release of Tender	22nd June, 2020
Last Date for sending pre-bid queries	29th June, 2020, 1700 Hrs
Site Visit	From 23nd June, 2020 to 26th June, 2020 and 29th June, 2020 between 1000 Hrs to 1700 Hrs.
Date of Pre-bid Meeting and venue	30th June, 2020, 1130 Hrs at C-DAC, Pashan Road, Pune - 4110081
Last date of submission of bids	20th July, 2020, 1500 Hrs
Date of opening of Technical bids	21st July, 2020, 1500 Hrs
Place of opening of technical bids	C-DAC, Pune 411008.
Bank Details for submitting Tender Fee and EMD	Bank Name: Bank of India Pashan Road Branch, Pune- 411008, Tel: +91-20-25697247 IFSC CODE : BKID0000516 Type of Account: SAVING ACCOUNT Account Number: 051610110002660

Instructions for Online Bid Submission:

The bidders are required to submit soft copies of their bids electronically on the CPP Portal, using valid Digital Signature Certificates.

REGISTRATION:

- Bidders are required to enroll on the e-Procurement module of the Central Public Procurement Portal (url: https://eprocure.gov.in/eprocure/app.
- As part of the enrolment process, the bidders will be required to choose a unique username and assign a password for their accounts.
- Bidders are advised to register their valid email address and mobile numbers as part of the registration process. These would be used for any communication from the CPP Portal.
- Upon enrolment, the bidders will be required to register their valid Digital Signature Certificate (Class II or Class III Certificates with signing key usage) issued by any Certifying Authority recognized by CCA India with their profile.
- Only one valid DSC should be registered by a bidder. Please note that the bidders are responsible to ensure that they do not lend their DSCs to others, which may lead to misuse.
- Bidder then can log into the site through the secured login by entering their user ID / password and the password of the DSC / e-Token.

PREPARATION OF BIDS:

- Bidder should take into account any corrigendum published on the tender document before submitting their bids.
- Please go through the tender advertisement and the tender document carefully to understand the documents required to be submitted as part of the bid. Please note the number of covers in which the bid documents have to be submitted, the number of documents – including the names and content of each of the document that need to be submitted. Any deviations from these may lead to rejection of the bid.
- Bidder, in advance, should get ready the bid documents to be submitted as indicated in the tender document / schedule and generally, they can be in PDF / XLS / RAR / DWF formats. Bid documents may be scanned with 100dpi with black and white option.
- To avoid the time and effort required in uploading the same set of standard documents which are required to be submitted as a part of every bid, a provision of uploading such standard documents (e.g. PAN card copy, annual reports, auditor certificates etc.) has been provided to the bidders. Bidders can use `My Space' area available to them to upload such documents. These documents may be directly submitted from the `My Space' area while submitting a bid, and need not be uploaded repeatedly. This will lead to a reduction in the time required for bid submission process.

SUBMISSION OF BIDS:

- Bidder should log into the site well in advance for bid submission so that he/she upload the bid in time i.e. on or before the bid submission time. Bidder will be responsible for any delay due to other issues.
- The bidder has to digitally sign and upload the required bid documents one by one as indicated in the tender document.
- The server time (which is displayed on the bidders' dashboard) will be considered as the standard time for referencing the deadlines for submission of the bids by the bidders, opening of bids etc. The bidders should follow this time during bid submission,
- The uploaded tender documents become readable only after the tender opening by the authorized bid openers.

- Upon the successful and timely submission of bids, the portal will give a successful bid submission message and a bid summary will be displayed with the bid no. and the date & time of submission of the bid with all other relevant details.

ASSISTANCE TO BIDDERS:

Any query relating to the process of online bid submission or queries relating to CPP Portal in general may be directed to the 24*7 CPP Portal Helpdesk on :- 0120-4200 462, 0120-4001 002, 0120-4001 005, 0120-6277 787,
e-mail for Technical - support-eproc@nic.in.

SECTION I: INVITATION FOR BIDS (IFB)

1. Introduction

Centre for Development of Advanced Computing (C-DAC) is a Scientific Society of The Ministry of Electronics & Information Technology Govt. of India.

C-DAC owns about 40,000 sq. mtr. of open land within PCMC area. It is planned to erect a compound wall surrounding this land. The details of the nature and specifications required for this wall are given in Section – IV of this document.

C-DAC invites proposals from the eligible contractors desirous to undertake this activity.

The eligibility criteria, scope of work/ services and other terms and conditions applicable for this work are as stipulated in this document.

2. Contact information

Materials Management Group (MMG)
Centre for Development of Advanced Computing
Innovation Park, Panchavati,
Pashan Road,
Pune - 411008
Tel No.: +91-20–25503673
E-mail: mmg@cdac.in

3. Two e-bids System:

The two e-bids system will be followed for this tender. In this system, bidder must submit their offer - online in separate packets as explained below:

Online – e-Packet No. 1: "Technical e-Bid" shall contain following documents in .pdf format only**:**

a. Covering letter, as per **Annexure – A.**
b. Authority letter, as per **Annexure – B.**
c. Scanned copy of Demand Draft /e-payment receipt towards tender fee of Rs. 1000/- (Rupees One Thousand Only) drawn in favour of C-DAC payable at Pune. The original DD must be submitted physically at the place of Opening of the Tender on or before the Due Date & Time of the Tender.
d. Scanned copy of Demand draft/e-payment receipt towards Earnest Money Deposit as per para 8, Section – II. The original Demand Draft must be submitted physically at the place of Opening of the Tender on or before the Due Date & Time of the Tender Submission. Alternatively, the bidder may submit declaration as per **Annexure – C.**
e. A copy of Certificate of Incorporation, Partnership Deed / Memorandum and Articles of Association / any other equivalent document showing date and place of incorporation, as applicable of the bidder.
f. Copies of PAN and GST registration certificates.
g. The copies of Profit and Loss Account for the years 2016-2017, 2017-2018 and 2018-2019 **OR** a certificate from a Chartered Accountant certifying the financial turn over for the years 2016-2017, 2017-2018 and 2018-2019.
h. The copies of contracts in support of eligibility criterion stipulated at para 4(b) Section II of this document.
i. Documents necessary in support of eligibility criteria (para 4, Section – II).

Note: C-DAC reserves the right to reject the bid if any of the above listed documents is not submitted.

On-line e-Packet 2: "Commercial eBid " shall contain: (.xls format only)

j. The Commercial e-Bid completed in all respects as per format given in Section – V of this document.

4. *Pre-Bid Meeting:*
A pre-bid meeting will be arranged as per schedule given on page No 1, to sort out the queries –if any raised by the bidders. The answers to queries and coeeigenda- if any will be uploaded on e-procurement portal.
The bidders are requested to send their queries on e-mail, prior to pre-bid meeting. The queries sent after pre-bid meeting will not be entertained.

5. *Last Date of uploading of e-bids and opening of the Technical ebids – Online.*
Last date (DUE DATE) for uploading of e-bids through: www.eprocure.gov.in/eprocure/app - against the tender id, as per the `Tender Schedule' above.
Technical e-bids will be opened `Online' through www.eprocure.gov.in/eprocure/app against the tender id, as per `Tender Schedule'
The e-bids must be submitted on-line. The Tender Fees & EMD must be submitted/deposited in person or through post/ courier (C-DAC shall not be responsible for any postal delays or any other reason for not submitting the tender fees & EMD etc. in the specified time and resulting in disqualification / rejection of any bid) **so as to reach on or before the due date and time of the uploading of the tender.** The representatives (maximum two) of bidders are welcome to attend the opening of the technical bids.
In case bidder requires any clarifications / information, they may contact C-DAC address given in `Tender Schedule'
Note: Please do not put "Commercial e-Bid" (prices quoted) in the technical bid packet. If the price quoted is submitted / leaked with technical e-bid the tender will be rejected at the sole discretion of C-DAC.

6. *Opening of commercial ebids*
Commercial e-bids of the qualified bidders only will be opened in the presence of the bidders or their authorized representative, who choose to attend, at the time, place and date to be informed later.
The authorized representative of bidders, present at the time of opening of the e-bids shall be required to sign an attendance register as a proof of having attended the bid opening.
The bidder's name, bid prices summary and other appropriate details will be displayed at the time of the opening of the commercial e-bids.

(END OF SECTION I)

SECTION II: INSTRUCTIONS TO BIDDERS (ITB)

1. *Time period for completion of works:*
   The selected contractor should commence the construction work within 15 days of receipt of works order and complete the work within 120 days from the date of receipt of works order.

2. *Locations of site*
   Centre for Development of Advanced Computing (C-DAC),
   Sector 12 of PCNTDA, Village Bhosari, Tal. Haveli, Pune

3. *Site Visit*
The contractors can visit the site directly of their own. If they require any assistance/information pertaining to site or have any technical queries, they may contact :
Shri. Satyabrata Mishra
Landline no.020-25503-694

4. *Eligibility Criteria:*

a) The contractor must be a **registered Indian entity** having valid registration for undertaking similar construction activities.

b) The firm should have **average annual turnover** for last three financial years is equal or more than 135 lakhs.

c) The bidder must have successfully **completed similar works** during last 5 years ending last day of month previous to the one in which applications are invited should be either of the following: -

1. Three similar completed works costing not less than the amount equal to 55 Lakhs.

or

2. Two similar completed works costing not less than the amount equal to 70 Lakhs.

or

3. One similar completed works costing not less than the amount equal to 110 Lakhs.

("Similar work means **Compound wall works/Civil Work involving RCC and Brick work**" should be clearly defined. Documentary evidence for similar experience is to be furnished of completed works along with tender.)

d) The bidder must have **shown profit** in their financial audited balance sheet for **last three years**. The copies of the same are to be attached with the offer.

e) The contractor **must not be black listed / debarred** from bidding by any Government Department, PSU or Autonomous institution, as on date of submission of bids.

Note:

All the relevant documents in support of eligibility criteria as stipulated above must be submitted along with the Technical bid.

In addition to above, the criteria regarding satisfactory performance of works ,personnel , establishment , plant , equipment etc. may be incorporated according to the requirement of the Project.

C-DAC reserves the right to award/ reject the proposal of any particular bidder without assigning any reason thereof.

5. *Amendment to Tender Document*

At any time prior to the deadline for submission of bids, C-DAC may, for any reason, whether on its own initiative or in response to the clarification request by a prospective bidder, modify this Tender document. The modifications could be pertaining to

a. Quantum of work
b. Nature of work
c. Quantum of services
d. Nature of services
e. Commercial terms and conditions.

The amendments, if any, will be notified by publishing a corrigendum and such amendments/ modifications will be binding on bidders.

C-DAC at its discretion may extend the deadline for the submission of bids during the bidding period, in order to give prospective bidders time for preparing and submission of bids.

6 **Preparation of Bids**

Bidder should avoid, as far as possible, corrections, overwriting, erasures or postscripts in the bid documents. In case however, any corrections, alterations, changes, erasures, amendments and/or additions have to be made in the bids, they should be supported by dated signatures of the same authorized person signing the bid documents.

7. Earnest Money Deposit (EMD)

The technical bid must be accompanied by Earnest Money Deposit of **Rs. 2,70,000/- (Rs. Two Lakh seventy thousand only)** in the form of Demand Draft or Bank Guarantee from a Nationalized Bank, in favour of C-DAC. The EMD can also be submitted by electronic transfer as per details given in Tender Activity Schedule(page 1). Bids submitted without EMD will stand rejected. No interest shall be payable on EMD.

Alternately, the bidder may choose to submit EMD / bid security declaration, as given in **Annexure-C**, subject to the conditions stipulated therein.

The bidders may claim exemption from submission of EMD as per the provisions of Rule 157 of General Financial Rules (GFR) in force. The bidder must submit a valid document in support of their claim for such exemption.

The EMD will be returned to the bidder(s) whose offer is not accepted by C-DAC, within 15 days from the date of opening of commercial bids. In case of the bidder(s) whose offer is accepted the EMD will be returned on completion of defect liability period. However if the return of EMD is delayed for any reason, no interest/ penalty shall be payable to the bidder.

The EMD shall be forfeited if the bidder withdraws the bid during the period of bid validity period specified in the tender.

8. Period of validity of bids

Bids shall be valid for **minimum 90** days from the date of submission. A bid valid for a shorter period shall stand rejected.

C-DAC may ask for the bidder's consent to extend the period of validity. Such request and the response shall be made in writing only. The bidder is free not to accept such request without forfeiting the EMD. A bidder agreeing to the request for extension will not be permitted to modify his bid.

9. *Submission of Bids*

The bid should be neatly arranged, pages numbered and secured properly. Each page of the bid should be signed by the authorized representative. They should not contain any terms and conditions, printed or otherwise, which are not applicable to the bid. The conditional bid will be summarily rejected. Insertions, postscripts, additions and alterations shall not be recognized, unless confirmed by bidder's signature.

10. *Deadline for Submission of Bids*

a. Bids must be received by C-DAC before the due date and time at the address specified in the tender document. In the event of the specified date for the submission of bids being declared as a holiday for C-DAC, the bid-closing deadline will stand extended to the next working day up to the same time.
b. C-DAC may extend this deadline for submission of bids by amending the bid documents and the same shall be suitably notified in the media.

11. *Late Bids*

Any bid inadvertently received by C-DAC after the deadline for submission of bids, will not be accepted and returned unopened to the bidder.

12. Opening of Bids

a. The technical bids will be evaluated on the basis of eligibility criteria, the contents of the bids and credentials of the bidder, to shortlist the eligible bidders. The commercial bids of only the eligible bidders shall be opened.
b. During the evaluation process, C-DAC may seek clarifications from the bidder, if required. The bidder may submit clarifications as required and / or submit the documents, catalogs, literature, drawings, layouts etc in response to the clarifications.
c. The commercial bids cannot be changed once submitted.
d. The eligible bidders will be informed about the date and time of the opening of the commercial bid.

13. Comparison of Bids and Award of Contract

a. Commercial bids of only those bidders will be opened who are found to be substantially responsive.
b. The contract shall be awarded to the bidder quoting the lowest price including GST.
c. In case of discrepancy between words and figures, calculation errors, discrepancy etc, the rates/ prices/ amounts that are lower will be taken as final.

14. C-DAC's Right to amend / cancel

a. If, for any unforeseen reasons, C-DAC is required to change/reduce the scope of construction work or services, this change shall be acceptable to the bidder without change in the unit price quoted. However, the reduction in scope will not be beyond 25 % of the original quantities mentioned in Schedule of Work & Services.
b. C-DAC reserves the right to cancel this tender without assigning any reasons there for.
c. C-DAC reserves the right to reject the bid submitted by any of the bidder, without assigning any reasons there for.

15. *Corrupt or Fraudulent Practices***.**

a. It is expected that the bidders who wish to bid for this project have highest standards of ethics.

b. C-DAC will reject bid if it is revealed that the bidder has engaged in corrupt and /or fraudulent practices while competing for this contract;

c. C-DAC may also declare a bidder ineligible, either indefinitely or for a stated duration, for participating in C-DAC's tender process, if it is revealed that the bidder has engaged in corrupt and /or fraudulent practices while competing for this contract

16. *Interpretation of the clauses in the Tender Document / Contract Document*

a. In case of any ambiguity/ dispute in the interpretation of any of the clauses in this tender document, interpretation of Director General, C-DAC shall be final and binding on all parties.

(END OF SECTION II)

SECTION III: SPECIAL CONDITIONS OF CONTRACT (SCC)

1. *Prices*

1.1 The price quoted shall be considered firm till defect liability period is over and no price escalation will be permitted.

1.2 The prices quoted must be inclusive of all incidental charges, if any, till they are delivered and installed at site.

1.3 The bid should mention clearly the taxes, duties, statutory levies etc applicable as on date of preparation of bid. In case of change in statutory tax structure, the taxes & duties, as applicable on date of execution of work, shall be paid.

1.4 If not quoted separately, it will be assumed that the prices quoted are inclusive of all applicable taxes, duties, levies etc

1.5 No concessional tax form (C/D) or any tax /duty exemption certificate will be given by C-DAC.

2. *Security Deposit:*

The successful bidder will be required to furnish the Security Deposit @ 5 % of the order value, within 10 days of receipt of order. The security deposit can be submitted in the form of Demand Draft or Bank Guarantee in favour of C-DAC, Pune. The Security Deposit will be returned to the contractor on successful completion of construction work.

3. *Payments:*

C-DAC shall give mobilization advance of 10% of the amount quoted by the selected agency against submission of advance bank guarantee of the equal amount. This bank guarantee shall be as per the format given in **Annexure- D** of this document.

On commencement of work, the Contractor shall submit running account bills towards the work completed, amounting to at least Rs 30.0 Lakh, along with all the supporting bill of quantities, measurement sheets, drawings, vouchers, documents, reports etc.

This bill will be verified by the competent authority of the agency for quantity and quality of the work completed. Each running account bill shall be supported by the technical inspection report, measurement sheets etc. The running account bill must be certified for payment by the competent authority of the agency.

C-DAC shall retain 5 % amount of each of the approved bill as retention amount /performance security. The retained amount will be settled on completion of defect liability period.

C-DAC shall deduct appropriate tax at source as applicable from each bill payable.

C-DAC reserves the rights to have the work and/ or services inspected and certified independently by third party agency appointed by C-DAC.

C-DAC shall release the payment within 10 working days of submission of the RA bills.

4. *Penalty for delayed Deliveries / Services*

In case of delay in completion of work beyond schedule of the work, a penalty @ 0.5 % of order value, per week or part thereof will be levied subject to a maximum, of 5% of the total order value.

However if the delay is beyond 5 weeks C-DAC reserves the right to terminate the contract.

Delay in completion of project if any attributed to force majeure situation or attributed to C-DAC will not be considered for computing the penalty amount.

5. *Defects Liability Period*

The expression "Defects Liability Period" shall mean the period of twelve (12) months, calculated from the date of obtaining of completion/ occupancy certificate for entire building, from the competent authority.

During the Defects Liability Period, the Contractor shall finish the work, if any, outstanding at the date of Substantial Completion, and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by C-DAC during the Defects Liability Period and within fourteen (14) days after its expiration, as a result of an inspection made by or on behalf of C-DAC prior to expiration of the Defects Liability Period.

*6. Termination***:**

If, in view of C-DAC, any of the contractual activity is delayed by the selected Contractor or any under or non performance is observed, C-DAC will notify the Contractor seeking to comply with delay/ under/non performance within 10 days. The agency should comply with the requirements notified by C-DAC within time limit given. In case, the agency fails to comply with the said requirements, C-DAC may terminate/cancel the contract by giving one month's notice, without assigning any reason. Bidders/suppliers/vendors agree and accept that they shall be liable to pay damages claimed by C-DAC, in the event of termination/breach of terms of this tender/ contract etc. Selected agency may terminate the contract by at least 30 days' written notice, only in the event of nonpayment of undisputed invoices. Except this situation, suppliers/vendors shall not have right of termination.

7. *Indemnity:*

The successful bidder shall indemnify, protect and save C-DAC from/against any claims, losses, costs, damages, expenses, action suits and other proceeding, resulting from/arising out of infringement of any Law /Rule by the bidder and end user, pertaining to mobile network services provided by the service provider

8. *Limitation of Liability:*

The liability of the Contractor arising out of breach of any terms/conditions of the order and addendums/amendments thereto, misconduct, wilful default will be limited to the total contract value.

However, liability of the Contractor in case of death, injury, damage caused to the personnel/property due to/arising out of/incidental to any act/omission/default/deficiency of supplier, will be at actuals.

In no event shall Party, its officers, directors, or employees be liable for any form of incidental, consequential, indirect, special or punitive damages of any kind

9. *Jurisdiction:*

The disputes, legal matters, court matters, if any shall be subject to Pune jurisdiction only.

10. *Force Majeure:*

C-DAC may consider relaxing the penalty and delivery requirements, as specified in this document, if and to the extent that, the delay in performance or other failure to perform its

obligations under the contract is the result of an Force Majeure. Force Majeure is defined as an event of effect that cannot reasonably be anticipated such as acts of God (like earthquakes, floods, storms etc.), acts of states, the direct and indirect consequences of wars (declared or undeclared), hostilities, national emergencies, civil commotion and strikes at premises of the selected agency.

In the event of and as soon as possible after the occurrence of any cause constituting force majeure, the Contractor shall give notice and full particulars in writing to the UNDP and to the Engineer of such force majeure if the Contractor is thereby rendered unable, wholly or in part, to perform its obligations and meet its responsibilities under this Contract.

11. *Arbitration:*

All disputes of any kind arising pertaining to the contract executed with the agency shall be referred by either party after issuance of 30 days notice in writing to the other party clearly mentioning the nature of dispute to a single arbitrator acceptable to both the parties. The venue for arbitration shall be Pune.

(End of Section – III)

Section IV

Schedule of Work & Services

The selected agency shall carryout all the works and provide services as required for completing the compound wall. Prospective bidders are expected to understand the requirements of C-DAC, terms and conditions of this tender and satisfy themselves fully with all aspects of work and site conditions, local environment, functional and statutory requirements for such construction work.

The Technical Specifications of the proposed compound wall are as follows:

TECHNICAL SPECIFICATION

Section No	**Items**
1.	General Rules
2.	List of Indian Standards
3.	Earthwork Excavation
4.	Concrete Works
5.	Brick Work
6.	Stone Masonry
7.	Steel, Iron Works
8.	Plastering and Pointing
9.	White Wash, Colour Wash and Distempering
10.	Painting
11.	List of Approved Materials
12.	List Of Mandatory Tests
13.	List Of Mandatory Field checks

SECTION -1

GENERAL RULES

1.1 Interpretation:

The Engineer in-charge shall be the sole deciding authority as to the meaning, interpretation and implication of various provisions of the specifications. His decision in writing shall be final and binding on all concerned.

1.2 Definitions:

The following terms and expression in the specification shall have the meaning and implication hereby assigned to them unless mentioned otherwise elsewhere:

(a) Best	With reference to quality of material and workmanship,the standard required shall be specified in preference to the expression "Best". The word "Best" when used shall mean that, in the opinion of the EIC there is no superior material / article and workmanship obtainable in the market and trade respectively
(b) Local	The word "Local" when used with reference to material / article shall mean the best (at the direction of EIC.) of its kind available and used in the locality (i.e.within a distance of 40km from the-boundary of the site of work, unless specified to the contrary in the tender Documents)
(c) Site	The land(s) and / or other place(s) on, in, into or through which work is to executed under the contract, or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.
(d) Contractor	The individual or Firm or company whether incorporated or not, undertaking the works and shall include the legal representative of such individual or the person comprising such firm or company, or the successor of such individual or firm or company and the permitted assign of such individual or firm or company.
(e) Approved / Directed	The approval or direction of the EIC or person deputed by him for the particular purpose.
(f) Indicated / As Indicated	As shown in drawings, specified in the BOQ, Technical Specifications, and Contract Conditions or deviation orders.
(g) Specially Ordered	Separately ordered in writing for the particular item(s) only in addition to the usual works, Orders, Requisition, etc.
(h) IS	The specifications and codes of Practice issued by the Indian Standard Institution (BIS)
(i) Month	A calendar Month
(j) E.I.C	The Engineer- in -Charge appointed by CDAC or his nominee(s) to supervise the works or part of the works.

1.3 **Abbreviation -**The following abbreviation, wherever they appear in the Specification shall have the meaning or implication hereby assigned to them:

Average	avg
Centirnetre	cm
Cubic	cu
Cubic Centimetre	Cm^3/cu cm
Cubic Metre	m^3/cum
Diameter	dia
etcetera	etc.
exceeding	exc.
Figure	Fig.
for example	e.g.

gram	g,gm
Kilogram	kg
Kilolitre	kl
Kilometer	km
Labour only	L.O.
Litre	I
Material and Labour	M&L
Metre	m
namely	viz.
Plain Cement Concrete	PCC
Polyvinyl-Chloride	PVC
Running Metre	Rmt,RM
Reinforced Cement Concrete	RCC
Rupee/Rupees	Re/Rs
Square metre	m2/sqm
Supply and fix or Supplied and fixed	S&F
that is	i.e.
Engineer In Charge	EIC

1.4 Specification of materials -Indian Standard Specification:

1.4.1 In the specification of materials which have been specified to conform to Indian standard have been partially reproduced from the relevant standard. These partial reproduction have been made to only' indicate specific requirements where alternative choice are mentioned in the IS and to bring out some of the quality characteristics for ready reference. The specification in the relevant Standard shall however be followed unless it is specifically mentioned that a particular requirement of the Relevant Standard is' dispensed with or is varied and the extent thereof is mentioned

1.4.2 Where any IS referred to in the Specification is amended, or revised, superseded or is merged into another IS or if split into more than one standard, either the IS referred to in the specification or any of the subsequently amended / revised / superceded / merged / split / is as applicable may be followed as alternative specification. Where any particular alternative out of two or more alternatives given in an IS is adapted and this alternative also figures in the amended / revised / merged split up IS, the alternative specified in the specification shall be followed.

1.4.3 For a composite item consisting of several items, each item will follow the relevant specification for that item and each operation will be carried out as per the relevant specification for that part of the item.

1.5 Materials to be approved

1.5.1 All materials to be provided by the Contractors shall be brand new and in accordance with the specifications. Where specifications are not given, the materials shall confirm to the quality as approved by the EIC. Samples of materials, fittings etc., shall be submitted by the Contractor for the approval of EIC before bulk supplies are brought on the site of works. Cement, Reinforcement / Structural steel shall be from a reputed manufacturer and should confirm to the relevant IS Codes. The contractor shall provide purchase vouchers from the reputed manufacturers / Suppliers.

1.5.2 The contractor shall satisfy the EIC that the materials provided by him confirm to the requirement of the specifications and are as per the sample approved by the EIC. Where materials are specified to comply with the requirements of an IS Specifications, the. Contractor shall if required, furnish the manufacturer's certificate that the materials satisfy the requirements of the IS.

1.5.3 The contractor shall supply samples of materials allowing ample time for the testing and approval in order that if the samples supplied fail to satisfy the specified requirements there will be time to receive and test other samples before materials are required to be used. '

1.5.4 Materials rejected by the EIC shall be removed forthwith by the contractor off the premises.

1.6 Testing of Materials

1.6.1 Methods of Test -When required by the EIC, test on materials shall be carried out in accordance with standard methods of tests issued by the Indian Standards Institution. Laboratory tests shall be conducted by recognised laboratories acceptable to the EIC.

1.6.2 Samples of testing: -The Contractor shall supply free of charge samples for testing of any material proposed to be used in the works. All expenditure required to be incurred for taking the samples packaging, conveyance etc., shall be borne by the Contractor.

1.6.3 **Cost of Testing: -**The cost of testing shall be borne by the contractor.

1.7 Storage of Materials

1.7.1 Materials shall be stored at site in such a way as to prevent deterioration or the loss or impairment of their structural and other essential properties. Materials which normally deteriorate during storage shall be kept constantly moving, by replacing old materials with fresh stocks. Freshly arrived shall never be placed over materials which had arrived earlier.

1.7.2 **Protection against Atmospheric Agencies**
Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric effects due to rain sun or wind or moisture to avoid deterioration.

1.7.3 **Protection against Fire and other Hazards**
Materials like Timber, Paints etc. shall be stored at site in such a way that there may not be any possibility of fire hazards. Inflammable materials and explosive shall be stored in accordance with the relevant regulation and rules so as to ensure the desired safety during storage.

1.8. Unit weight of Building Materials
The unit weight of materials, unless otherwise indicated in the relevant Indian Standards for the materials, shall be reckoned as given in IS 1911-1967 schedule of unit weight of Building materials.

1.9 Workmanship-IS Codes of Practice and Safety Codes

1.9.1 The work shall be carried out as described in the specification and IS codes of Practices and safety codes where referred to in the Specification and the provisions of the relevant IS code of Practice or Safety Code, Provision in the Specification shall take precedence.

1.9.2 Where IS Code of Practice and Safety Codes have not been referred to in the Specification, the relevant IS Standard may be followed as a guide for standard Practice.

1.10 Methods of Construction, Tools and Plants.
The contractor shall employ only such methods of construction, tools and plant as are appropriate for the type of work.

1.11 Water
Water used whether in the process of making materials or in the execution of the work or for cleaning, etc. shall be clean and fresh, and free from deleterious matter and shall be obtained from an approved source.

1.12 Directions
Instructions shall be given in writing for all approved directions; no verbal instruction shall be deemed to be binding nor shall such work be measured /paid.

1.13 Alternatives
Where alternatives materials, process, etc. are specified in the specification, the discretion shall rest with the EIC.

1.14 Safety in Construction

The contractor shall take all necessary precaution and measures listed in the IS Safety Codes, in the MES Safety Code or as directed by the EIC to ensure the safety of works/construction and of workmen and shall be responsible for the same .The provision of the following IS Safety Codes shall generally apply.

IS No.	**Subject**
3696(Part 1)-1987	Safety Code for scaffolds and ladders -Part I, Scaffolds
3696{Part 11)-1966	Ditto-Part II, Ladders
4014 (part 11)-1967	Code for Practice for steel tubular scaffolding; Part II, safety regulation scaffolding
4130-1976	Safety Code for demolition of buildings (first revision)
5121-1969	Safety Code for piling and other deep foundation
5916-1970	Safety Code for construction involving use of hot bituminous materials.
7293-1974	Safety Code for working with construction machinery.
7969-1975	Safety Code for storage and handling of building materials

1.15 Method of Measurement:

For method of measurement MES SSR and I.S-1200, Specification for Method of measurement of Building and Civil Engineering Works shall be followed.

1.16 Theoretical Consumption of Materials:

For theoretical consumption of materials like cement aggregates, etc., IS 10067, Specification for material constants and Building works shall be followed

SECTION -2

LIST OF INDIAN STANDARDS

The below given list is only indicative.
Following is the consolidated list of Indian Standards referred to under the respective section in these specifications. In case any IS Code is not referred to here the code applicable to the said material /workmanship shall apply irrespective of that indicated in the Techinal Specification or not.

IS Code.	Subject
5- 2004	Colours for ready mixed paint and enamels (Fifth revision)
44- 1991	Specification for Iron oxide pigments for paints (Second revision)
63- 1978	Specification for whiting for paints and putty (Third revision)
104- 1979	Ready mixed paint, brushing, zinc chrome, priming (Second revision)
109- 1968	Ready mixed paint, brushing, priming, plaster to IS Colour No 361, Light stone and No 631 Light grey (First revision)
277- 2003	Specification for Galvanised Steel sheet (plain and corrugated)(Sixth revision)
278- 2001	Specification for Galvanised Steel Barbed wire for fencing (Third revision)
280-2006	Specification for mild steel wire for general engineering purposes(Fourth revision).
427- 2005	Specification for distemper dry, colour as required (Second revision)
432- (Part I) 1982	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement, Part I, Mild steel and medium tensile steel bars (Third revision)
432- (Part 2) 1982	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement Part-II, Hard drawn steel wire (Third revision)
455- 1989	Specification for Portland Slag Cement (Fourth Revision)
456- 2000	Plain and Reinforced Concrete – Code of Practice (Third Revision)
516-1959	Method of test for Strength of concrete.
524-1983	Varnish, finishing, exterior synthetic air drying (Second revision)
650-1991	Specification for Standard sand for testing of cement.
808- 1989	Dimensions for hot rolled steel beam, column, channel and angle sections. (Third revision)
811- 1987	Cold formed light gauge structural steel section. (Revised)
1077- 1992	Common Burnt Clay Building Bricks – Specification (Fifth Revision)
1199-1959	Method of Sampling and Analysis of Concrete.
1200	Method of Measurement

SECTION -3

EARTH WORK EXCAVATION

Indian Standard

The following IS with latest revision apply to this Section:

I.S.NO	Subject
2720 PtVII-1980	Method of test for soils. Part VII-Determination of Water Content, dry density relation using. light compaction (second revision)
3764-1966	Safety code for excavation work including Amendment No-1 of March 1976
4081-1986	Safety code for blasting and related drilling operations (first revision)
6313(part-I)-1981	Anti-Termite treatment in Building Constructional Measures (first revision).
6313(part-ll)-1981	Anti-Termite Measures in Building Pre-Constructional Chemical treatment measures(first revision)

3.1 Authority of Classification :
The Classification of soils shall be decided by the consultant and Engineer – in – Charge and this decision shall be final and binding on the contractor. Merely the use of Explosives in excavation shall not be considered as a reason to classify hard rock , unless blasting is clearly authorized by the Engineer – in – Charge

3.2 Types of Excavation

3.2.1 Rough Excavation:
Excavation not requiring dressing of sides and bottom and reduction to exact levels such as winning earth from borrow pits; hillside cutting etc., shall be described as 'rough excavation' .

3.2.2 **Surface Excavation:**
Excavation exceeding 1.5 m in width as well as 10 sq. m area on plan; but not exceeding 30 cm in depth shall be described as 'surface excavation'.

3.2.3 **Excavation over Areas:**
Excavation exceeding 1.5 m in width as well as 10 sq. m area on plan and exceeding 30 cm in depth shall be described as 'excavation over areas.

3.2.4 **Surface Dressing**:
Trimming of natural ground, rough excavated surface and filled up area to remove vegetation and or small inequalities not exceeding 15 cm deep shall be described as surface dressing'.

3.3 Antiquities and Useful Materials:
Any finds such as relics or antiquity, coins, fossils or other articles of value shall be delivered to the EIC and shall be the property of the CDAC

3.3.1 Any Useful Material obtained from the excavation shall be stacked separately in the regular stacks as directed by the EIC and shall remain the property of the CDAC. The decision of the EIC as to what is useful and what is useless shall be final and binding.

3.4 Inspection of site:
The contractor shall be responsible' to inspect the site of work and ascertain the nature of the ground in which the excavation is to be carried out.

3.5 Site Clearance:
Before the work is started, the area coming under cutting and filling shall be cleared of shrubs vegetation, grass, bush weed, trees and' saplings not exceeding 30 cm in girth, measured at a height of I m above the ground level Useful materials shall be stacked and rubbish / useless materials disposed off at the place directed by the Engineer – in –Charge. Roots of trees and saplings shall be removed as described under felling of trees and the hollows filled up with earth, levelled and rammed.

3.6 Felling of Trees:

Trees exceeding 30 cm in girth when measured at the height of 1m above ground level and which are to be cut shall be so approved in writing by the EIC and marked at site. Felling of trees shall include digging out roots up to 60 cm below the ground level or 50 cm below the formation level, whichever is lower. All holes and hollows, formed in the ground by, digging of roots shall be carefully filled with earth, well rammed and leveled. Boulders which may interfere with the work shall be removed, after breaking down,' if necessary.

3.6.1 The trunk and branches of the trees shall be cut into suitable pieces as directed. Useful materials shall be initially stacked at site of work as directed by EIC and will be property of the CDAC. All serviceable material and rubbish shall be removed to a distance up to 1.5Km outside the periphery' of the area under clearance and burnt or otherwise disposed off as directed.

3.7 Setting out and making profiles:

3.7.1 All excavation, embankments, traverses etc., shall be set out to the true line, curve, level or slope required. The contractor shall be responsible for the accuracy of all setting out.

3.7.2 Masonry pillars shall be erected at suitable points in the area to serve as benchmarks for the execution of the work. These benchmarks shall be connected with any permanent benchmark. In case of filling necessary profiles with pegs, bamboos, and string or' burjis' shall be made to show the correct formation level before the work is started. In case of cutting, levels may be marked by the designing pits and embedding bricks bats at the required levels. The profiles and 'burjis' shall be maintained during the execution of the work.

3.7.3 The ground levels shall be taken on roughly level ground ordinarily at 15m distance. In sloping and undulation areas, levels shall be taken at lesser distance depending on ground conditions. The ground level shall be recorded in the field level books and plotted on plans, and signed jointly by EIC and the contractor before the earthwork is started. The labour required for taking levels shall be supplied by the contractor at no extra cost to CDAC.

3.8 Surface Dressing

Uneven surfaces of the natural ground, rough excavated surfaces and filled up area where ordered shall be trimmed to an uneven surface, horizontal or sloping, by removing vegetation and by scraping high patches and filling in low patches with the scraped soil to give an even and neat look to the site. The maximum depth of cutting shall not exceed 15 cm.

3.9 Rough Excavation

The locations and depths of borrow pits and the extent of hillside cutting shall be indicated by the EIC. Sufficient number of telltales or dead man shall be left in position as indicated by the EIC for proper measurements of excavation. Such tell tales shall not be removed until after the measurements of rough excavation have been recorded in the measurement book. Where practicable, borrow pits shall be drained to prevent stagnation of water in them.

3.10 Excavation Generally

3.10.1 All excavation (except rough excavation) shall be paid to the exact dimensions and profiles as shown on the drawing and the Quoted rate shall include cost for working space / allowances as per applicable standards or as directed by the EIC.However authorized width as per SSR or IS 1200 will be paid.

3.10.2 Disused foundations drains or other obstructions met with during excavation shall be grubbed up and cleared away to the extent required.

3.10.3 Damage to the existing Drains, Water mains, cables, etc:

During excavation the contractor shall take particular care to avoid damage to the existing drains, water mains, cables or other underground work. Where required, existing pipes, cables etc. shall be properly slung or otherwise supported and report to the Engineer – in – Charge for receiving instruction regarding further coarse of action.

3.10.4 Top spit and other vegetable matter shall be separated from excavated material if so directed.

3.10.5 Bad Ground:

If during excavation the contractor encounters, expansive soil or other bad ground, he shall immediately notify it to EIC for his instructions in writing.

3.10.6 Inspection and Approval:
The contractor shall notify the EIC when excavation is ready for inspection. The excavation shall be inspected and passed by the EIC in writing, measurements recorded in the measurement book before foundation is laid.'

3.11 Excavation in Trenches and Over Areas in Soil

3.11.1 In firm soil the sides of excavation shall-be kept vertical up to a depth' of 1.5 m from the bottom. For greater depth excavation profile may be widened or the sides sloped or shored up, depending up on the nature of soil. As ordered by the EIC in writing. It shall be responsibility of the contractor to take complete instructions from the EIC, in regarding the extent and manner of stepping, sloping or shoring and timbering to be done for excavations, where necessary.

3.11.2 Excavation shall be done from top to the bottom. Undermining and underpinning shall not be allowed.

3.11.3 The bed of excavation shall be formed to the required level, slope or grade shall be made firm by watering and ramming. The side of excavation shall be dressed or trimmed. Soft defective spots shall be dug out and filled with concrete of the same mix as that of the base concrete or approved dry filling as directed by the EIC.

3.11.4 If the excavation is done to a depth greater than that shown in the drawings or directed; the excess depth shall be made good by the contractor at his own expense with the concrete of the same proportion as base concrete.However, for excavation in drain work the excess depth shall be made good with stiff clay puddle at places where the drains are required to be pitched and with ordinary earth, properly watered and rammed, where the drains are not required to be pitched.

3.12 Precautions:

Only trained person shall be employed. All precautions shall be taken to avoid accidents and to ensure safety of workers, public and property during operations. Red flags shall be prominently displayed around the area.
This shall be either specifically covered in the Contractors all risk policy as stipulated in the General Condition of Contract or seprate insurance policy shall be obtained for specific purpose.

3.13 Balling / Pumping of water

All water that may accumulate in excavations during the progress of work from subsoil water, springs or any other cause shall be bailed / pumped out or otherwise removed. The foundations 'shall be kept dry during excavation and laying of foundations. Pumping shall be done directly from the foundation trenches or from a sump outside the excavation as necessary in such a manner, as to preclude the possibility of movement of water through any fresh concrete or masonry and washing, away the parts of 'concrete or mortar. No pumping shall be allowed during laying of concrete or masonry and for a period of at least 24 hours thereafter unless it is done from a suitable sump separated from concrete or masonry by effective means. Pumping shall be done in such a way as not to damage to the work or adjoining property by blows, subsidence etc. Disposal of water shall not cause inconvenience or nuisance in the area or cause damage to the property and structure nearby. Dewatering / Bailing out of water in all locations of work site and from the excavated trenches, pits / area shall be bailed out / pumped out as necessary by the contractor at his own cost. The contractor shall arrange sufficient mechanism to pump out the water depending upon the accumulation of water in the trenches etc.

3.14 Protection

The contractor shall protect the excavation from the effect of frost other damage and shall make good such damage to the satisfaction of the EIC. Fencing and other precautions such as red flags and red lights at night etc. as necessary for protection against risk of accidents due to open excavation shall be provided. While carrying out excavation near a building, care shall be taken to see that proper shoring etc required is 'provided so as not to adversely affect, the foundation of adjacent building.

3.15.1 F**illing Excavated Earth in Foundation Trench, in plinth and Under Floor etc.**
The earth used for filling shall be free from salts, organic and other deleterious matter. Highly expensive soils like black cotton soil shall not be used, unless so specified. All clods of earth exceeding 50 mm shall be broken or removed. Earth obtained from borrow pits and surplus earth from excavation, if any, shall be directly used for

filling and double handling avoided to the extent practicable.

3.15.2 Filling sides of trenches:
As soon as the work in foundation bas been completed and measured, the space around foundation masonry in trenches shall be cleared of all debris, brickbats, etc. and filled with earth in layers not exceeding, 250 mm, each layer being watered, rammed and compacted before the 'succeeding one is laid. Earth shall be rammed with iron rammer where feasible and with the butt ends of crowbar where rammer cannot re used.

3.15.3 Filling Plinth, Under Floor and hardstanding etc.
Filling shall be started from the lowest level in regular horizontal layers each not exceeding 250 mm in depth. Each layer shall be compacted by ramming with rammers of7 to 10 kg weight. Earth filling shall be adequately watered for' achieving maximum compaction. Special care shall be taken to compact the filling at the junctions of the floors with walls and columns. The top surface of the filling shall be neatly dressed level or to slope or grade as directed. In large floors, like factory floors/ hangers, hard standing etc., each layer of earth filling shall be compacted by the mechanical means such as by sheep foot-roller or by hand roller or by power roller, compactors/rammers to 90 to 95 percent of standard Proctor's density under optimum moisture conditions.

3.16 Filling in Trenches for pipes, drains, cables, etc.

3.16.1 Material for filling:
Earth used for filling shall be free -from salts, organic or other deleterious matter. All clods of earth exceeding 50 mm shall be broken or removed. Unless otherwise indicated, where the excavated material is mostly rock, the rock fragment shall be broken into pieces not bigger than 150 mm size and mixed with fine materia1 consisting of decomposed rock moorum or earth as available, so as to fill up the voids as far as possible and then the mixture used for filling.

3.16.2 Filling Trenches:
Filling in trenches for pipes and drains shall be commenced only after the joints of pipes and drains have been tested and passed by the EIC in writing.

3.16.3 Where the trenches are excavated in soil the filling shall be done with earth on both the sides simultaneously and on top of pipes in layers not exceeding 250 mm thick, watered, rammed and compacted; taking care that no damage is caused to the pipe below.

3.16.4 In case of excavation in rock, the filling up to a depth of 300 mm above the crown of pipe shall be done with fine material such as earth, moorum or pulverized decomposed rock according to the availability at site, in the same manner as described for trenches excavated in soil The remaining filling shall be done with rock fragments mixed with fine material as available to fill up the voids, watered. rammed and compacted, In layers not exceeding 250 mm thick. Particular care shall be taken in a back-filling to avoid future troubles from bursts and leakages due to differential settlement.

3.17 Embankments and Traverses

3.17.1 **Clearing the Site**
Prior to commencement of earth work, the site shall be cleared of all obstruction and vegetation including trees, undergrowth grass, rubbish etc. All stumps shall be cut down below ground level as specified under' felling of trees'.

3.17.2 Embankments .for road work etc shall be set out true to alignment, gradient, camber super elevation etc as indicated or directed by the EIC.

3.17.3 **Compacting Original Grounds:**

Original ground shall be compacted as much as possible by rolling or by other means like tamping where rolling is not feasible. All empty pockets or depressions left in the soil as a result of clearing and grubbing operation shall be filled and compacted. Any unsuitable materials occurring in the embankment foundation shall be removed and replaced with approved materials.

3.17.4 Where an embankment is to be placed on steep sloping ground, the surface of the ground shall be benched in step or broken up in a manner that the new materials would bond with the existing surface.

3.17.5 Embankment work shall not proceed unless the foundations have been inspected by the EIC for satisfactory conditions and approved.

3.17.6 Earth for Filling:

Only approved earth shall be used in the embankment. All clods of earth exceeding 50 mm shall be broken or removed .Soils having maximum dry density of less than 1.44 gm/cc are ordinarily unsuitable and shall not be used unless specifically approved in writing by the EIC. Similarly soils having maximum dry density of 1.52 gm/cc are ordinarily considered not suitable for use in embankments exceeding 3 m in height or in embankments of any height subject to long periods of inundation. The work shall be so executed that the best available earth, is saved for the top portion of the embankment. Where highly expansive soils exhibiting marked swell and shrinkage properties indicated to be used in filling, these shall be deposited at the bottom of the embankment and no such materials shall be placed in the top 50 cm portion of the embankment below the sub grade.

3.17.7 **Placing Soil :**

Earth shall be deposited in layers not exceeding 25 cm. When a sheep foot roller is used, the thickness of the layer shall not exceed the length of the stamping foot by more then 5 cm. For adequate compaction the embankment shall be constructed in uniform layers spread over the entire width of embankment. Successive layers shall not be placed unless the layers under construction have been thoroughly compacted to satisfy the specified requirements.

3.17.8 **Compaction:**

Each layer shall be thoroughly compacted with sheep foot and/or power road roller of weight not less than 8 tones till the soil behaves as an elastic material and gets compressed under the load of the roller. In location where consolidation by power roller is not possible, .manually or mechanically operated rammers shall be employed for Compaction. The embankment shall be finished to the lines, grades and cross section as directed. :The compaction of earth filling in embankments shall be carried out under optimum conditions, so as to obtain at least. 95 percent of standard Proctor density for each layer. Dry density shall be determined in accordance with IS-2720 (Pt Vll). Method of tests for soils (Part VII)-Determination of water content-dry density relation using light compaction. The moisture content of each layer of soil at the time of compaction should be from 1% above to 2% below the optimum moisture content. Highly expansive clays (such as black cotton soil) where specified to be used, should be compacted at a moisture content of 3-4 percent above the optimum to a density not exceeding 90% of standard Proctor's density.

3.17.9 **Allowance for Settlement:**

To allow for subsequent settlement of embankment, the finished level of the embankment shall be set higher than the specified level by 1-2 percent of the height of the embankment.

3.17.10 **Compaction Control:**

Proper record of compaction tests carried out shall be maintained. Density measurements shall be done at the rate of 1 test per 500-1000 Sqm of the compacted area, except where otherwise indicated.

3.18 Subsidence And Shrinkage

The contractor shall make good all subsidence and shrinkage in all earth fillings, embankments, traverses etc. during execution of work and thereafter until the expiry of defect liability period.

3.19 Timbering / planking and Strutting

3.19.1 When the depth of a trench in a soft but firm soil exceeds 1.5 m, stepping sloping and or planking and strutting of sides shall be done as ordered, in writing by the EIC. In the case of loose and slushy soil the depth at which these precautions are to be taken shall. be determined by the EIC according to the nature of the soil

3.19.2 It shall be the responsibility of the contractor to take all necessary steps to prevent the sides of the trenches from collapse. Regarding the necessity or otherwise of timbering or any other safety measures, the contractor shall be responsible to obtain the decision of the EIC, in writing, failing which the contractor shall be liable for any damage caused due to non-adoption of proper timbering or other safety measures.

3.19.3 Deep excavation shall be inspected by the Contractor after every rain; storm or other hazard increasing occurrence and protection against slides and ' caving shall be increased, if necessary and as directed by the EIC.

3.19.4 Planking and strutting shall be 'close' or 'open' type depending on the nature of soil and the depth of trench. The type of planking and strutting shall be as indicated by the EIC. Where distinctly different types of soil strata are encountered, each strata shall be treated separately as required by its characteristics

3.19.5 Timbering shall be of sufficient strength to resist earth pressure and ensure 'safety from slips, damage to the property or injury to person. Where excavation has also to stand vibrations from adjacent machinery, vehicles, railroads, blasting and other sources, additional bracings shall be provided. Generally the specification and sizes and spacing of sheeting, wales and struts used for timbering for different depths of trench shall be as given in IS 3764-1966 Safety code for excavation work. Shoring shall extend 30 cm above the vertical sides.

3.19.6 The withdrawal of timbering shall be done very carefully to prevent collapse of the sides of excavation and any damage to the work, executed in the excavated area. No Claim shall be entertained for any timber, which cannot be withdrawn and is lost or buried unless ordered by the EIC writing to be left permanently in position.

3.20 Preconstruction Anti-termite Chemical Treatment:

3.20.1.1 **Chemical**:
Anti termite treatment shall conforming to the IS 6313 specification in water emulsion shall be applied uniformly at the prescribed rate in all stages of treatment.

3.20.1.2 Concentration of the chemical as emulsifiable concentrate will be as indicated on the sealed containers. For obtaining, the specified concentration, chemical shall be diluted with water in the required quantity before it is used. Graduated containers shall be used for the dilution of the chemical. For example, to dilute chemical of 30 percent concentration, 59 parts of water to one part of the chemical shall be added to achieve 0.5 percent concentration.

3.20.2 **Mound Treatment:**
If termite mounds are found within the plinth area of the building these shall be destroyed by pouring chemicals into the mounds at several places, after breaking open the earthen structure, and making holes with crow-bars, at the rate of 4 liters of chemical emulsion per cubic metre of mound.

3.20.3 Conditions of formation:
Barrier shall be complete and continuous under the whole of the building / structure to be protected. All foundations shall be fully surrounded by and in close contact with the barrier of treated soil. On loose, sandy or porous soils where loss of treating solution through piping or excessive percolation is likely to occur, preliminary moistening to fill the capillary spaces in soil may be done.

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

3.20.5 **Disturbance:**
Once formed, treated soil barriers shall not be disturbed. If treated soil barriers are distributed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

3.20.6 **Treatment of Masonry Foundations and Basement**:
The bottom surface and the sides (up to a height of about 300 mm) of excavations made for masonry foundations and basements shall be treated with the chemical at the rate of 5 litres per square metre surface area. After the masonry foundations and the retaining wall of the basements come up, the backfill in immediate contact with the foundation structure shall be treated at the rate of 7.5 litres per square meter of the. vertical surface of the sub-structure for each side. If water is used for ramming the earth fill, the chemical treatment shall be carried out after the ramming operation is done by rodding the earth at 150 mm centers close to the wall surface and working the rod backward and soil should be .tamped, in. place. The earth is usually returned in layers and the treatment shall be carried out in similar stages. The chemical emulsion shall be directed towards the masonry surfaces so that the earth in contact with these surfaces is well treated with these chemicals.

3.20.6.1. Treatment for RCC Foundations and Basements:
The treatment shall start at a depth of 500 mm below the ground level except when such ground level is raised or

lowered by filling or cutting after the foundations have been cast. In such cases the depth of 500 mm shall be determined from the new soil level resulting from the filling or cutting mentioned above, and soil in immediate contact with the vertical surfaces of RCC foundations shall be treated at the rate of 7.5 liters per square meter.

3.20. 7 Treatment of Top Surface of plinth filling:
The top surface of the filled earth within plinth walls shall be treated with chemical emulsion at the rate of 5 liters per square meter of the surface before the sand bed / hardcore or sub-grade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes upto 50 to 75 mm deep at 150 mm centers both ways may be made with 12 mm dia mild steel rods on the surface to facilitate saturation of the soil with the chemical emulsion.

3.20.8 Treatment at Junctions of the wall and the floor:
Special care shall be taken to establish continuity of the vertical chemical barrier on. inner wall surfaces from ground level upto the level of the filled earth surface. To achieve this, a small channel 30 x 30 mm shall be made at all the junctions of wall and columns with the floor (before laying the sub-base) and the rod holes made in the channel up to the ground level 150 mm apart and the iron rod moved backward and forward to break up the earth and chemical emulsion poured along the channel at the rate of 7.5 liters per square meter of the vertical wall or column surface so as to soak the soil right to bottom. The soil should be tamped back into place after this operation.

3.20.9 Treatment of soil along External Perimeter of Building: -.
After the building is complete but before laying plinth protection, holes shall be made in the soil with iron rods along the external perimeter of the building at intervals of about 150 mm and depth 300 mm and these holes shall be filled with chemical emulsion at the rate of 7.5 liters per sq. meter of vertical surface of perimeter of the external wall.

3.20.9.1 **Treatment of soil under apron along external perimeter of building:**
Top surface of the consolidated earth over the apron is to be laid shall be treated with chemical emulsion at the rate of 5 liters / Sqm of the vertical surface before the apron is laid. If consolidated earth does not allow emulsion to seep through, holes upto 50 to 75 mm deep at 150 mm centre both ways may be made with 12 mm diameter mild steel rod on the surface to facilitate saturation of soil with chemical emulsion.

3.20.10 Treatment of soil surrounding pipes and conduits:
When pipes and conduits enter the soil inside the area of the foundations, the soil surrounding the point of entry shall be loosened around each such pipe or conduit for a distance of 150 mm and to a depth of 75 mm before treatment is commenced. When they enter the soil external to the foundations, they shall be similarly treated unless they stand clear of the walls of the building by about 75 mm for a ' distance of over 300 mm

3.20.11 Safety precautions:
The chemicals used for treatment are poisonous and hazardous to health. Therefore necessary safety precautions shall be taken by the Contractor in handling and use of the chemicals and emulsions.

3.21 Hard Core

3.21.1 Hard core shall be of hard broken stones or boulders, quarry waste, gravel, bricks of old broken concrete, as indicated. Material for hard core shall be hard, tough, clean and free from dust and other deleterious matter. The material for hard core shall be well graded for providing a dense and compact sub-grade. Where the gravel or concrete rubble, etc, are not well graded, it shall contain sufficient fine material for its proper compaction.

3.21.2 Unless otherwise indicated, materials for hard core shall be broken to gauge not exceeding 63mm. Hard core of gauge upto 100mm may be specified and used when laid in hard standing and pavements where power roller is used for consolidation.

3.21.3 Brick aggregate shall be from well burnt or slightly over burnt bricks and shall not contain any appreciable solution of sulphate content when used on a wet side.

3.21.4 Coarse ungraded gravel and rock may be used as a base layer for hard core exceeding 15cm thick covered by a layer of well graded material.

3.21.5 Concrete rubble shall be clean and suitably graded. Care shall be taken with rubble from general building demolition which may contain mixtures of material.

3.21.6 Hard core filling shall be spread and levelled in layers not exceeding 15cm thick, watered and well rammed or rolled where indicated.

Disposal of Surplus Excavated Material :

All Materials considered surplus shall be moved to destinations within the specified and disposed off as directed.

Measurements:

The measurement of Earthwork shall be done as specified in MES SSR 2004 – Part II and IS 1200.

Excavation shall be measured in CUM for each class of material encountered, limited to the dimension shown in the drawing including authorized widths or as directed by the consultant and Engineer – in – Charge. Excavation over increased width, cutting of slopes, shoring, shrutting and planking shall be deemed as convenience to the contractor in executing work and shall not be measured and paid for separately.

SECTION-4

CONCRETE

Indian Standards

The following IS with latest revision apply to this section:

I.S. No	Subject
10262 -1982	Recommended Guide Lines for Concrete Mix Design
383-1970	Specification for coarse and fine aggregates from natural sources for concrete (Second revision)
456-2000	Code of practice for plain and reinforced concrete (Fourth revision).
516-1959	Method of test for strength of concrete.
1199-1959	Method of sampling and analysis of concrete.
2185 (part-I)-1979	Specification for load bearing, hollow concrete blocks (second revision)
2185 (Part-II)-1983	Specification for concrete masonry units Hollow and solid light weight concrete blocks (first revision)
2185 (Part-III)-1984	Specification for concrete masonry units Auto cleaved cellular (aerated) concrete blocks (first revision)
2645-1975	Specification for integral cement water proofing compounds (first revision)
4926 - 2003	Ready Mixed Concrete – Code of practice
7861 (part-I)-1971	Code of practice for extreme weather concreting Part 1-Recommended Practice for hot weather concreting
7861 (Part-Il)-1981	Code of practice for extreme weather concreting Part II-Recommended practice for cold weather concreting.
8112-1989	Specification for 43 Grade Ordinary Portland Cement
12269 - 1987	Specification for 53 Grade Ordinary Portland Cement

MATERIALS :

Cement :

Unless otherwise indicated, cement used shall be Ordinary Portland Cement 43 grade confirming to IS 8112 of approved make. Use of any other grade of cement incase of extreme emergency shall be with the specific approval from the consultant and Engineer – in – Charge. Cement older than 3 months from the date of manufacturing shall not be used for the work.

Storage:

Cement in bags shall be stored in dry waterproof sheds to protect the cement from dampness and to minimize warehouse deteriorations. Where cement has been stored for over 3 month or for any reason the stored cement shows signs of deterioration or contamination, it may be tested before use for its strength, setting time, etc., cement which has fully or partially set shall not be used.

Storage of cement at the site of work shall be at the contractor's expense and risk. In the event of any damage occurring to cement due to faulty storage in contractor's sheds or on account of negligence on his part, such damage shall be the liability of the contractor. The storage shall be planned considering optimum utilization as per planned progress and shall not allow storage of cement for longer period than the specified.

Aggregates from Natural Sources:

Quality of Aggregates:

Aggregates from natural sources shall consist of (crushed or uncrushed) stones, gravel and sand or combination thereof conforming to IS 383. Specification for coarse and the fine aggregates from natural sources used for concrete. They shall be hard, strong, dense, durable, clean and free from veins and adherent coatings and free from injurious amounts of disintegrated pieces, alkali, vegetable matter and other deleterious substances. As far as possible, flaky and elongated pieces shall be avoided. Aggregated shall be obtained from approved sources as indicated.

Coarse aggregates shall be obtained from crushed granite, trap, basalt or similar stones from approved quarry. Sampling and testing shall be as per 1S : 2386 .

Deleterious Materials:

Aggregates shall not contain any harmful material, such as pyrites, coal, lignite, mica, shale or similar laminated material, clay, alkali, organic impurities, soft fragments, sea shells, etc., in such quantities as to affect the strength or durability of the concrete. Aggregates to be used for reinforced concrete shall not contain any material liable to attack the steel reinforcement. Aggregates, which are chemically reactive to alkalis in cement, shall not be used in cement concrete.

Limits of Deleterious Materials:

The maximum quantities of deleterious materials in the aggregates shall not exceed the limits laid down in IS 383.

4.3.3.1 If the quantities of deleterious materials in the aggregates exceed the limits mentioned above the aggregates shall be washed in fresh and clean water to the satisfaction of E.I.C before use.

4.3.3.2 Use of sea-sand shall not be allowed for any description of mortar and concrete works, in any location.

4.3.4 Aggregate Crushing Value:

The aggregate crushing value shall not exceed 45 percent for aggregate used for concrete other than for wearing surfaces and 30 percent for concrete for wearing surfaces such as runways roads and pavements.

4.3.5 Aggregate Impact Value:

As an alternative to aggregate crushing value, the aggregate impact value shall not exceed 45 percent by weight for aggregates used for concrete other than for wearing surfaces and 30 percent by weight for concrete for wearing surfaces, such as runways roads and pavements.

4.3.6 Aggregate Abrasion Value:

The abrasion value of aggregate, using Los Angels machine shall not exceed the following value:

a) For aggregates to be used in concrete for wearing surfaces-30 percent

b) For aggregates to be used in other concrete-50 percent

4.3.7 Size and Grading of Aggregates:

(1) Graded Coarse Aggregate: -Grading shall be within the limits given in the following table:

GRADING OF COARSE AGGREGATE:

IS Sieve Designation	Percentage Aggregate	Passing for graded of nominal size	
	40 mm	20 mm	12.5 mm
80 mm	100	-	-
63 mm	-	-	-
40 mm	95-100	100	-
20 mm	30-70	95-100	100
12.5 mm	-	-	90-100
10 mm	10-35	25-55	40-85
4.75 mm	0-5	0-10	0-10

GRADING OF FINE AGGREGATE:

(2) Fine Aggregate (Sand): -The grading of fine aggregates shall be within the limits given in the following table and shall be described as fine aggregates Grading zone I, II, III & IV. Where the grading falls outside the limits of any particular grading zone of sieves other than 600 micron I.S. Sieve, by a total amount not exceeding 5 percent, it shall be regarded as falling within that Grading Zone. This tolerance shall not be applied to percentage passing the

600 micron I.S. Sieve or to percentage passing any other size on the coarser limit of grading Zone 1 or the finer limit of Grading Zone IV.

IS Sieve Designation	Percentage passing for			
	Grading Zone I	Grading Zone II	Grading Zone III	Grading Zone IV
1	2	3	4	5
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	90-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 micron	15-34	-59	0-79	0-100
300-micron	5-20	8-30	12-40	-50
50 micron	0-+10	0-10	0-10	-10

NOTE 1: For crushed stone sands the permissible limit on 150 micron I.S. Sieve shall be increased to 20 percent. This does not affect the 5 percent allowance, as already permitted, applicable to other sieve sizes.
NOTE 2: Fine aggregate conforming to Grading Zone IV shall not be used in reinforced concrete, unless tests (which shall be recorded) have been made to ascertain the suitability of proposed mix proportions and prior written approval of EIC for use of such fine aggregate is obtained.

(3) All-in Aggregate: -Grading of all in aggregate shall be within the limits given in the following table:

IS Sieve Designation	Percentage passing for All-in-Aggregate of nominal size	
	40 mm	20 mm
80 mm	100	-
40 mm	95-100	100
20 mm	45-75	95-100
4.75 mm	25-45	35-50
600 micron	8-30	10-35
150 micron	0-6	0-6

NOTE : For carrying out tests on all-in-aggregates, the fractions passing through 4.75 mm IS sieve and the fractions retained on 4.75 mm IS sieve shall be first separated and there shall comply with the requirements (except grading) specified for fine aggregates and coarse aggregate respectively.

4.4 Water Proofing Compound:

Integral cement waterproofing compound where indicated shall be used and the same shall confirm to the requirements of IS 2645-1975.

4.5 Water:

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts, sugar, organic materials or other substances that may be deleterious to concrete or steel The pH value of water shall generally be not less than 6. Potable water is generally considered satisfactory for mixing concrete.

Water found satisfactory for mixing is .also suitable for curing concrete. However, water used for curing should not produce any objectionable stain or unsightly deposit .on the concrete surface. The presence of tannic acid or iron compounds is objectionable.

4.6 WORKMANSHIP

4.6. Water cement ratio shall be maintained at its correct value.

4.6.1 No substitutions in the materials used on the work or alterations in the established proportions shall be made without additional test to show that the quality and strength of concrete are satisfactory.

4.6.2 Workability of concrete:

The concrete shall be of adequate workability for the placing condition of the concrete and proper compactions with the means available. Suggested ranges of values of workability of concrete for some placing conditions, measured in accordance with IS 1199-1959, are given below :-

Placing conditions	**Degree of workability**	**Values of Workability**
1	**2**	**3**
Concreting of shallow sections with vibration	Very low	20-10 seconds vee-bee time OR 0.75-0.80 compacting factor
Concreting of lightly Low reinforced sections with vibration	Low	10-5 seconds vee-bee time OR 0.80-0.85 compacting factor
Concreting of lightly reinforced sections without vibration, or heavily reinforced section with vibration	Medium	5-2 seconds vee-bee time OR 0.85-0.92 compacting factor 6-25mm slump for 12.5 mm aggregate OR 25-75mm slump for 20 mm aggregate
Concreting of heavily reinforced section without vibration	High	Above 0.92 compacting factor OR75.;125mm slump for 20 mm aggregate

4.6.3 Mixing:
Concrete shall be mixed in a mechanical mixer. The mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency. If there is segregation after unloading from the mixer, the concrete shall be re-mixed. The mixing time may be taken as 1-1/2 to 2 minutes. .

4.6.4 Form Work:
4.6.4.1 General:
The formwork shall be designed and constructed to the shapes, lines and dimensions shown on the drawings. All forms shall be sufficiently watertight to prevent leakage of mortar. Forms shall be constructed so as to remove in sections. Formwork shall be provided finished fair and even as specified in section 7-Woodwork. The form work shall be properly designed so that it is rigid enough to remain free from bulging, sagging or displacement while placing the concrete and consolidation.

Cleaning and Treatment of Forms:
All rubbish particularly chippings; shavings and sawdust shall be removed from the interior of the forms before the concrete is placed. The formwork in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition to prevent adhesion between formwork and concrete. Care shall be taken that such approved composition is kept out of contact with the reinforcement.

Stripping Time:
Forms shall not be struck until the concrete has attained strength at least twice the stress to which the concrete may be subjected at the time of removal of formwork. The strength referred to shall be that of concrete using the same cement and aggregates, with the same proportions and cured under conditions of temperature and moisture similar to those existing of the work. Where so required formwork shall be left longer. In normal circumstances and where ordinary Portland cement is used, forms may generally be removed after the expiry of the following periods: For other cement stripping time shall be indicated:

(A)	Walls, columns and vertical faces of all structural members	2 days
(B)	Beam Soffits (props left under)	7 days
(C)	Removal of props under beams and arches I) Spanning upto 6 m (2) Spanning over 6 m	 14 days 21 days

In case of bad weather these periods may be increased at the direction of EIC
The number of props left under, their sizes and disposition shall be such as to be 'able to safely carry the dead load

of slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.

4.6.6.4 Removal of Form work:
Formwork shall be removed in such a manner as would not cause any shock or vibration that would damage the concrete. Before removal of soffits and props concrete surface shall be exposed to ascertain that the concrete has sufficiently hardened. .

4.6.6.5 Where the shape of the element is such that formwork has re-entrant angles, the formwork shall be removed as soon as possible after the concrete has set, to avoid shrinkage cracking occurring due to the restraint imposed.

REINFORCEMENT:

4.6.7 Assembly of Reinforcement:

Reinforcement shall be bent and fixed as specified in section 10 Steel and Iron work. All reinforcement shall be placed and maintained in the position shown in the drawings during concreting. Crossing bars shall not be tack welded for assembly of reinforcement, unless otherwise indicated. All Reinforcement shall be of tested Quality and specified Diameter as per the design. Test reports shall be submitted to Engineer – in – Charge / Consultant for approval.

4.6.7.1 Tolerance on Placing of Reinforcement:
Unless otherwise directed, reinforcement shall be placed within the following tolerance:
(a) For effective depth 200 mm or less + 10 mm
(b) For effective depth more than 200 mm + 15 mm

4.6.7.2 Welded joints or mechanical connectors:
Welded joints in reinforcement may be used where indicated / directed but in all cases of important connections, tests shall be made to prove that the joints are of the full strength of the bars connected.

4.6.8 Cover to Reinforcement:

4.6.8.1 Reinforcement shall have concrete cover and the thickness of such cover (exclusive of plaster or other decorative finish) shall be as follows, unless otherwise indicated:
a) At each end of reinforcing bar, not less than 25 mm or less than twice the diameter of such bar;

b) For a longitudinal reinforcing bar in a column not less than 40 mm nor less than the diameter of such bar. In the case of columns of minimum dimension of 200 mm or under whose reinforcing bars do not exceed 12 mm, a cover of25 mm may be used;

c) For longitudinal reinforcing bar in a beam, not less than 25 mm nor less than the diameter of such bar;

d) For tensile, compressive, shear, or other reinforcement in a slab, not less than 15 mm nor less than the diameter of such bar; and

e) For any other reinforcement, not less than 15 mm nor less than the diameter of such bar.

4.6.8.2 Increased cover thickness may be provided when surfaces of concrete members are exposed to the action of harmful chemicals acid vapour, saline atmosphere sulphurous smoke, etc., and such increase of cover may be between 15mm and 50mm beyond that specified in 4.6.8.1, as indicated.

4.6.8.3 In all cases the cover shall not exceed 75 mm.

4.6.9 Transporting:

Concrete shall be transported from the mixer to the formwork as rapidly as possible by methods, which will prevent the segregation or loss of any of the ingredients and maintaining the required workability. During hot or cold weather, concrete shall be transported in deep containers.
Other suitable methods like transporting by transit mixers may be adopted. Special care should be taken to reduce

loss of water by evaporation in hot weather and heat loss in cold weather during transportation. Sufficient numbers of transit mixtures shall be employed for maintaining continuity of concreting process.
Concrete line-pumps of suitable capacity and sufficient numbers shall be engaged for pouring concrete in pavements.

4.6.10 Placing:
The concrete shall be deposited as nearly as practicable in its final position to avoid rehandling. The concrete shall be placed and compacted before setting commences and should not be subsequently disturbed. Methods of placing should be such as to preclude segregation. Care shall be taken to avoid displacement of reinforcement or movement of formwork. The concrete, which is deposited or otherwise disturbed after initial setting commences shall be immediately removed from the site.

4.6.10.1 Before placing the concrete in trenches or on sub-grade or sub-base, the sub-grade / subbase shall be cleaned of all injurious or foreign matter, watered and well consolidated, if necessary.

4.6.10.2 The final layer of concrete shall be laid to such levels and falls as may be directed.

4.6.10.3 When concrete has to be lowered to any depth below 15m, it shall be conveyed in suitable receptacles or by chute. The delivery end of the chute shall be as close as possible to the point of deposit. The chutes shall be thoroughly flushed with water before and after each working period, the water for this purpose shall be -discharged outside the formwork.

4.6.11 Compaction:

Concrete shall be thoroughly compacted and, fully worked around the reinforcement, around embedded fixtures and into the corners of the formwork. Mechanical vibrators shall be employed for compacting concrete. Over vibration or vibration of very wet mixes is harmful and shall be avoided; under vibration is also to be avoided. Sufficient numbers of reserve / vibrators in good working condition shall be kept at all times so as to ensure that there is no slacking / interruption in compacting. Vibrators of specified sizes shall be used depending upon the quantum of concreteing.

4.6.11.1 Where vibration is to be applied externally, the design of formwork and the disposition of vibrators shall be such as to ensure efficient compaction and to avoid surface blemished.

4.6.12 Construction Joints:
Concreting shall be carried out continuously up to construction joints the position and arrangement of which shall be as indicated or directed by the consultant and Engineer – in – charge.

4.6.12.1 When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean and thoroughly wetted. For vertical joints neat cement slurry at the rate of 2.50 kg of cement per sqm shall be applied on the surface before it is dry. For horizontal joints surface shall be covered with a layer of mortar about 10 to 15 mm thick composed of cement and sand ratio as the cement and sand in the concrete mix. The layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing of concrete.

4.6.12.2 Where the concrete-has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes. Care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and all free water removed. The surfaces shall then be coated with neat cement slurry. On this surface, a layer of concrete not exceeding 150mm in thickness shall first be placed and shall be well rammed against old work; particular attention being paid to comers and close spots; work thereafter shall proceed in the normal way.

4.6.12 Curing:
Exposed surfaces of concrete shall be kept continuously in. a damp or wet condition by covering with a layer of sacking, canvas, Hessian or similar materials or a layer of sand or by ponding for at least seven days from the date of placing of concrete. Approved curing compounds may be used in lieu of moist curing with the permission of EIC. Such compounds shall be applied to all exposed surface of the concrete as soon as possible after the concrete has set.

4.6.13 Protection:

The concrete shall be carefully protected after it is laid against the action of frost and shielded from exposure to sun to avoid rapid drying. Care shall be taken to protect the concrete from all shaking and other disturbances during construction. No traffic shall be allowed on the finished concrete surface for at least 7 days. This period may be increased or decreased at the discretion of EIC

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

4.6.15 Exposed Surfaces :
4.6.15.1.1 The contractor shall use proper formwork so that the concrete in contact with removal of formwork present an even surface. Concrete while being poured against formwork shall be adequately tamped, or vibrated where directed, so that fines are drawn towards the surface and honey combing is avoided.

4.6.15.2 Exposed surfaces of concrete shall be "Finished fair and Even in Forms".

Exposed surfaces after striking off formwork shall be such as to present a fair and even surface and shall not be plastered unless otherwise specified. The surface shall be presentable without any further treatment. Any irregularities and protruding formwork marks shall be removed and minor honeycombing made good with cement and sand mortar 1:3. Lines along the formwork joints may however show.

4.6.15.3 Exposed surfaces of concrete which are indicated/required to be plastered shall be roughened with wire brushes and hacked out closely immediately after removal of formwork.

4.6.15.4 **Openings and Inserts :**
Openings and Positions of Inserts shall be made as per the drawing or as directed by the Consultant and EIC.This shall be done with atmost accuracy/precision and any deviation from the Drawing or instruction by the Consultant or EIC, the same shall be rectified by the Contractor at his own cost. No Extra payment shall be admissible for making openings/inserts etc.

4.6.16 Sampling and testing of concrete:
Samples from fresh concrete shall be taken as per IS 1199-1959. Method of sampling of concrete and cubes shall be made, cured and tested at 28 days in accordance with IS 516-1959, Method of test for strength of concrete.

4.6.16.2.1 Where indicated, tests on beams for modulus of rupture at 72 ± 2hrs or at 7 days, or compressive strength tests at 7 days may be carried out in addition to 28 days compressive strength alone shall be the criterion for acceptance or rejection of the concrete.

4.6.16.3Test Specimen:
Three test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for such purpose as to determine the strength of concrete at 7 days or to check the testing errors.

4.6.16.4Test Strength of samples:
The test strength of the sample shall be the average of the strength of three specimen. The individual variation shall not be more than +/- 15 percent of the average.

4.6.16.5Acceptance Criteria:
The concrete shall be deemed to comply with the strength requirement when both the following conditions are met :-

a) The mean strength determined from any group of four concecutive test results complies with the appropriate limits in Colimn No. 2 Table –11 of IS 456 -2000
b) Any individual test results complies with the appropriate limits in column No.3 of Table -11 of IS 456-2000. :

If the concrete is deemed not to comply pursuant to acceptance criteria, it shall be dismantled and redone at the contractor's expenses.
Concrete of each grade shall be rejected if it is porous or honey-combed: its lacing has been interrupted without providing a proper construction joint; the reinforcement has been displaced beyond the tolerances specified or

construction tolerances have not been met. However, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-charge

4.6.16.5 **Standard Deviation:**

Standard deviation of concrete of each grade shall be determined separately as stated below.

Grade of Concrete	S.D. for different degree of control in N/mm2		
	Very Good	Good	Fair
M 10	2	2.3	3.3
M 15	2.5	3.5	4.5
M 20	3.6	4.6	5.6
M 25	4.3	5.3	6.3
M 30	5	6	7
M 35	5.3	6.3	7.3
M 40	5.6	6.6	7.6

Control expected for this work is "Very Good" and the contractor shall deploy weigh batcher as required to attain the required control

4.7 Waterproof Concrete:-

Where indicated, cement concrete shall be waterproofed by adding integral waterproofing compound conforming to IS 2645-1975, Specification for integral cement waterproofing compounds at the time of making concrete as per the manufacturer's instructions. The quality of waterproofing compound shall be as indicated but in no case shall be less than the quality recommended by the manufacturers and not exceeding 3 percent by weight of cement.

4.8 Work in Extreme Weather Concreting:

Concreting during hot and cold weather shall be done as per the procedures set out-in IS: 7861 (part-I) Code of practice for extreme weather concreting; part I Recommended practice for hot weather concreting, or IS7861 (part-II)-1981 Code of practice for extreme weather concreting; Part II Recommended practice for cold weather concreting.

4.9 Reinforced Concrete Work in water Retaining Structure:

4.9.1.1 Special care shall be taken to get the most suitable grading of aggregate so as to produce the densest possible concrete. Mix proportion shall be indicated. Water cement ratio shall be controlled consistent with the requirements of workability to produce impervious concrete.

4.9.2 The concrete between the reinforcement and the formwork on the water face shall be well compacted and the board joints tight, so as to produce a face free from honey-combing or pores. External vibrators viz. shutter vibrators at the rate of one vibrator per 2.5 m² of shutter area shall be used to produce a compact concrete with a dense skin which shall not, however, contain an excess of cement, wherever it is not possible to use shutter vibrator, pin vibrator shall be used after the approval of EIC.

4.9.3 **Construction, Contraction & Expansion Joints.**

4.9.3.1 All vertical, horizontal construction and expansion joints in water retaining structures shall be located and executed as shown in the drawings and no deviation shall be permitted without the specific permission of EIC. Where days' work joints are formed whether horizontally or vertically, they shall be rebated as called out on drawings. Care shall be taken to remove from the earlier lift over all loose pieces of gravel, stone chips, wooden chips, country nails or any other foreign materials. All laitance shall also be thoroughly removed. If necessary, the face of the old concrete shall be well hacked to expose the aggregate and after washing the surface, a thin coat of mortar or grout (1 cement: 1 sand) shall be applied immediately before resuming concreting.

4.9.3.2 Water bar installation along the joints shall be done by embedding one half of the water bar in each side of the joint by suitable jigs / supporting arrangements between the adjacent sections of the concrete as per the manufacturer's specifications and directions of the EIC. Water bars shall be properly aligned and placed in position

during embedding. To achieve the continuity of the water bar all along the joint at crossing and at change of alignment, the water stops shall be welded (in T,X or L shapes as the case may be) as per manufacturer's specifications and directions of EIC. Suitable jigs manufactured out of reinforcing bars may be used for fixing the water bars.

4.9.3.3 **Fittings:**

Pipes and outer fittings passing through the walls and bottom shall be well embedded in the concrete and shall be provided with normal puddle flanges. Opening in the walls, and floor slabs if any shall be provided as per the relevant drawings.

4.9.4 Curing :
Concrete in water retaining portion shall be cured minimum for 21 days.

4.9.5 Hydraulic Testing:
Structures shall be tested strictly in accordance with IS: 3370 (Part I) for water tightness. For underground tank, the total maximum drop in water surface level over seven days shall not exceed 40 mm.

4.10 Pre-cast Reinforced Concrete-Generally
4.10.1.Pre-cast reinforced concrete articles such as manhole cover and frame,columns, fencing posts, door and window frames, lintels, chajjas, copings, sills, shelves, slabs, louvers etc. shall be of the grade or mix as indicated and cast in forms or moulds. The forms shall be of timber or of steel for better finish. Provisions shall be made in the forms and moulds to accommodate fixing devices such as nibs, clips, hooks, bolts and forming of notches and ho les. The contractor may precast the units on cement or steel platform that shall be adequately oiled provided the surface finish is of the same standard as obtained in the forms. Each until shall be cast in one operation.

4.10.2 Concrete shall be proportioned, mixed, placed and thoroughly compacted by vibration or tamping to give a dense concrete free from voids and honeycombing.

4.10.3 Precast 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 or to impair the strength or the performance of construction. All angles of the precast units with the exception of the angles resulting from the splayed or the chamfered faces shall be true right angles. The rises shall be clean and sharp except those specified to be rounded. The wearing surface shall be true and out of winding. On being fractured, the interior of the units shall present a clean, homogeneous appearance.

4.10.4 The longitudinal reinforcement shall have a minimum cover of 12 mm or twice the diameter of the main bar, whichever is more, unless otherwise directed.

4.10.5 Curing :

After placing, the concrete shall be adequately protected during setting and in first stages of hardening from shocks and from the harmful effects of sunshine, drying winds and cold. The concrete shall be cured for at least 7 days.
. The truck mixer shall have discharge units to convey through the pump to desired location in the site.

INSPECTION AND TESTING:

Specific control tests and evaluations are required during the manufacturing process to produce predictable high quality concrete. The concrete shall undergo all the specified test for concrete as per IS codes.

SECTION-5

BRICK WORK

5.1 Indian standards

The following IS with latest revision apply to this section:

LS. No.	Subject
195-1963	Specification for fire clay mortar for laying fire clay refractory bricks (second revision)
702-1988	Specification for industrial bitumen (second revision)
1077-1986	Specification for common burnt clay building bricks (fourth reversion)
1526-1960	Sizes and shapes for fire bricks (230mm. series)
1580-1969	Specification for bituminous compounds for water proofing and caulking purposes (first reversion)
1905-1980	Code for practice for structural safety of building masonry wall (second revision)
2116-1980	Specification for sand for masonry mortars (first revision)
2386 (Part II) 1963	Methods of test for aggregates for concrete. Part II -Estimation of deleterious materials and organic impurities.
2691-1988	Specification for burnt clay facing bricks (second revision)
4832 (Part II) 1969	Specification for chemical resistance mortars, Part II, Resin type.
4832 (Part III) 1968	Specification for chemical resistance mortars, Part III, sulphor type.
5454-1978	Methods for sampling of clay building brick (first revision)
4860-1968	Specification for acid resistance bricks.
6165-1971	Dimension for special shapes of clays bricks.

MATERIALS

5.2 CEMENT

Unless otherwise indicated, Cement shall be Ordinary Portland cement, 43 grade conforming to IS 8112 of approved make/ brand. Use of any other grade of cement incase of extreme emergency shall be with the specific approval from the consultant and Engineer – in – Charge.

5.3 Sand for Masonry Mortars

Unless otherwise indicated, sand for mortars shall consist of natural sand, crushed stone sand or crushed gravel sand or a combination of any of these conforming to IS 2116-1980:, specification for sand for masonry mortars. Sand shall be hard, durable, clean and free from adherent coatings and shall not contain clay and impurities such as iron pyrites, alkalies, salts, coal, mica, shale or similar laminated or other materials exceeding the specified limits.

5.3.1 The maximum quantities of clay, fine silt and fine dust in sand shall not be more than 5 percent by mass. Organic impurities shall be below that obtained, by comparison with the standard solution specified in 6.2.2 of IS 2386 {Part II)-1963. Method of test for aggregate for concrete, Part II Estimation of deleterious material and organic impurities.

5.4 Common Burnt Clay Building Bricks

5.4.1 Common burnt clay building bricks (hereinafter termed as bricks) shall conform to the requirements laid down in IS 1077 -1992, specifications for Common burnt clay building bricks. The class of bricks (based on minimum average compressive strength) viz 3.5(or35), 5(or50) as mentioned below, shall be as indicated. Bricks shall be neither overburnt nor under burnt and shall be free from cracks, or any other such defects.

5.4.2 Sub Class A bricks shall have smooth rectangular faces with sharp corners and shall be uniform in color. Sub Class 'B' bricks may have slight distorted and round edges provided no difficulty arise on this account in laying of uniform courses.

5.4.3 **Dimensions:** Size of bricks shall be as indicated. Standard of bricks are as under:

5.4.4 Tolerance:
The permissible tolerance on the dimensions of the bricks, unless otherwise indicated, shall be +/-3 Percent for Sub Class A bricks and +/-8 Percent for Sub Class B bricks. To verify conformity within tolerance limit, twenty whole bricks selected at random from the stack shall be arranged upon a level surface successively for measuring the length, width and height, in contact with each other and in a straight line.

5.4.5 General Quality:
Bricks may be hand or machine moulded and shall be made from suitable soils. They shall be free from cracks, flaws and nodules of free lime. Bricks of 7.5 and 10 cm thickness (height) shall be moulded with frog 1 to 2 cm deep on one of its flat faces. Bricks of 4 cm or 5 cm height and those by an extrusion process may not be provided with frogs.

5.4.6 Compressive Strength:
The compressive strength of any individual brick shall not fall below the minimum average compressive strength specified for corresponding class of brick.

5.4.7 Water Absorption:
The average water absorption of bricks, after immersion in cold water for 24 hours shall not be more then 20 percent for bricks upto class 12.5 and 15 percent for higher class of bricks.

5.4.8 Efflorescence:
The rating of efflorescence of the bricks shall not be more than moderate (For bricks upto Class 125)

5.4.9 Handling and Storage of Bricks:
Bricks shall not be dumped at site. They shall be stacked in regular tiers on even ground as they are unloaded to minimize breakage and defacement of bricks. Bricks selected for facing and any particular purpose / situation of use shall be stacked separately.

WORKMANSHIP

5.5 Masonry Mortars

5.5.1 Proportioning

Mortars shall be of the mix as indicated. The mixes specified are by volume Mix proportions of cement mortars specified are in the proportions of cement to dry sand.. If moist sand is used, necessary allowance shall be made for bulking.

Cement shall be measured by weight. 50 Kg of cement shall be taken as equal to 0.035 cum to determine bulk. The quantity of water to be added to the mortar shall be such that working consistency is obtained. Excess water shall be avoided.

5.5.2 Preparation of Cement Mortar:
Mixing shall be done preferably in a mechanical mixer. If done by hand mixing operation shall be carried out on a clean watertight platform. Cement and sand shall be mixed dry in the required proportion to obtain a uniform colour. The required quantity of water shall then be added and the mortar hoed back and forth for 5 to 10 minutes with additions of water to a workable consistency. In the case of mechanical mixing, the mortar shall be mixed for at least three minutes after addition of water. Cement mortar shall be freshly mixed for immediate use. Any mortar which has commenced to set shall be discarded and removed from the site.

5.5.3 Time of Use of Mortars:
Mortar with cement as an ingredient shall be used as early as possible after mixing, preferably within half an hour from the time water is added to the mix or at the latest within one hour of its mixing. The mixing of mortar shall be planned in such a way that the same is consumed with in half an hour considering the quantum of work and manpower deployment

5.5.4 Workability of Masonry Mortars:
The working consistency of the mortar is usually judged by the worker during application. The water used shall be

enough to maintain the fluidity of the mortar during application, but at the same time it shall not be excessive leading to segregation of aggregates from the cement.

5.6 Setting Out

All brickwork shall be set out and built to the respective dimensions, thickness and heights, as indicated.

5.7 Scaffolding

Scaffolding shall be strong to withstand all dead, live and impact loads which are likely to come on them. Scaffolding shall be provided to allow easy approach to every part of the work, overhand work shall not be allowed.

For exposed brick facing double scaffolding having two sets of vertical supports shall be provided. For brickwork, which is to be plastered over, single scaffolding may be provided. In single scaffolding one end of the putlogs shall rest in the hole provided in the header course of brick masonry. Not more then: one header for each putlog shall be left out Such holes shall not be allowed in the case of pillars or narrow masonry portions between openings which are less than one meter in width or are immediately under or near the structural member supported by the walls. The holes left shall be made good on removal of scaffolding to match with the face work / surrounding area.

5.7.2 Timber or bamboo scaffolds shall be erected in accordance with the provisions contained in IS 3696 (Part 1)-1987, Safety code for scaffolds and ladders, Part I-Scaffolds, to ensure safety of workman and others. Steel scaffolding shall be erected in accordance with the provisions contained in IS 2750, Specification for steel scaffolding and relevant provisions of IS 3696 (part 1).

5.8 Soaking of Bricks

Bricks shall be soaked in water before use for a period for the water to just penetrate the whole depth of the bricks. Alternatively bricks may be adequately soaked in stacks by profusely spraying with clean water at regular intervals for a period not less than six hours. When bricks are soaked, they shall be removed from the tank sufficiently early so that at the time of laying they are skin-dry. Such soaked bricks shall be stacked-on a clean place where they are not again spoiled by dirt, earth, etc.

NOTE : The period of soaking may be easily found at site by a field test in which the bricks are soaked in water for different period and then broken to find the extent of water penetration. The least period that corresponds to complete soaking will be the one to be allowed for in the construction work. .

NOTE II : If the bricks are soaked for the required time in water that is frequently changed the soluble salts in the bricks will be leached out, and subsequent efflorescence will be reduced.

5.9 Laying

All loose materials, dirt and set lumps of mortar which may be over the surface on which brickwork is to be freshly started, shall be removed with a wire brush and surface wetted slightly. Bricks shall be laid on a full bed of mortar. When laying, the bricks shall be properly bedded and slightly pressed with handle of trowel so that the mortar can get into all the pores of the bricks surface to ensure proper adhesion. All the joints shall be properly flushed and packed with mortar so that no hoIIow spaces are left. Care shall be taken to see that the required quantity of water is added to the mortar to the mixing platform to obtain required consistency. Addition of water during laying of the course shall not be permitted. In case of walls two brick thick and over, the joints shall be grouted at every course in addition to bedding and flushing with mortar.

5.9.1 While using old size bricks (FPS conventional bricks) top courses of all plinths, parapets, steps and top of walls below roof slab or floor slab shall be laid with bricks on edge, applicable in case of traditional bricks unless directed otherwise. Care shall be taken that the bricks forming top courses and ends of wall are properly keyed into position.

5.9.2 Bricks shall be laid with frog up, However when the top courses are exposed, bricks shall be laid with frog down, care shall be taken to fill the frogs with mortar before embedding the bricks in position.

5.9.3 All quoins shall be accurately constructed and the height of courses checked with storey rods as the work proceeds. Acute and obtuse quoins shall be bonded, where practicable, in the same way as square quoins; obtuse quoins shall be formed with squint showing a three quarter bricks on the other.

5.10 Bond

All bricks work shall be built in English Bond, unless otherwise indicated. Half brick walls shall be built in stretcher bond. Header bond shall be used for walls curved on plan for better alignment. Header bond shall also be used in foundation footings; stretchers may be used when the thickness of wall renders use of headers impracticable. Where the thickness of footings is uniform for a number of courses, the top courses of the footing shall be of headers.

5.10.1 Half or cut bricks shall not be used except where necessary to complete the bond.

5.10.2 Overlap in stretcher bond is usually half bricks and is obtained by commencing each alternate course with a half bricks. The overlap in header bond, which is usually half the width of the bricks, is obtained by introducing a three quarter bricks in each alternate course at quoins. In general, cross-joints in any course of brickwork shall, not 'be nearer than a quarter of bricks length from those in the course below or above it. .

5.11 Uniformity

The bricks work shall be, built in uniform layers; corners and other advanced work shall be raked back. No part of a wall during its construction shall rise more then one meter above the general construction level, to avoid unequal settlement Parts of walls left at different levels shall be properly raked back. Toothing may be done where future extension is contemplated but shall-not be used as an alternative to raking back.
For Half brick partition to be keyed into main walls, indents shall be left in the main walls.

5.12 Alignments and Prepends

The walls shall be taken truly plumb or true to the required batter, where specified. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in the alternate courses shall come directly one over the other. (Quoins, jambs, and other angles shall be properly plumbed as the work proceeds. The maximum permissible tolerance in masonry shall be as under:

(a) Deviation from vertical within a storey per 3m height	6mm
(b) Deviation from vertical in the total height of a building	12.5mm
(c) Deviation of bed joints from horizontal	
(i) in any length upto 12m	6mm
(ii) in any length over 12m	12.5mm total

5.13 Thickness of Joints .

Thickness of joints shall be such that four courses and three joints taken consecutively shall measure as follows unless otherwise specified:
(i) Old size brick -Equal to four times of actual thickness plus 4cm
(ii) Modular brick -Equal to 39 cm
In cases of soakage pits, cesspools, manholes and the like, the thickness of joints upto 15mm may be adopted. Where brick work to match the existing work, the joints shall be of the same thickness as in the existing work.

5.14 Striking Joints

Where no pointing, plastering or other finish is indicated, the green mortar shall be neatly struck flush. Where pointing, plastering or other finish is indicated, the joints shall be squarely raked out to a depth not less than 10mm for plastering and 15mm for pointing.

5.15 Protection against damage

Care shall be taken during construction that edges of jambs, cills, heads etc. are not damaged. In inclement weather, newly built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away.

5.16 Curing

The brick work shall be constantly kept wet for at least seven days.

5.17 Facing

In case of walls one bricks thick and under, at least one face shall be kept even and in 'proper plane, while the other face may be slightly rough. In case of walls more then one brick thick, both the faces shall be kept even and in proper plane. .

For exposed brickwork selected brick of the specified class and subclass shall be used for the face work. Where however, use of facing bricks is indicated; brick walls shall be faced with facing bricks. No rubbing down of brick work shall be allowed.

Brick work shall be plastered pointed or otherwise finished, as indicated. Joints of external faces of brick walls in foundation up to 15 mm below ground level and of internal faces of bricks walls in foundation and plinth below sub-floor level shall be struck flush when the mortar is green, as the work processed.

5.18 Cleaning

Face of brickwork shall be cleaned on the same day it is laid and all mortar droppings removed.

5.19 Brickwork Curved on Plan

Brickwork Curved on Plan to a radius exceeding 6m shall be built as described for general brickwork but where the inner radius is 6 meter or less, all courses shall be of header with bricks roughly cut to the radius wedge shaped joints, unless otherwise indicated.

SECTION- 6

STONE MASONRY

6.1 Indian Standards: -The following Indian Standards with latest revision apply to the section**.**

1121 (Part 1)-1974	Method of test for determination of strength properties of natural building stones Part-I-Compressive strength (first revision)
1124-1974	Method of test for determination of water absorption, apparent. specific gravity and porosity of natural building stones Part-l-Compressive strength(first revision)
4101 Part 1 - 1967	Code of Practice for External Facings and Veneers - Part 1 : Stone Facing
1706-1972	Method for determination of resistance to wear by abrasion of natural building stones (first revision)

6.2 Stones

6.2.1. The stone shall be of the type such as granite, trap, basalt, or similar approved stones and shall be obtained from the approved quarries.

6.2.2. Stone shall be hard, sound, durable and free from weathering decay and defects like cavities, cracks, flaw, sand holes injurious veins patches of loose or soft materials and other similar defects that may adversely effect its strength and appearance. As far as possible, stone shall be uniform color and texture. Generally stone shall not contain cryptocrystalline silica or chest, mica and other deleterious materials like iron oxide, organic impurities, etc.

6.2.3 In the case of stratified rocks stone for building purposes shall be so quarried and dressed that when set in the building, the. Stones are laid along the plane of stratification.

NOTE 1: Test for compressive strength shall be carried out as laid down in IS: 1121(Part 1)-1974 Method of test for determination of strength properties of natural building stones: Part-I compressive strength.

NOTE 2: Test. for water absorption shall be carried out as laid down in IS: 1124-1974, Method of test for determination of water absorption apparent specific gravity and porosity of natural building stones.

6.2.4 **Dimensions of Stones** :-Unless otherwise indicated, the length of stone for stone masonry shall not be exceed three times the height and the breadth on base shall not be greater thanthree fourth the thickness of wall. Height of stones may be up to 30 cm. Minimum dimensions of stones (except slate stone) for various type of masonry shall be as given below:

i) Stones for random rubble masonry may be of any size and shape but shall be not less than 15 cm in any direction.

ii) Stones for squared rubble masonry shall be not less than 15 cm in length and width.

iii) Stones for block-in-course masonry shall be not less than 20 cm in breadth or height and length than twice the height.

iv) Stones for ashlar masonry shall be not less than 30 cm in breadth and height and length not less than twice the height.

v) Stones for sills shall be of full thickness depth and width. Length of stone shall be as large as available but normally not less than 90 cm.

Vi) Stones for lintels shall be of full thickness (depth) and length. Where stone lintel of full width is not available two stones may be used to make the width.

vii) Stones for copings shall be of full thickness and width. Length of stones shall be as large as available but not less than 30 cm.

viii) Stones for kerb stone shall be of size as indicated. The length shall not be not less than the height.

(ix) Stones for arches, domes and circular moulded work – the dimension shall depend on the particulars of the curve.
x) In case of stone pitching the average dimension of boulders along the longest axis shall be approxiemately equal to the thickness of pitching.

Masonary mortars same as in the case of brick work shall be followed

6.3 Random Rubble Masonry

The stone shall be laid in their natural bed and shall be solidly laid in mortar.

a. Uncoursed: -This type of masonry shall be constructed of stones as they come from the quarry. The mason select stones of all shapes and sizes, more or less at random, and place them in position to obtain a good bond, while restricting cutting of the stones to the removal of inconvenient comers with a scrabbling or spalling hammer. '

b. Brought to Course: -This walling is similar to uncoursed random rubble except that the work is roughly. Leveled up to course at intervals varying from 45 cm to 90 cm in height according to the locality and the type of the stone used.

6.4 General Requirements for Stone Masonry Construction :

6.4.1 All stone masonry shall be set out and built to the respective type; dimensions, thickness and height as indicated.

6.4.2 All labours on stone shall normally be executed when it is freshly quarried.

6.4.3 Stones shall be sufficiently wetted before laying to prevent absorption of water from mortar.

6.4.4 The natural bed of the stratified stone shall be laid that the pressure is always perpendicular to the strata. Stone in walling, steps, copings, sills etc. shall be placed with the grain or natural bed horizontal In arches the grain shall be parallel to bed or voussoirs. In projecting cornices and corbels the natural bed shall be vertical and at right angle to the face of the wall.

6.4.5 The courses shall be built perpendicular to the pressure, which the masonry will bear. In case of battered walls, the beds of stone and plane of courses shall be at right angle to the face of wall.

6.4.6. Vertical joints shall be staggered as fur as possible. In the case of squared rubble coursed masonry , block in courses masonry and Ashlar masonry, stone shall break joints on the face for at least half the height of the courses and the bond shall be carefully maintained through out.

6.4.7. Bell shaped bond stones or header shall not be used.

6.4.8 All necessary chases for joggles, dowels, and cramp shall be formed in the stone before hand.

6.4.9 Stone shall be laid on a full bed of mortar. All joints should be properly flushed and packed.

6.4.10 Protection: -Care shall be taken during construction that edges of jambs, sills, heads etc are not damaged. In inclement weather newly built work shall be suitably protect by covering with gunny bags of tarpaulin.

6.4.11 Curing: -Masonry work shall be kept constantly moist on all the faces for a minimum period of seven days. Watering shall be done carefully so as not to disturb or wash out green mortar. In case of lime mortar, curing shall commence two days after the laying of masonry and shall continue for seven days.

6.4.12 Bond Stones: -Dressing of bond stone shall be done as for stones. In Coursed masonry full surface of the bed shall be dressed on the face, beds and joints and made into a squared block.

For pillars with a cross sectional area 0.25 sq m and below, the bond stone shall be a single full bond stone .For pillar exceeding 0.25 sq m either it shall be single bond stone or it shall be made up of four stones provided in two courses crossing the joints at right angle as directed by the EIC. The full bond stones shall be provided one at the bottom, one at the top and remaining in-between them at course not exceeding one meter apart center to center.

6.4.13 Plain Cement concrete Bond Stone :

Plain cement Concrete Bond stones of mix 1:3:6 Type C-1 may be provided in lieu of stone bond stones. The spacing of PCC bond stones shall be as specified for stone bond stone and shall be laid on the full section of the walling in one piece.

6.4.14 Construction Details :

Construction Details and respective specifications as given in brick work shall apply.

6.5 **Stone Masonry Construction:**

6.5.1. **Random Rubble Masonry, Uncoursed.**

6.5.1.1 **Dressing:** -Stone shall be hammered-dressed on the face, the sides and the beds to enable to come in proximity with the neighboring stones. The bushes on the face i.e. maximum depression from a straight edge held against the dressed surface shall not be more than 40 mm on an exposed face and 20 mm on faces to be rendered.

6.5.1.2 **Laying:** -Every stone shall be carefully fitted to the adjacent stone so as to form neat and close joint. Face stone shall extend and bond well in the back. These shall be arranged to break joints as much as possible and to avoid long vertical lines of joints. Thickness of joints shall not exceed 25 mm. Wall shall be leveled up at top of the plinths, sills and lintel level of openings, floor and roof levels and at top with minimum amount of chips and spalls.

The masonry shall be raised in plumb joints shall be either raked upto a depth not less than 10mm and finished flush as directed.

6.5.1.3 **Hearting Stones :-**The hearting or interior filling of a wall face shall consists of rubble stone not less than 15 cm in any direction, carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar. The hearting shall be laid nearly level with facing and backing.

6.5.1.4. **Insertion of Chips: -**Chips and spalls of stone shall be used wherever necessary to avoid thick mortar beds and joints and it shall be ensured that no hollow spaces are left anywhere in the masonry. Chips shall not be used below hearting stones to bring these up to the level of face stones .The use of chips and spans shall be restricted to the filling of interstices between the adjacent stone in hearting and these shall not' exceed 20 percent of the quality of a stone masonry. Spalls and pinning may show on faces.

6.6 Bond stones :-

Through bond stones shall be provided in walls up to 60 cm thick. In the case of walls above 60 cm thickness, bond stones of the full thickness of wall or a set of two or more bond stones overlapping each other by at least 15 cm shall be provided in a line from face to back. Bond stones shall not be less than 2 per sq m of face and staggered. No stone shall tail into a point. A distinguishing letter for subsequent verification shall marked on bond stones. Precast Cement Concrete (1:3:6) Type C-1 may be provided, cross section not less than 225 Sqcm and length equal to the thickness of wall at no extra cost.

6.6.1 **Quoin & jamb Stones:** -The quoin and jamb stones shall be selected stones, hammer dressed. Quoin stone shall not be less than 0.01 cu m in volume. Height of quoins and jamb stones shall not be less than 15 cm. Quoins shall be laid header stretcher alternately. Face bed and joints 5 cm and 2.5 cm respectively in case of granite or trap stone and 8 cm and 4 cm respectively in case of other stones, so that no portion of the dressed surface shall have a depression more than 6 mm from a straight edge held against the dressed surface.

6.7. Stone and Boulder Pitching

Stones shall be carefully hand packed in a manner to ensure a reasonably smooth surface and uniform thickness; spaces between the stones shall be minimized. Such spaces shall be wedged with spalls of suitable size, immediately following the packing of stones.

6.7.1 Ribs shall be provided at the junction of the slope with the ground and at the upper extremity of the slope. Ribs shall be rectangular in cross section with width equal to dimensions of stone along its longer axis and depth equal to depth of lining.

SECTION-7

STEEL, IRON WORK

7.1 **Indian Standards** The following IS with latest revision apply to this section:

I.S.No.	*Subject*
210-1993	Specification for Grey Iron casting (Fourth revision)
277-2003	Specification for Galvanised Steel sheet (plain and corrugated) (Sixthrevision)
278-2001	Specification for Galvanised Steel Barbed wire for fencing (Third revision)
280-2006	Specification for mild steel wire for general engineering purposes.(Fourth revision)
412-1975	Specificationforexpanded metal steelsheetsfor generalpurposes (Secondrevision)
432 (part I) 1982	Specificationformildsteeland mediumtensilesteelbarsand hard drawnsteelwirefor concrete reinforcement, Part I, Mild steel and medium tensile steel bars (Third revision)
432(Part 2) 1982	Specificationformildsteeland mediumtensilesteelbarsand hard drawnsteelwirefor concrete reinforcement Part-II, Hard drawn steel wire (Third revision)
733-1983	Specification for wrought aluminium and aluminium alloys bars, rods and sections (for general engineering purposes). (Third revisiQn)
737-1986	Specification for wrought aluminium and aluminium alloys sheet and strip for general engineering purposes (Third revision)
800-1984	Code of practice for general construction in steel (Second revision).
806 - 1968	Code of Practise for use of steel tubes in general building construction
808-1989	Dimensions for hot rolled steel beam, column, channel and angle sections. (Third revision)
811-1987	cold formed light gauge structural steel section. (Revised)
814 -2004	Specification for covered electrodes for manual metal arc welding of carbon and carbon managese steel (sixth revision)
816-1969	Code of practice for use in metal arc welding for general construction in mild steel (First revision).
818-1968	Code of practice for safety and health requirement in electric and gas welding and cutting operations (First revision).
822-1970	Code of procedure for inspection of welds.
2062-2006	Specification for hot rolled low, medium and high tensile structural steel (Sixth revision)
4923-1997	Hollow Steel sections for structural use : Specifications
4948-2002	Specification for welded steel wire fabric for general use (Second revision)
7205-1974	Safety code for erection of structural steel work.
7215-1974	Tolerances for fabrication of steel structures.
7307(Part 1)- 1974	Approval tests of welding procedures, Part I, Fusion welding of steel.
12753 - 1989	Eletrogalvanized coatings on round steel wire-specifications.
12778-2004	Hot rolled parallel, flange steel sections for beams, columns and bearing piles dimensions and section properties. (First revision)
12843- 1989	Tolerances for erection of steel structure

CAST IRON WORK

7.2 Structural Steel Work

Structural steel shall conform to

(a) Structural steel (fusion welding quality) 'fe 410-W' conforming to IS 2062-2006, Specification for structural steel (fusion welding quality). Fe 310-0 steel may be used for general purpose such as door and window frames, window bars, grills, steel gates, handrails, tie bars etc.

7.2.1 **Freedom from Defects:**

All finished steel shall be well and cleanly rolled to the dimensions, sections and weights specified. The finished

material shall be reasonably free from cracks, surface flaws, laminations, rough, jagged and imperfect edges, and all other harmful defects. Minor surface defects may be removed by the manufacturer by grinding provided that the thickness is not locally by more than 4 percent with a maximum of3 mm.

7.2.2 Structural steel of different sections, sizes and lengths shall be stacked separately. For each classification of steel separate areas shall be earmarked. Steel shall be marked with distinct painting marks for easy identification. All steel shall be so stored that it is always at least 15 cm above the ground level In case of long storage suitable protective measures shall be taken to prevent scaling and rusting.

7.3 Tolerances

Rolling and Cutting tolerances shall be as per IS 1852.

7.4 Chequered Plates

Chequered plates shall be as per requirements given in IS 3502-1994 Specification for steel chequered plates, Pattern of chequered plates shall be as directed. Plates shall be cleanly rolled and shall be reasonably free from harmful surface defects such as cracks, surface flaws, imperfect edges, etc. thickness of chequered plates specified shall be exclusive of the raised portion.

7.5 Bolts Nuts and Washers

7.5.1 Bolts and nuts shall be conforming to the relevant requirements given in the following IS specifications and as indicated:

(a) IS1363-2002 (Parts 1 to 3) Specification for hexagon head bolts, screws and nuts Of product grade 'C' (Size M5 to M64)
(b) IS 1367 (Parts 1 to 20) Technical supply conditions for threaded fasteners.
(c) IS 6639-2005 Specification for hexagon head bolts, for steel structures

7.5.2 The heads shall be forged. in one piece with the bolts and the nuts shall, be neatly made with the hole truly in the centre. The threads shall be full, true and deep. The heads and nuts shall be hexagonal unless square heads and nuts are specially indicated. Bolts and nuts Shall be cleanly finished and shall be sound and free from defects, which may affect their serviceability. Bolts and nuts shall be suitably protected against corrosion.

7.5.3 Washers :

Plain washers shall be of steel conforming to IS 2016-1974. Specification for plain washers: Spring washers shall conform to IS 3063-1994, specification for single coil, rectangular section spring washers for bolts; nuts and screws. The washer shall be free from cracks, burns, pits to other defects. The hole shall be reasonably concentric, with the outer periphery. All sharp edges shall be removed. .

7.6 Electrodes

Electrodes for metal arc welding of mild steel shall be as per IS 814-2004, Specification for covered electrodes for metal arc welding of structural steel Joints in materials above 20 mm thick and' all-important connections shall be made with low hydrogen electrodes. The mechanical properties of the weld deposit shall be such as to satisfy all the requirements such as tensile strength, elongation and impact strength of the parent, metal.

7.7 Workmanship Generally

Structural steel work riveted, bolted or welded shall be carried out described in IS 800-1984, code of practice for use of structural steel in general building construction.

Note :The Contractor shall prepare the shop Drawings indicating all details regarding cutlength, weld, bolts, joints, splicing, position etc., for the approval of the consultant before providing for any fabrication. All connections, bolts, welds etc., shall be neatly described in the drawing. Approval of shop Drawings by the consultant shall not relieve the Contractor from the responsibility for correctness of the dimensions and adequacy.

7.8 Straightening and bending:

All material shall be straight and if necessary, before being worked shall be straightened and flattened by pressure, unless required to be of curvilinear form and shall be fee from twists. Straightening of .steel by hammer blows is not permitted. All bending and cutting shall be carried out in cold condition, unless otherwise directed, in such manner as not to impair the strength of the metal.

7.9 Cutting and Machining

Member shall be. cut mechanically by saw or shear or by oxyacetylene flame. All sharp rough or broken edges and all edges of joints which are subjected to tensile or oscillating stresses shall be grounded. No electric metal arc cutting shall be allowed. All edges cut by oxyacetylene pores shall be cleaned of impurities and slag prior to assembly cutting tolerance shall be as follows:
(a) For member connected at ends +/- 1 mm.

(b) Elsewhere +/- 3 mm.

7.10 Welding

7.10.1 Welding shall be done by metal arc process unless otherwise permitted by the EIC, in writing, in accordance with IS 816-1969 Code of practice for use of metal arc welding of general construction. in mild steel, and IS 9595-1996 Recommendation of Metal .arc welding, regarding workmanship welding method, welding procedure with suitable electrodes and wire flux, combinations, quality of welds, correction of weld faults etc.

7.11 Approval and Testing of welders:

The contractors shall satisfy the EIC that the welder is suitable for the work up on which they will be employed.

7.12 Weld instruction:

The weld seams shall satisfy the following:
a. shall correspond to design, shapes and dimensions

b. Shall not have any defects such as cracks, incomplete penetration and fusion under cuts, rough surfaces, burns, blow holes, and porosity etc beyond permissible

7.12.1 During the welding operation and approval-of finished elements inspection ant test shall be made as shown in table 1 below

SL No	Inspection of test	Coverage	Procedure	Evaluation and remedy of defects
1	Inspection of welds seam appearance	All welds	Naked eye or lens	All faulty welds shall be rectified
2	Checking of sizes	At least one for each welds seam	Ordinary measuring instrument (Ruler templates)	Should faulty weld be found, all welds shall be checked and all defects shall be rectified
3	Mechanical test for Welding, procedures, Performance and Electrodes		As per IS :9595	As per IS :9595

The mechanical characteristics of the welded joints shall be as in IS: 9595

STEEL REINFORCEMENT

7.13 Steel Reinforcement for concrete

Steel Reinforcement shall be of mild steel plain bars, high strength deformed bars manufactured by thermo mechanical treatment process (TMT), steel wire fabrics and of grade / types as indicated. .

7.13.1 Mild steel plain bars shall be grade I or grade II as indicated and conforming to IS 432 (part I) -1982, Specification for mild steel and medium tensile steel bars. Alternatively mild steel bars shall be of grade E 250 conforming to IS 2062.

7.13.2 High strength Deformed Bars shall be produced by thermo mechanical treatment process (TMT) and shall be of grade Fe 415, Fe 500 or Fe 550 as indicated meeting all requirements confirming to IS 1786 - 1985 Specification for high strength deformed bars and wires for concrete reinforcement.

7.13.3 Fabric reinforcement shall conform to IS 1566-1982, Specification for hard drawn steel wire fabrics for concrete reinforcement.

7.13.4 Tolerance on size of Reinforcement Bars:

The tolerance on diameter of the mild steel bars will be +/- 0.5mm for bars upto and including 25mm dia with a total margin of 1 mm, and +/- 0.75mm for bars above 25mm dia with total margin of 1.5mm. The tolerance on the diameter in the case of coiled round bars shall be +/- 0.5mm upto and including 12mm diameter with a total margin of 1 mm Measurement shall be taken at point sufficiently away from the ends ensuring exclusion of heavy ends.

7.13.5 Tolerance on Weight:
The tolerance on weight of plain and deformed round shall be ±4 percent with a total margin of 8 percent for bars upto and including 8 mm diameter and +/-2.5 percent for bars over 8 mm diameter with a total margin of 5 percent.
Tolerances on weight of fabric reinforcement shall be +/- 6 percent

7.13.6 Freedom from defects:
All finished bars shall be well and cleanly rolled to the dimensions and weights specified: these shall be sound and free from cracks, surface flaws, laminations and rough, jagged and imperfect edges and other defects and shall be finished in a workmanlike manner.

7.13.7 Steel reinforcement shall be stored as to prevent distortion and corrosion. Any reinforcement that has "deteriorated or corroded or is considered defective by the EIC shall not be used in the work. Bars of different classification, sizes, and lengths shall be stored separately to facilitate use in such sizes and lengths so as to minimize wastage in cutting from the standard lengths

7.14 Bends and Hooks forming end Anchorages

7.14.1 In the case of binders, stirrups, links, etc the straight portion beyond a curve at the end shall be not less than 8 times the nominal size of the bar.

7.14.2 Bars specified to be formed to radii exceeding those given in the table X of IS2502.Code of practice for bending and fixing of bars for concreting need not be bent but the required curvature may be obtained during the placing.

7.14.3 Bending of bars:

Bars shall be bent to shape cold except that bars larger than 25 mm in size may be bent hot at cherry red heat (not exceeding 850°C) Hot bar shall not be cooled by quenching. A bar which shows any sign of cracks at a bend shall be rejected.

7.15 Splicing:
Where bars required are longer than those carried in stock, splices shall be provided as far as possible, away from the section of maximum stress and be staggered. Lap splices shall be considered as staggered if the centre to centre distance of the splices is not less than 1.3 times the lap length .The use of short length bars shall not be permitted. IS 456-1978, Code of practice for plain and reinforced concrete recommends that splices in flexural members should not be at section where the bending moment is more than 50 percent of the moment of resistance; and not more than half the bars shall be sed at a section.

7.16 Cover Blocks:
Cover blocks generally of PVC or cement mortar. shall be used to ensure the required cover for the reinforcement. 'The mortar or concrete used for the cover blocks or rings shall, be not leaner than the mortar or concrete in which they would be embedded.

7.17 Spacers:
Where multiple rows of reinforcement are provided distances between successive rows shall be properly maintained while concreting by providing suitable spacer bars.

7.18 Placing Reinforcement:

All mill scale, loose or scaly rust, oil and grease or any coating that will destroy the bond shall be thoroughly cleaned off the steel reinforcement with a stiff wire brush or approved means before it is placed in forms. Steel reinforcement when placed in the forms. shall be properly braced, supported, or otherwise held firmly in position so that placing and ramming/vibrating of concrete does not displace it. -'

7.18.1 It shall be ensured that all reinforcement can be properly placed. Congestion of steel shall be avoided at points where members intersect.

7.19 Tolerance in Placing of reinforcement:

Unless otherwise indicated, reinforcement shall be placed within following tolerance.

a) For effective depth 200 mm or less = +/-10mm

b) For effective depth more than 200mm=+/-15mm

The cover shall in no case be reduced by more than 1/3 of specified cover or 5 mm whichever is less.

7.20 Steel Wire Fabric Reinforcement

Hard drawn steel fabric shall conform to IS 1566-1982 specification for bard drawn steel wire fabric for concrete reinforcement, MESH size, weight, size of wire for square and oblong welded wire fabric shall be indicated. The fabric shall be formed by spacing the main and the cross wire, which shall be fixed at the point of inter-section by electric welding.

"Since fabric is supplied in long rolls it is rarely necessary to have a joint of the main wires. In structural slab laps in regions, of maximum stress shall be avoided. When splicing of welded wire fabric is to be carried out, lap splices of wires shall be made so that overlap measured between the extreme cross wires shall be not less than the spacing of Cross wires plus 10 cm. For edge laps a lap of 5 cm shall be provided.

7.21 Welding of Reinforcement

Welding of bars where indicated or agreed to by the EIC, in writing, in lieu of lapping shall be done in accordance with IS 2751-1979 code of practice for welding of concrete construction. Welding in general shall be done as described for structural steel work.

7.21.1 Bars up to and including 20 mm dia shall be lap welded and those larger than 20 mm dia shall be butt-welded. In case of lap welds, the length of lap shall be five times the dia or 100 mm whichever is greater. The throat thickness shall not be less than 3 mm for bars up to 16 mm dia and 5 mm for bars over 16 mm dia and up to 20 mm dia.

Butt Welding

Where it is not possible to rotate bars for welding in flat position the axis of the bars shall be horizontal and the respective axis of the welds shall be vertical .The edge preparation for inclined bars shall be such that welding is done only on sides. All the bars to the butt-welded shall be aligned and set up in position with their axis in one straight line. This may be done in a jig or by means of a clamp or by using guides. Rotation of the bars shall be avoided, until they are adequately welded.

Lap Welding

Edge preparation is not necessary for lap welds.

Finish:

The profile of the welds shall be uniform, slightly convex and free from overlap at the toes of the welds. The weld face shall be uniform in appearance throughout its length. The welded joint shall be free from undercut. The joints in the weld run shall be as smooth as practicable and shall show no pronounced hump or crater in the weld surface. The surface of the weld shall be free from porosity, cavities and trapped slag.

7.22 Barbed Wire

Galvanised steel barbed wire for fencing shall confirm to IS 278-2001, Specification for galvanized steel barded wire for fencing. The galvanized barbed wire shall be manufactured from galvanized mild steel wire conforming to IS 280-2006, Galvanised coating of steel wire shall conform to the requirements as laid down for medium coated wire in IS 4826, Hot dipped galvanized coatings on round steel wires. The barbed wire shall consist of two line wire 2.24 mm nominal dia, one or both containing 2 mm dia barbs at 75 mm centre to centre and weighing 97 to 106 Kg per Km. The barbs shall have a length of not less than 13 mm and not more than 18 mm. The points shall be sharp. The line and point wires shall be circular in section, free from scales and other defects and shall be uniformly galvanized. The

line wire shall be in continuous lengths and shall not contain any welds other than those in the rod before it is drawn. Barbed wire shall be stretched and fixed in specified number of rows and diagonals. The diagonals wires will be interwoven with horizontal wires by fixing the old rows of wires, then the diagonal cross wires and lastly the even rows of wires. The barbed wires shall be held to the RCC posts by means of GI staples fixed to wooden plugs or GI binding wire tied to 6 mm bar nibs fixed while casting the posts. The barbed wire shall be fastended to the ballies/timber posts by means of GI staples, driven into the post. Turn buckles and straining bolts shall be used at the end posts where indicated. .

7.23 Mild Steel Wire

Mild steel wire for fencing, mattresses shaped nets, etc. shall be galvanized and shall conform to IS 280-2006, specification for mild steel wire for general engineering purposes. All finished steel wire shall be well and cleanly drawn. Wires shall be sound and free from splits, surfaces flaw, rough jagged and imperfect edges and other harmful surface defects. Zinc coating shall be smooth, even and bright. Fixing arrangements shall be as directed.

7.24 Welded Steel Wire Fabric.

Wire fabric for general use such as fencing, windows grills etc. shall confirm to IS 4948 – 2002, specification for welded steel wire fabric for general use. The longitudinal and transverse wire shall be securely connected at every intersection by process of welding. Wire fabric shall be rust proof and free from injurious defects. The mesh size and the size of wires shall be as indicated. Steel wire fabric in each panel shall be in one whole piece. Wire fabric shall be fixed with wooden beads or MS flats as indicated.

7.24.1 The welded steel wire fabric in fencing shall be stretched and fixed to the posts by means of G.I staple fixed to wooden plugs or G.I binding wire tied to 6 mm bar nibs, fixed while casting the posts 25 cm apart or as indicated.

7.25 Fan Clamps

Circular cast iron box for ceiling fan clamps shall be fixed during the laying of RCC slabs. The sizes of the box shall be 10 cm overall dia, 75 mm height, with rim thickness of 5 mm. Bottom and top lid shall be 1.5 mm thick mild steel sheet with its top surface hacked for proper bonding with the concrete. Lid shall be screwed to the box. Fan clamps shall be made of 12 mm dia mild steel bar bent to shape with its end bent as directed.

SECTION -8

PLASTERING AND POINTING

8.1 Indian Standards

The following IS apply to this Section:

I.S.No.	Subject
1542-1977	Specification for sand for plaster (First revision)

8.2 Definitions

a) The term 'Plastering' shall cover all type of rough or fair finished plastering, rendering, floating and setting coat or finishing coat, screed, etc., in cement mortar.

(b) "Dubbing out" shall mean filling in hollows in the surface of wall and roughly leveling up irregular or out of Plumb surface prior to rendering.

(c) "Rendering" or "rendering out" shall mean the plaster coat, which is applied following the "Dubbing out" or the final coat in case of one coat work.

(d) "Floating coat" shall mean the second coat in a three coat plaster work, to bring the rendering coat to a true and even surface before the setting or finishing coat is applied.

(e) 'Setting or Finishing coat' shall mean final coat in a two or three coat Plaster work.

(f) "Thickness of Plaster' shall mean the minimum thickness at any point on a surface. This dose not include thickness of dubbing out.

(g) The term "even and fair" as referred to finishing of the plastered surface shall mean a surface finished with a wooden float;

(h) The term "even and smooth" as referred to finishing of the Plastered surface shall mean a surface leveled with wooden float and subsequently smoothed with a steel trowel.

MATERIALS

8.3 Cement

Unless otherwise indicated, cement shall be .Ordinary Portland Cement 43 grade confirming to IS-8112-1989 as specified in Section for concrete.

8.4 Sand

Unless otherwise indicated, sand for plastering and pointing shall conform to IS 1542-1977, Specification for sand for Plaster. Sand shall consist. of natural sand, except where, crushed stone sand or crushed gravel sand or a combination of any of these are indicated. The sand shall be hard, durable, clean and free from adherent coating and organic matter and shall not contain any appreciable amount of clay balls. Sand shall be obtained from approved sources.

8.4.1 **Deleterious Materials:**

Sand shall not contain any harmful impurities such as iron pyrites, alkalies, salts, coal, mica shade or similar laminated materials, soft fragments, sea shells and Organic impurities in such quantities as to affect adversely the hardening, the strength and the durability or the appearance of the Plaster or applied decoration or to cause corrosion of metal lathing or other metal in contact with Plaster. The maximum quantities of clay, fine silt, fine dust shall be not more than 5 per cent by weight. Origin impurities in the sand shall not exceed the following limit 'that the colour of the "liquid is low that indicated by comparison with the standard solution specified 6.2.2. of IS 2386 (Part II)-1963'.

8.5 The particle size grading of sand for plaster and pointing work shall be as under, unless otherwise specified to conform to the sample maintained by the GE for the purpose.

IS Sieve designation	Percentage Passing by Weight
10mm	100
4.75 mm	95-100
2.36 mm	95-100
1.18mm	90-100

600 microns	80-100
300 microns	20-65
150 microns	0-5

NOTE : Where the grading falls outside the limits of grading zones of sieves other than 600 micron IS sieve by a total amount not exceeding 5 percent, it shall be regarded as falling within the grading. This tolerance shall note be applied to percentage passing the 600 micron IS sieve or to percentage passing any other sieve size on the finer limit.

NOTE :-Sand whose grading falls outside the above limits shall be processed to comply with the standard by screening through a suitably sized sieve and/or blending with required quantities of suitable sizes of sand particles.

8.6 Aggregates
All aggregates other than sand shall conform to IS 383-1970, Specification for course and fine aggregates from natural sources for concrete. Refer Section 4-concrete.

8.7 Integral water Proofing Compound
Refer Section 4-Concrete.

8.8 Metal Lathing
Metal Lathing shall be of wire netting or expanded metal is indicated.

8.9 Lime Putty (Neeru)
Lime Putty shall be obtained by slaking fat lime with fresh water and sifting it. Putty shall be kept moist until used and the quantity prepared at a time shall not be more than that can be consumed in 7 days. .

8.10 Water
Water used for mixing and curing shall be clean, free from deleterious matter and also from unusual proportions of dissolved salts. Sea water or tidal actuary or brackish water shall not be used. Water fit for drinking is normally suitable.

WORKMANSHIP Scaffolding
Where possible, independent scaffolding shall be used to obviate the subsequent restoration of masonry in put log and other bricks in the work. Stage scaffolding shall be provided for ceiling plaster.

Preparation of Mortar for Plastering and Pointing Cement and Cement Lime Mortar:
These shall be prepared as described in Section 5-brickwork. These shall quantities as required and applied within 30 minutes of mixing. .

Proportioning Mixes:
All mixes specified are by volume.

Preparation of Background for Application of Plaster Cleanliness:
All dirt, dust and other foreign matter on masonry and laitance on the concrete surface shall be removed by watering and brushing as required. If the background contains soluble salts, particularly sulphates, the application of plaster shall be done only after the efflorescence of the salt<; is complete and the efflorescence is completely removed from the surface. Any trace of algae or moss formation shall be removed.
Joints in brickwork, stone masonry and hollow block masonry be racked out to a depth of not less then 10 mm as the work proceeds. Local projections in brickwork and masonry beyond the general wall face shall be trimmed off where necessary.

Roughness:
Smooth surfaces of in-situ concrete walls and ceilings etc. shall be roughened by wire brushing, if it is. not hard; and by hacking or bush hammering if it is hard, to provided for proper adhesion. Projecting burrs of mortar because of gaps at joints in shutting shall be removed. The surface shall be scrubbed clean with wire brushes. In addition concrete surface shall be pock marked with a ponot less then 3 mm deep.
Suction Adjustments:
Adequate drying intervals shall be made by tool at spacing of about 50 mm, the pocks made to be allowed between

the erection and plastering to bring the surface suitable for suction adjustment. High rate of suction makes the plaster weak porous and friable. The wall shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry in spots, such areas shall be moistened again to restore uniform suction. Excessive water leads to failure of bound between the plaster and the background.

Evenness:
Any local unevenness must be leveled and projections removed to avoid variance in thickness of plaster.

8.11 Immobility

Differential movements between the background and the plaster due to moisture change, temperature change, structural settlement, deflection, etc. causes cracks. The major part of such movements shall be allowed to set in before the plaster is applied.

8.12 **Precaution against Discontinuity Background:**

All straight cut groove through the plaster at the junction of wall to ceiling may be provided where directed.
8.13 Holes left in the wall" after removing scaffolding, shall be field up with the respective masonry and the patch plastered up true and in conformity with rest of the wall so that no sign of Patch work shows cut.

8.14 Plastering-Generally

8.14.1 The type and mix of mortar for plastering, the number of coats to be applied, and surface finish of the plaster and the background to which the plaster is to be applied shall be as indicated.

8.14.2 The mortar of dubbing out and rendering coat shall be the same type and mix. Dubbing out may be executed as a separate coat or along with the rendering coat.

8.14.3 Plastering operations shall not be started until all necessary fixtures such as door and window names, mantle pieces are completed and all pipes and conduits to be embedded have been installed and surface to be plastered have been passed by the EIC.

8.14.4 **Protection:**
All existing work and fitting that are likely to be damaged in the application of plastering shall be protected. Care shall be taken to avoid, as fur as possible, the splashing of mortar on to the finished surfaces such as joinery, paintwork and glazing; all such splashes shall be cleaned off immediately.

8.14.5 Screeds 15x15 cm shall be, laid vertically and horizontally not more than 2m apart to serve as guide in bringing the work to an even surface.

8.14.6 Plastering shall be done from top to bottom and care shall be taken to avoid joints in continuous surface.

8.14.7 **Maintenance of Proper Time Intervals:**

To avoid breakdown of adhesion between successive coats, drying shrinkage of first coat shall be allowed to be materially completed before a subsequent coat is applied.

8.14.8 All comers arises angles, junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering of comers, arises and junctions shall be carried out with proper templates to the required size. Plastering of cornices, decorative features, etc. shall normally be completed before the finishing coat is applied.

8.14.9 In suspending the work at the end of the day, the plaster shall be cut clean to the both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scraped clean and wetted with cement slurry before plaster is applied to the adjacent area.

8.14.10 Partially set and dried mortar shall not be retampered for use.

8.14.11 **Cleaning on completion:** On completion all work affected by plastering and pointing shall be left clean

special care shall be taken when removing any set mortar nom glass and joinery, etc. to avoid damaging their surface.

8.14.12.**Trueness of Plastering System:**
The finished plaster surface shall not show any deviation more than 4 mm when checked with straight edge of 2 m length placed against the surface.

8.15 **One Coat Plaster Work**
Mortar shall be firmly applied to the masonry walls and well pressed into the joints and forcing it into surface depressions to obtain a permanent bond. The plaster shall be laid in a little more than the required thickness and leveled with the wooden float. On concrete walls, rendering shall be dashed on to roughened surface to ensure adequate bond. The dashing of rendering coat shall be done using a strong whipping motion at right angles to the face of walls. The surface shall be finished even and fair, unless indicated to be finished even and smooth. .

8.16 **Two coat Plaster Work**
8.16.1 **First Coat**:
The first coat of the specified thickness shall be applied in a manner similar to one coat plaster work. Before the first coat hardness, the surface of the cement plaster shall be scored to provided key for second coat. The rendering coat shall be kept damp for atleast two days. It shall then be allowed to become thoroughly dry.

8.16.2 **Finishing coat**
Before starting to apply the finishing coat, the second coat shall be damped evenly. Mortar shall be applied from top to bottom, wherever possible, in the operation to eliminate joining marks. The surface shall be finished as specified for one coat plasterwork.

8.17 **Neeru Finish**
After applying and finishing the undercoats and before they set the finishing coat of specially prepared lime putty about 1.5 mm thick shall be well polished with a trowel.

8.18 Sand faced Plaster
After the undercoat of cement and sand mortar 1:4., not less than 10 mm thick, has been applied and finished, the final coat of cement and sand mortar 1:4 shall be applied to a thickness not less than 5 mm and brought to an even surface with a wooden float. The surface shall than be tapped gently with a wooden float lined with cork to retain a coarse surface texture; care being taken that the tapping is even and uniform.

8.19 **Curing**
Each coat shall be kept damp, continuously for at least two days. Moistening shall commence as soon as the .plaster bas hardened sufficiently and is not susceptible to injury.' The water shall be applied preferably by using a fine fog spray. Soaking of wall shall be avoided, and only as much water as can be readily absorbed shall be used. Excessive evaporation on the sunny or windward sites of buildings in hot dry weather shall be prevented by hanging mattings or gunny bags on the outside of the plaster and keeping them wet.

8.20 After the completion of finishing coat, the plaster shall be kept wet for at least seven days and shall be protected during that period from extremes of temperature them wet.

8.21 **Water Proofing Plaster**

Integral water proofing compound shall be mixed with cement in the proportion indicated by weight Care shall be taken to ensure waterproofing material gets well and integrally mixed with cement and does not run out separately when water is added.

8.22 **Metal Lathing**
Lathing shall be tightly stretched before nailing and secured with 25 mm galvanized steel staples at 20 cm centers, if the studding is of wood and with 0.90 mm iron tying if the studding is of steel. Edges of lathing shall be lapped 50 mm at the sides and wired together with 1.25 mm typing wire. Overlaps shall not occur at angles or curves. End laps shall occur only at supports. Before plastering the surface of metal 'lathing shall be brushed over with thin cement slurry.

8.23. **Pointing**

8.23.1 The type and mix of mortar for pointing and the type of pointing shall be as indicated.

8.23.2 **Racking out joints**

Joints of new brick work or block or stone masonry shall be raked out (without damaging the brick work or masonry) when the mortar is green to such a depth that the minimum depth of new mortar measured from either the sunk surface of the finished pointing or from the edge of the brick / block shall not be less than 10 mm. The raked out joints shall be well wetted before application of mortar.

8.23.3 **Application of Mortar and Finishing:**
The mortar shall be pressed firmly into the raked out joints, with a pointing trowel according to the type of pointing required. The mortar shall not be spread over the corners, edges or the surface of the ' masonry. When pointing is air dry, it shall be rubbed smooth with the trowel and shall then be finished with proper tool. The surface of masonry shall be cleaned of all mortar.

8.24 **Pointing on Random Rubble / Polygonal Rubble Stone Masonry:**
The pointing shall follow the natural irregularities in line and surface of stone.

8.25 **Raised Pointing (Masons V Joints and Bastrad Truck):** Raised pointing shall project from the wall facing with its edges cut parallel so as to have a

8.25.1 **Curing :** The pointing shall be kept wet for seven days. During this period it shall be suitably protected from all dangers

SECTION -9

WHITE WASHING, COLOUR WASHING AND DISTEMPERING

9.1. Indian standards:
The following IS apply to this section:

I.S. No.	Subject
63 – 1978	Specification for whiting for paints and putty (second revision)
428 -2000	Specification for distemper, oil emulsion, colour as required (first revision)
5411-(Part-l)-1974	Plastic emulsion paint part-1 for interior use(first revision)

MATERIALS

9.2 **Distemper, Oil Emulsion:**
Distemper of required colour and shade shall be obtained ready mixed conforming to IS: 428-2000 Specification for distemper, oil emulsion. The material shall be in the form of a homogeneous paste free from odour of putrefaction as such and when mixed with water.

9.3 **Protective Measures:**

Surfaces of doors, windows, floors, articles of furniture, etc., and such other parts of the building not to be treated shall be protected from being splashed upon. Such surfaces shall be cleaned of splashes of white wash, colour wash, distemper, etc. The contractor shall be responsible for any damage to the fittings, fixture and furniture,

9.4 **Scaffolding:**
Wherever scaffolding is necessary, it shall be erected in such a way that, as far as possible, no part of scaffolding shall rest against the surface to be treated. A properly secured and well tied suspended platform (JHOOLA) may also be used. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For work in ceilings, proper stage scaffolding may be erected, where necessary.

9.5 Acrylic Distemper

9.5.1 Preparation of Acrylic Distemper
The distemper shall be thinned with water or any other prescribed thinner in the proportion of 1 kilogram of distemper to 600 ml of water or in the proportions as specified by the manufacturers, which shall invariably be followed. Add water slowly to the paste while continuing to stir the mixture.

9.5.2 Preparation of surfaces
The surface shall be thoroughly cleaned of dust, dirt efflorescence, chalking, grease, mortar drops and other foreign matter. The surface shall be sand papered with grade I abrasive paper and Dusted off to achieve an even and smooth surface. If surface so obtained is uneven, it shall be brought to a perfectly even surface by applying putty and allowing it to dry completely and then it shall be rubbed with the abrasive paper and dusted off.

9.5.3 Priming Coat.
Apply a coat of wall primer as per manufacturer's instructions and allow it to dry for 6 -8 hours. Smoothen the surface by filling dents with thin coats of wall putty and allow drying for 4-6 hours. Sand the surface with Emery paper 180 and wipe clean. Apply another coat of primer and allow drying for 6 -8 hours. Sand the surface with Emery paper 320 and wipe clean.

9.5.4 Application of Acrylic Distemper.
After the priming coat has dried, the surface shall be lightly sandpapered with zero grade abrasive paper, taking care not to rub out the priming coats and then dusted off. Prepared distemper shall then be applied with brushes in coats comprised of horizontal strokes immediately followed by vertical ones which together constitute one coat. Distempering shall always be started from ceiling down. A uniformly finished surface without patches, brush marks distemper drop etc shall be obtained.

9.5.4.1 Distemper shall be applied in dry weather with double bristled distemper brushes. The first coat shall always be of lighter tint than that required finally and the subsequent coat shall be applied only after the previous one has thoroughly dried for at least 24 hours.

9.5.4.2 The distemper shall be thinned and prepared using prescribed thinner as per manufacturer instruction.

9.5.4.3 Workability of acrylic distemper surface shall be tested with wet cloth. Oil bound distemper shall not come out when surface is rubbed with wet cloth.

SECTION -10

PAINTING

10.1 **Indian standards .** The following I.S. apply to this section.

I.S. No.	Subject
5-1978	Colours for ready mixed paint & enamels (third revision)
75-1973	Linseed oil, raw & refined (Second Revision)
102-1962	Ready mixed paint, brushing, red lead, nonsetting, priming (Revised)
104 -1979	Ready mixed paint, brushing, zinc chrome, priming (second Revision)
109-1968	Ready mixed paint, brushing, priming, plaster to IS colour No. 361, Light stone & No. 631 Light grey (First revision)
157-1950	Ready mixed paint, brushing, acid & alkali resistant, lead free, for general purposes, IS colour No.446 red oxide, No. 537, Signal red No. 632 Dark admiralty grey & black & other colours as required
158-1981	Ready mixed paint, brushing, bituminous, black, lead free, acid, alkali, water & heat resisting (Third revision)
159-1981	Ready mixed paint, brushing, acid resisting for protection against acid fumes colour as required. (First revision)
162-1950	Ready mixed paint. brushing, fire resisting, silicate type for use on wood colour as required.
164-1981	Ready mixed pant, brushing, for road marking (First Revision)
212-1983	Crude coal tar for general use (Second revision)
218-1983	Creosote & anthracite oil for use as wood preservative (Second revision)
290-1961	Coal tar black-paint (Revised)
341-1973	Black Japan, type A, B & C (First revision)
345-1952	Wood filler, transparent, liquid.
348-1968	French polish (First revision)
349-1981	Lacquer, cellulose, nitrate clear, finishing glossy for metal (First revision)
423-1961	Plastic wood for joiner's filler (Revised)
430-1972	Paint remover, solvent type, non-flammable (Second Revision)
431-1972	Paint remover, solvent type, flammable (Second revision)
524-1983	Varnish, finishing, exterior synthetic (second revision)
640-1956	Ready mixed red oxide paint for Hessian (colour unspecified)
1232-1964	Ready mixed paint, brushing yellow ochre, semi-gloss for general purposes (Revised)
1236-1958	Ready mixed paint, brushing oil gloss, heat resisting, to IS colour No.630 Deep buff.
1504-1974	Beeswax (Second revision)

2074-1979	Ready mixed paint, air drying, red oxide zinc chrome priming (first revision)
2339-1963	Aluminium paint for general purposes in dual containers.
2932-1974	Enamel, synthetic, exterior, undercoating & finishing (First revision)
3536-1966	Ready mixed paint, brushing, and wood primer, pink.
3585-1966	Ready mixed paint, aluminium, brushing, priming, water resistant for woodwork.
3678-1966	Ready mixed paint, thick white, for lettering.
5083-1988	Knifmg stopper.(Second revision)
5411(Part-1)-1974	Plastic emulsion paint, Part-I, for interior use (First revision)
5660-1970	Ready mixed paint, brushing, aluminium red oxide primer.
5691-1970	Lacquers, cellulose, pigmented finishing, glossy.
7164-1973	Stopper.

10.2 Paints & Allied Materials-Generally :

10.2.1 All paints & allied materials shall be of quality not inferior to that required by the relevant IS specification. Paints, etc. shall be ready mixed. The colour & tints of paints , unless indicated shall be as approved by the ElC.

10.2.2 The contractor shall inform the EIC, well before he places bulk order for the materials ,the names of the brands & manufactures of paints he proposes to use in the works & submit samples thereof & obtain prior written. approval of the ElC.

10.2.3 The whole of the materials required for the painting work shall be obtained direct from, approved manufacturers or their authorized agents & shall be brought to the site in makers, drums, k gs, etc. with seals unbroken.

10.2.4 **Compatibility of paints :**

Before considering the application of undercoats, it shall be made sure that those selected are compatible with each other. The primer, filler, undercoating & finishing paints shall be of paints made by the same manufacturer.

10.2.5 **Storage of paints:**
All containers of paints, thinners & allied materials shall preferably be stored in well ventilated room free from excessive heat, sparks or flame or direct rays of sun. The containers of paint shall be kept covered or properly fitted with lid & shall be kept open except while using. Materials, which have become stale or fat due to improper & long storage shall not be used or mixed with usable stuff.

10.3 **Painting Work-Generally**

10.3.1 The type of paint & allied material to be the number of coats to be applied, the preparatory treatment appropriate to the surface & any special process or treatment to be adopted shall be as indicated.

10.3.2 Where more than one coat is indicated, each coat shall be approved, in writing, by EIC before the next coat is applied.

10.3.3 No painting work shall be carried out in wet & very humid weather when there is danger of dew or weather is otherwise unfavourable. No painting or any other process likely to be damaged by dust shall be carried out in windy weather.

10.3.4 Painting except the priming coat shall be taken in hand after all other builder's work is finished

10.3.5 The paint in the drum shall be thoroughly mixed prior to application. The materials shall be mixed, prepared & applied strictly in accordance with the instructions or recommendations 'of the manufacturers except where otherwise directed by the EIC. The paints shall be mixed periodically during brushing.

10.3.6 Addition of Thinners:

Thinners (such as mineral turpentine) shall not be added to paints on the feeling that the consistency of the paint supplied by the manufacturer is too thick. If the paint has been manufactured to conform to the specifications, the paint shall have the correct consistency & shall not require further dilution. If there is any doubt, the viscosity of the paint may be checked. If a slight adjustment of viscosity is necessary thinner, recommended by the manufacturer shall be used after prior approval of EIC.

10.3.7 The surface must be thoroughly dry & clean before painting work is proceeded with at all stages or processes of work. All dust, dirt, rust, & grease shall be removed before painting is started. Painting shall follow immediately after pre-cleaning or pre-treatment; any contamination which may occur in the intervening period shall be removed. Every individual coat shall be properly applied, reasonably level smooth & free from runs & holidays (minute uncovered areas).

10.3.8 **Drying Time**

For paint film to perform in unison, each coat of paint shall be allowed to dry sufficiently but not excessively before a subsequent coat is applied. Manufacturers' instructions for drying time shall be adhered to properly

10.3.9 **Flatting down :**
Cutting of primer & undercoat shall be done to provide a key for subsequent coats. The primer coat, with or without putty, shall be dry cut & the undercoat with or without putty for spot work, shall be wet cut with waterproof emery paper No. 220/240. In the cas.e of under coatings without putty, surface prior to finishing coat, shall be wet cut with waterproof emery paper No. 280/320. The surface shall be dry, clean & free from dust before subsequent coat is applied.

10.3.10 **Appearance:**
The painted surface shall have a clean uniformly coloured appearance. No hair marks from the brush or clogging of paint puddles in the corner of panels, angles of moulding etc. shall be left on the work.

10.3.11 **Colour**
Correct colour matching shall be judged against.a sample having the same type of surface as that to which the paint has been applied.

10.3.12 In painting doors & windows, the putty round the glass panes shall also be painted but care shall be taken to ensure that no paint, stains, etc. are left on the glass. Tops of shutters & surfaces in similar hidden locations shall not' be left out in painting. .

10.4 Scaffolding
The scaffolding as required shall be erected for proper execution of work. If the work can be done safely with a ladder or jhoola these may be permitted in the place of scaffolding.

10.5 Brushing of painting

10.5.1 **Generally:**
Clean pliable brushes free from loose bristles shall be used. Paints shall not show objectionable pulling under the brush. The brush shall be such that the paint does not show lapping streaks & works satisfactorily under it.

10.5.2 Cleaning of paint containers shall be done only with paint thinners, which are compatible with the paint to be filled.

10.5.3 **Brush Application:**

While applying. the paint, the brush shall be held at an angle of approximately 45 degree to the vertical surface & several light strokes applied in the area to be painted., so as to. first transfer the paint to the surface. During painting, the brush shall also be turned around 180 degree in order to ensure that the paint on both the faces of bristles is utilized completely. The paints are then spread with gentle pressure so as to hide the surface & produce a uniform coating. Ensure that the ends & not the sides of the bristles come in contact with the surface during painting. The paint shall be applied, first using vertical strokes until the surface are covered, & then brushed crosswise for complete coverage with light strokes, so as to smooth out laps & brush marks, & finally laid off with vertical strokes.

10.6 Painting Woodwork –Not applicable

10.7 **Preparation of Cement and cement concrete surfaces:**
New surfaces to be painted should be dried thoroughly. Before painting the surface shall be thoroughly brushed to remove all dirt and other foreign matter incidental to building operation.

10.7.1 Any loose or uneven areas or any major cracks or defects in the cement concrete or plaster background shall be cut out and made good and the repairs allowed to dry thoroughly. Cracks may be wetted thoroughly prior to filling or priming paint may be applied to the sides of creeks to avoid undue absorption of water & subsequent shrinkage & filling. Minor cracks may be filled with cement mortar. Fine cracks in lime plaster may be filled with a mixture of linseed oil putty & white lead.

10.8 **Preparation of Masonry surface:**

All mortar joints shall be brought to a sound condition before painting operations are started. In the case of new brick work painting shall be deferred for at least three months after completion of masonry work & longer if the weather during the period becomes unfavourable for drying. Dirt may be removed by washing with water.

10.9 **Preparation of surfaces Generally**:

10.9.1 Any existing paint showing extensive flaking, bleaching, or saponification (as shown by stickiness or the presence of yellow soapy runs) shall be removed by scraping & washing & the surface allowed to dry completely.

10.9.2 Any existing fungus or mould growth shall be completely removed. The surface shall be thoroughly scraped & rubbed down with bristle & brush sand paper & then washed down with clean water & allowed to dry.

10.9.3 If efflorescence appears, painting shall be deferred until it ceases. Efflorescence shall be removed by -drying brushing, in no case the efflorescence salts shall be removed by washing.

10.9.4 Dry distempers and lime wash shall be totally removed prior to re-painting. It may sometimes be necessary to wet the surface before scrapping. This shall not be overdone and all surfaces shall be perfectly dry prior to the application of any priming coat.

10.9.5 Local defective patches shall be treated individually by removing all loose or softened paint and bringing forward the treated patches with primer and undercoating before applying a fresh coating over the whole area.

10.9.6. Minor defects are frequently more apparent once the priming or. the first coat has been applied and if any further stopping or filling is done over the first coat, The area must be brought forward with appropriate paint to restore even porosity over the surface.

SECTION –11

LIST OF APPROVED MAKE/VENDOR

Item	Approved Make /manufacturer
Cement	Ultra Tech, ACC, Century, Grasim, Ambuja
Reinforcement Steel	SAIL, TISCO, RINL
Structural Steel	TISCO, SAIL, RINL
Grouts/Admixtures/Water proof Chemicals/ Construction Chemicals	BASF ,FOSROC, PIDILITE, SIKA, SWC,
MS Tubes	Jindal, TATA, Indian Tube, Zenith
PVC Pipes	Finolex, Sudhakar ,Jain, Kisan,

Plywood/ Shuttring plywod	Century, Kit ply, Green ply
Paints/Distemper	Asian Paints, Berger, Jenson Nicholson, ICI
Welding Electrodes	Advani Oerlicon, Essab
White cement	JK ,Birla
Particle Board	Novapan, Indian plywood, Kitply, Green ply.

Notes :-
The make/brand name mentioned elsewhere in this document or BOQ shall also be applied for the respective items/materials. .

The make/brand/manufacturer's name mentioned above is indicative and provided as a guide only. All the material shall conform to the specifications in the BOQ and relevant IS Codes or other international codes if relevant IS codes are not available.

In case the relevant material with above brand names are not available or the same are not in conformity with IS, the contractor shall provide equivalent or superior brand materials as approved by Engineer in Charge. Indication of brand name as above does not relive the contractor from using the material with superior specification as per the directions of Engineer In Charge.

The MES SSR Part-I, Specifications -2009 shall form an integral part of the contract. The specifications on materials, workmanship, quality control specified in SSR PART-1 –2009 will be applicable for all the items required to be executed for the completion of work irrespective of those specified in this Technical specification book let or not.

List of Tests:-(as per Client Instrcution)
***Few of the below mentioned tests has to be carried out as per Client/CDAC Requirements.**

	Item	Description	Tests to be carried out at
		CIVIL WORKS	

1	Cement	Normal Consistency (IS 4031)	At Field / Outside Laboratory
		Fineness &. Soundness(IS 4031)	— do —
		Compressive strength(IS 4031)	— do —
		Chemical composition	At Outside Laboratory
		Intial & Final Setting Time(IS 4031)	At Field Laboratory
2	Coarse Aggregate	Sieve Analysis - particle size distribution (IS 2396}	At Field Laboratory
		Percentage of Clay Umps (IS 2386)	— do —
		Specific Gravity & Water absorption (IS 2386)	— do —
		Flakiness index & Elongation Index (IS	— do —
		Percentage of minerals finer than 75 microns (IS 2386)	— do —
		Aggregate Crushing value (IS 2386)	Outside laboratory
3	Fine Aggregate / Sand	Sieve Analysis - particle size distribution (1S 2386)	At Field laboratory
		Percentage of Clay Lumps (IS 2430)	— do —
		Percentage of material: finer than 75 microns (IS 2386)	— do —
		Specific Gravity Water absorption (IS 2386)	— do —
		Bulkage (IS 2386)	— do —
		Surface moisture (IS 2386)	— do —
4	Water	Chemical analysis for determining suitability for use in concrete (IS 3025) i) P^H Value ii) Limits of acidity iii) Limits of alkality iv) Percentage of solids a)chlorides b)suspended matter c)sulphates d)Inorganic solids	Outside laboratory (At starting of the Project, at every month and at every' change of source)

S.No	Item	Description	Frequency	Tests to be carried out at
5	Admixtures	Chemical Composition	As desired by the Owner & Consultant	Outside Laboratory
6	Reinforcement steel	Cross Sectional area	For Every 20MT or part thereof for each item / dia and at change of source	Outside Laboratory
		Bend and Re-bend Test(IS 1599)	— do —	— do —
		Tensile strength/Ultimate Tensile Stress (IS 1608)	— do —	— do —
7	Concrete	Workability (SlumpTest) – IS 456	As desired by the Owner & Consultant	At Field Laboratory

		Compressive Strength (Cube Test) – (IS 456)	For each concrete pour/ RCC element (No of test specimen as per IS 456)	At Field Laboratory
		Non-Destructive Tests (Ultra Sonic Pulse velocity test with Schmidt Hammer Test)	As desired by the Owner & Consultant	At Field by outside laboratory / agency
8	Structural Steel	Cross Sectional Area	For Every 20MT or part thereof and at change of source	Outside laboratory
		Tensile Strength/ Ultimate Tensile stress	— do —	— do —
9	Bricks	Compressive strength (IS 3495)	For every 50000 Nos and at change of source	At Field/outside laboratory
		Dimension (IS 1077)	— do —	Outside Laboratory
		Water Absorption & efflorescence	— do —	— do —
		Gauge and size of the section	— do —	At Field Laboratory
		Weight of sections	— do —	— do —

S.No	Item	Description	Frequency	Tests to be carried out at
4.	Cement concrete pavement under controlled conditions	**Coarse aggregate**		Out Side Laboratory
		1. Flakiness Index - IS 2386 (Part 1)	Before approval of the quarry and every sub-sequent change in the source of supply and one test per 100 cum.	
		2. Impact Value - IS 2386 (Part IV)	-Do-	-Do-
		3. Lose Angles abrasion Value - IS 2386 (Part IV)	-Do-	-Do-
		4. Deleterious material IS 2386 (Part II)	Before approval of the quarry and at every subsequent change in the source of supply	-Do-
		5. Moisture content IS 2386 (Part III)	Regularly as required subject to a minimum of one test per day	-Do-
		Fine Aggregate		
		1. Silt content	One lest per 15 cum.	At Field Laboratory
		2, Gradation of sand - IS 2388 (Part in	-Do-	At Field Laboratory
		3. Deleterious material - IS 2386 (Part II)	Before approval of Ihe quarry and at every subsequent change in the source of supply	At Field Laboratory
		4. Moisture content - IS 2386 (Part III)	Regularly as required subject to a minimum of two tests per day	At Field Laboratory

	5. Mix Aggregate - IS 2366 (Part I)	One test per 15 cum of concrete	At Field Laboratory
	6. Flexural strength - IS 526	One lest consisting of 8 specimen for 30 cum. of concrete	Out Side Laboratory

Note :

The above mentioned frequency tests are given as a Standard Engineering Practice to be followed for this project. Depending on the requirement at site and as may be found necessary by the Owner & Consultant the above tests shall be made more frequent and initial and subsequent tests shall be decided by the Owner & Consultant. In addition to the above tests other relevant tests shall also be performed as may be found necessary.

* Outside Laboratory means the Govt. Laboratories as shall be approved by the Owner & Consultant.

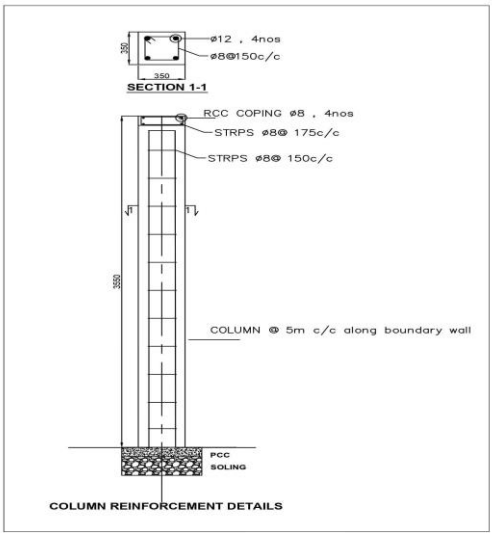
List of checks:-(as per Client Instrcution)

List Of Field Checks

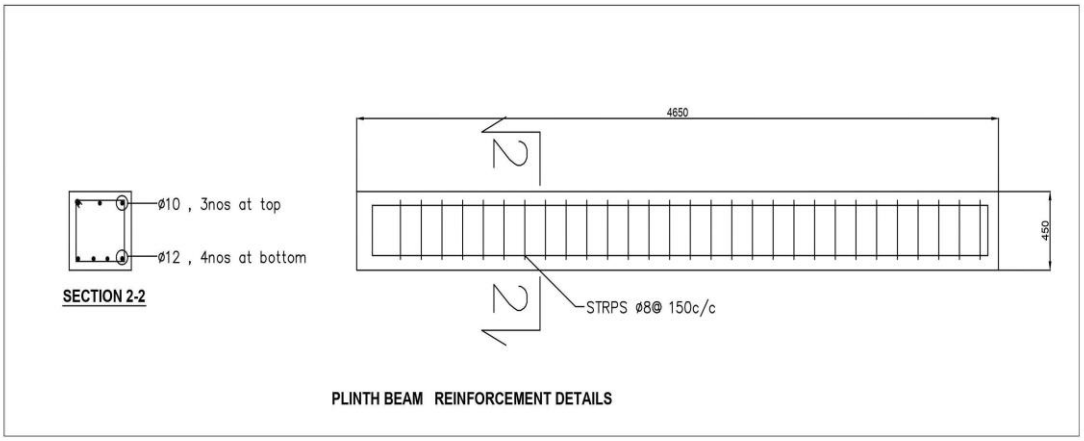
S.No	Item	Description	Frequency
		CIVIL WORKS	
1	Cement	Manufacturer's Test Certificate	For each consignment
		Checking Grade, Manufacturing Date, Lumps	-----do-----
		Checking method of storage in cement godown	At regular intervals (as required)
		Checking recordsfor receipt and issue	-----do-----
2	Coarse Aggragate	Visual Inspection for quality of materials	For each Truck load
		Method of stacking	At regular intervals (as required)
3	Fine Aggregates	Visual Inspection for quality of materials	For each Truck load
		Method of stacking	At regular intervals (as required)
		Rough Test forSilt and Clay content	At regular intervals (as required) and at every change of source
		Bulkage	-----do-----
4	Water	Checking whether it is clear water and free from any odour	At regular intervals (as required) and at every change of source
5	Admixtures	Manufacturer's Test Certificate	For each consignment
		Checking manufacturing and expiry date	For each pack or container
6	Reinforcement Steel Materials	Manufacturer's Test Certificate	For each consignment
		Checking grade and size as in the tag	-----do-----
		Appreance (Colour, Rusting)	-----do-----
		Unit Weight	-----do-----
7	Reinforcement Work	Checking whether rebars in position are as per drawing & bending schedule	For each RCC element
		Lap length, bored length provided	-----do-----
		Cover	-----do-----
		Arrangement for labour movement on reinforced area	-----do-----
8	Concrete	Availability of required number of workmen & equipment	For each concrete pour / RCC element

		Availability of materials	-----do-----
		Whether design mix is approved	-----do-----
		Ensuring that Calibration of Weight Batcher is checked regularly	-----do-----
		Access and pouring mechanism	-----do-----
		Batching as per design mix	-----do-----

1. **Column Reinforcement Details**



COLUMN REINFORCEMENT DETAILS

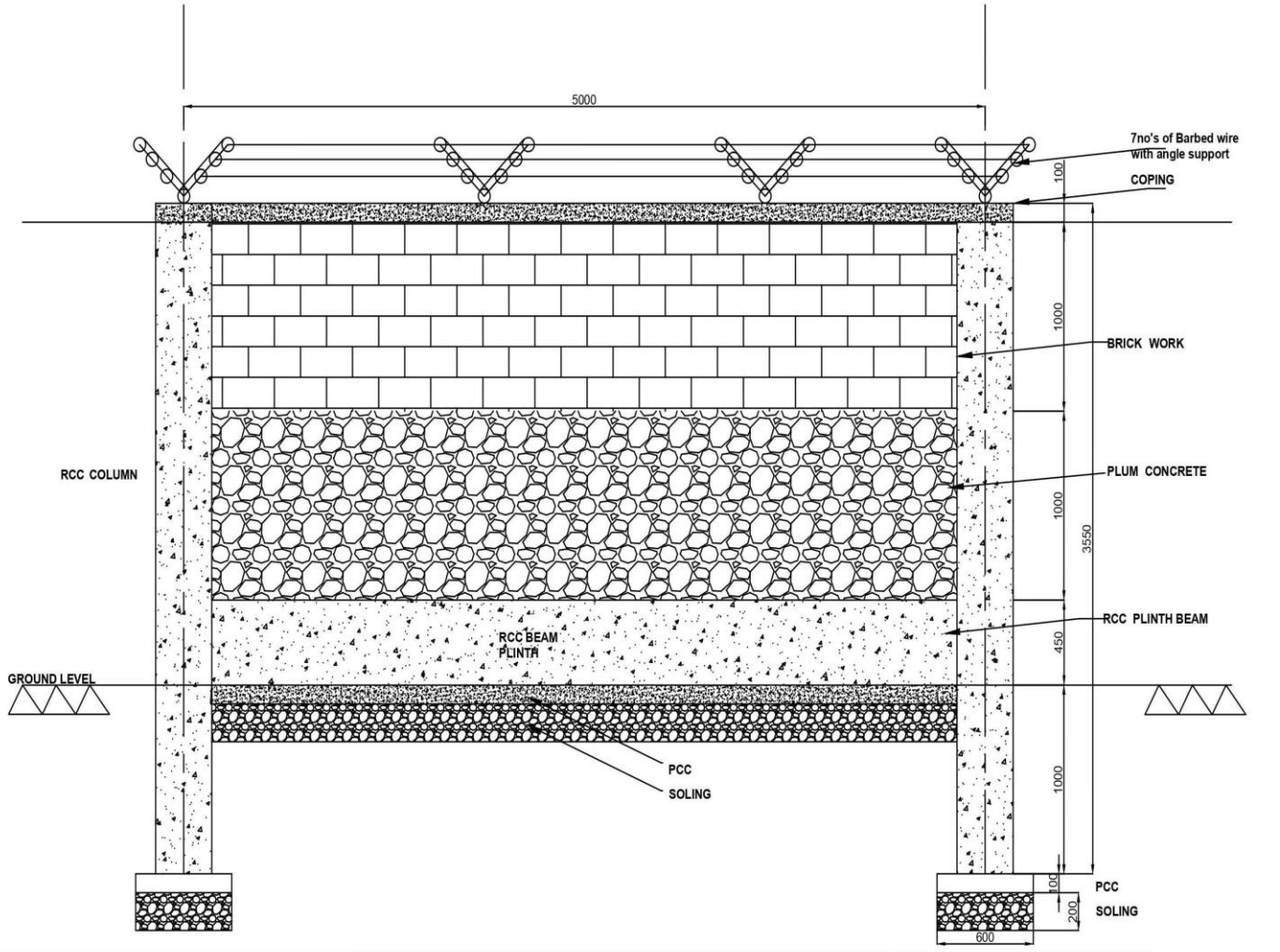


PLINTH BEAM REINFORCEMENT DETAILS

2. **Details of Solid Compound Wall:**

Plinth beams, Columns C/C5 mtrs, Expansion Joints 9" wall – combination of Plum concrete and ash bricks (7.5 grade) up to 6.5 ft above plinth beam, Y shaped MS frame + barbed wire (7 rows) above RCC coping + Porta cabin for security + One MS gate (6 mtr)

As per elevation drawing given below:


5000
7no's of Barbed wire with angle support
COPING
100
1000
BRICK WORK
RCC COLUMN
PLUM CONCRETE
1000
3550
RCC PLINTH BEAM
RCC BEAM PLINTH
450
GROUND LEVEL
PCC
SOLING
1000
100
PCC
200
SOLING
600

3. **The tentative Bill of Quantities:**

Sr No.	Description of Item	Units	Quantity
A	**Compound Wall**		
1	**Excavation** for foundation in earth, soil of all types, sand, gravel and soft murum, including removing the excavated material up to a distance of 50 m. beyond the building area and stacking and spreading as directed, dewatering, preparing the bed for the foundation and necessary back filling, ramming, watering including shoring and strutting etc. complete. (Lift upto 1.5 m.) Bd.A.1 Page No. 259 SSR Item No. 21.02 Reference No.BDA 1	Cum	524.05
2	**Plum Concrete 75:25, M-20** Rubble/ Grading 1 60-80 mm Stone including centering, formwork, cover blocks, compaction, finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete.(Excluding reinforcement and structural steel).with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/ concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand	Cum	221.11
3	**Brickwork** with common burnt clay F.PS. (non modular) bricks of class designation 7.5 in foundation and plinth in .Cement mortor 1:6 (1 cement: 6 course sand)(230 mm thick wall)	Cum	221.11
4	Providing and erecting **Y type barbed wire** fencing with **seven rows of wire** with 2.45 mm dia G.I. pipe (Rezan/concentiDeleted ire 0.75 mm dia) with hot dip and G.I. coated hooks as per drawing supported on M.S. angle 50 x 50 x 6 mm at 1.75 mtr. c/c including fixing and fastening with wire, painting M.S. angles with one coat of red lead primer and two coat of oil paint etc. complete. As directed by Engineer in charge. SSR Item No. 40.05 Reference No.BDW	Rmt	952.00

5	Providing and laying Cast in situ/Ready Mix cement concrete **M- 20** of trap / granite /quartzite/ gneiss metal for **R.C.C. columns** as per detailed designs and drawing or as directed including centering, formwork, cover blocks, laying/pumping, compaction finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete,(Excluding reinforcement and structural steel).with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/ concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand Bd.F.5 Page No. 300 and B.7,Page.No. 38 SSR Item No.25.31 Reference No.BDF 5	Cum	341.16
6	Providing and fixing in position **TMT - FE - 500** bar **reinforcement** of various diameters for R.C.C. pile caps, footings, foundations, slabs, beams columns, canopies, staircase, newels, chajjas, lintels pardis, copings, fins, arches etc. as per detailed designs, drawings and schedules including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required complete. Bd.F.17, Page No. 306 SSR Item No.26.33 Reference No.BDF 17	MT	30.10
7	**Filling** in plinth and floors with approved excavated material in 15cm. to 20cm. layers including watering and compacting etc. complete. Bd.A.10 Page No. 262 SSR Item No. 21.36 Reference No.BDA 10	Cum	311.24
8	15 mm cement **plaster** on rough side of single or half brick wall of mix 1:4 (1 cement : 4 coarse sand)	Sqm	5990.94
9	Providing & applying **white wash with lime** to give an even shade (total 3 coats) to walls with scaffolding including surface preparation etc. complete	Sqm	5990.94
10	Providing dry/ trap/ granite/ quartzite/ gneiss rubble stone**soling 20 cm thick** including hand packing andcompacting etc. complete Bd.A. 12 PageNo. 264 SSR Item no 21.38	Cum	134.90

11	Providing and laying **PCC** Cast in situ/Ready Mix cement concrete in **M-10** of trap/ granite/ quartzite/ gneiss metal for foundation and bedding including bailing out water, formwork, laying/pumping, compacting, roughening them if special finish is to be provided, finishing if required and curing complete, with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand Bd. E. 1 Page No. 287 SSR Item No.24.01 Reference No.BDE 1	Cum	67.45
B	**Entrance gate & Security Cabin**		
1	Providing structural **steel work in trusses**, other similar trussed purlins and members with all bracing, gusset plates etc. as per detailed designs and drawings or as directed including cutting, fabricating, hoisting, erecting fixing in position, Making riveted/ bolted/ welded connection and one coat of anticorrosive paint and over it 2 coats of oil painting approved quality and shade etc. complete. Bd.C.8 Page No. 278 SSR Item No. 23.04 Reference No.BDC 8 (The approval of Gate Design drawing etc need to be taken from EIC/Consultant before fabrication of Gate)	MT	3.08
2	Providing and fixing **H.D.P container Syntex** or alike one piece moulded water tank made out of low density polythyler and built corrugation including of delivery up to destination hoisting and fixing of accessories such as inlet, outlet overflow of all tanks capacity above 1000 to 20,000 litres As directed by engineer-in-charge. SSR Item No.42.54 Reference No. BDV	Litres	1000.00
3	**FRP -Porta cabins (Size 200 sqft)-Wall thickness 30mm** 1)High tolerance, corrosion resistance and durability 2) aesthetically designed 3)Adequate insulation of storage building cabin maintains a 5-7°C ambient temperature difference 4)All electrical facility – wiring, socket, light fixtures are provided. 5)Foundation to be set up. 6)Great resistance to natural disasters and weatherproof	Sqft	200

4	**FRP -Porta cabins (Size 40 sqft)-Wall thickness 30mm** 1)High tolerance, corrosion resistance and durability 2) aesthetically designed 3)Adequate insulation of storage building cabin maintains a 5-7°C ambient temperature difference 4)All electrical facility – wiring, socket, light fixtures are provided. 5)foundation to be set up. 6)Great resistance to natural disasters and weatherproof	Sqft	40
5	**FRP Portable Toilet & Bathroom Size** 8'x4'x h-8.5'-30mm wall thickness	Sqft	32

General Responsibilities:

1. The agency shall not, except after obtaining the prior written approval of the C-DAC, assign, transfer, or sub-contract or any part thereof to any third party.

The Contractor shall also ensure the compliance of the following labour legislations:(i) Minimum Wages Act

(ii) Employees Provident Fund

(iii) Employees State insurance Act *****

(iv) Workmen's compensation Act, if the ESI Act does not apply*****.

On the substantial completion of the Works, the agency shall clear away and remove from the Site all Constructional Plant surplus materials, rubbish and Temporary Works of every kind and leave the whole of the Site and Works clean and in a workmanlike condition to the satisfaction of C-DAC.

a) *Defects Liability Period*

The expression "Defects Liability Period" shall mean the period of twelve (12) months, calculated from the date of obtaining of completion/ occupancy certificate for entire building, from the competent authority.

b) Completion of Outstanding Work and Remedying of Defects

During the Defects Liability Period, the Contractor shall finish the work, if any, outstanding at the date of Substantial Completion, and shall execute all such work of repair, amendment, reconstruction, rectification and making good defects, imperfections, shrinkages or other faults as may be required of the Contractor in writing by C-DAC during the Defects Liability Period and within fourteen (14) days after its expiration, as a result of an inspection made by or on behalf of C-DAC prior to expiration of the Defects Liability Period.

c) Cost of Execution of Work of Repair

All such outstanding work shall be carried out by the Contractor at his own expense if the necessity thereof shall, in the opinion of C-DAC, be due to the use of material or workmanship not in accordance with the Contract, or to neglect or failure on the part of the Contractor to comply with any obligation expressed or implied, on the Contractor's part under the Contract.

d) Remedy on Contractor's Failure to Carry Out Work Required

If the Contractor shall fail to do any such work outstanding on the Works, C-DAC reserves the right and shall be entitled to employ and pay other persons to carry out the same, and all expenses consequent thereon or incidental thereto shall be recoverable from the Contractor by the Employer, and may be deducted by C-DAC from any monies due or which may become due to the Contracto

(End of Section – IV)

Section – V: Price Bid Format

Item Rate BoQ

Tender Inviting Authority: CENTRE FOR DEVELOPMENT OF ADVANCED COMPUTING (C-DAC), Innovation Park, PANCHAVATI, Pashan Road, PUNE 411008
Name of Work: Appointment of Contractor for constructing a Compound Wall

Contract No: CDACP/Compound Wall/2020/302

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevent columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

NUMBER #	TEXT #	NUMBER #	TEXT #	NUMBER #	NUMBER	NUMBER #	NUMBER #	TEXT #
Sl. No.	**Item Description**	**Quantity**	**Units**	**BASIC RATE In Figures To be entered by the Bidder in Rs. P**	**GST in %**	**TOTAL AMOUNT Without Taxes in Rs. P**	**TOTAL AMOUNT With Taxes**	**TOTAL AMOUNT In Words**
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	**Compound Wall**							
1.01	Excavation for foundation in earth, soil of all types, sand, gravel and soft murum, including removing the excavated material up to a distance of 50 m. beyond the building area and stacking and spreading as directed, dewatering, preparing the bed for the foundation and necessary back filling, ramming, watering including shoring and strutting etc. complete. (Lift upto 1.5 m.) Bd.A.1 Page No. 259 SSR Item No. 21.02 Reference No.BDA 1	524.05	CUM			**0.00**	**0.00**	INR Zero Only
1.02	Plum Concrete 75:25, M-20 Rubble/ Grading 1 60-80 mm Stone including centering, formwork, cover blocks, compaction, finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete.(Excluding reinforcement and structural steel).with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/ concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand	221.11	CUM			**0.00**	**0.00**	INR Zero Only
1.03	Brickwork with common burnt clay F.PS. (non modular) bricks of class designation 7.5 in foundation and plinth in .Cement mortor 1:6 (1 cement: 6 course sand)(230 mm thick wall)	221.11	CUM			**0.00**	**0.00**	INR Zero Only
1.04	Providing and erecting Y type barbed wire fencing with seven rows of wire with 2.45 mm dia G.I. pipe (Rezan/concentiDeleted ire 0.75 mm dia) with hot dip and G.I. coated hooks as per drawing supported on M.S. angle 50 x 50 x 6 mm at 1.75 mtr. c/c including fixing and fastening with wire, painting M.S. angles with one coat of red lead primer and two coat of oil paint etc. complete. As directed by Engineer in charge. SSR Item No. 40.05 Reference No.BDW+B15	952.00	RMT			**0.00**	**0.00**	INR Zero Only

1.05	Providing and laying Cast in situ/Ready Mix cement concrete M- 20 of trap / granite /quartzite/ gneiss metal for R.C.C. columns as per detailed designs and drawing or as directed including centering, formwork, cover blocks, laying/pumping, compaction finishing the formed surfaces with cement mortar 1:3 of sufficient minimum thickness to give a smooth and even surface or roughening if special finish is to be provided and curing etc. complete,(Excluding reinforcement and structural steel).with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/ concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand Bd.F.5 Page No. 300 and B.7,Page.No. 38 SSR Item No.25.31 Reference No.BDF 5	341.16	CUM			**0.00**	**0.00**	INR Zero Only
1.06	Providing and fixing in position TMT - FE - 500 bar reinforcement of various diameters for R.C.C. pile caps, footings, foundations, slabs, beams columns, canopies, staircase, newels, chajjas, lintels pardis, copings, fins, arches etc. as per detailed designs, drawings and schedules including cutting, bending, hooking the bars, binding with wires or tack welding and supporting as required complete. Bd.F.17, Page No. 306 SSR Item No.26.33 Reference No.BDF 17	30.10	MT			**0.00**	**0.00**	INR Zero Only
1.07	Filling in plinth and floors with approved excavated material in 15cm. to 20cm. layers including watering and compacting etc. complete. Bd.A.10 Page No. 262 SSR Item No. 21.36 Reference No.BDA 10	311.24	CUM			**0.00**	**0.00**	INR Zero Only
1.08	15 mm cement plaster on rough side of single or half brick wall of mix 1:4 (1 cement : 4 coarse sand)	5990.94	SQM			**0.00**	**0.00**	INR Zero Only
1.09	Providing & applying white wash with lime to give an even shade (total 3 coats) to walls with scaffolding including surface preparation etc. complete	5990.94	SQM			**0.00**	**0.00**	INR Zero Only
1.10	Providing dry/ trap/ granite/ quartzite/ gneiss rubble stonesoling 20 cm thick including hand packing andcompacting etc. complete Bd.A. 12 PageNo. 264 SSR Item no 21.38	134.90	CUM			**0.00**	**0.00**	INR Zero Only
1.11	Providing and laying PCC Cast in situ/Ready Mix cement concrete in M-10 of trap/ granite/ quartzite/ gneiss metal for foundation and bedding including bailing out water, formwork, laying/pumping, compacting, roughening them if special finish is to be provided, finishing if required and curing complete, with fully automatic micro processor based PLC with SCADA enabled reversible Drum Type mixer/concrete Batch mix plant (Pan mixer) etc. complete. With natural sand/V.S.I. quality Artificial Sand Bd. E. 1 Page No. 287 SSR Item No.24.01 Reference No.BDE 1	67.45	CUM			**0.00**	**0.00**	INR Zero Only
2	**Compound Wall**							
2.01	Providing structural steel work in trusses, other similar trussed purlins and members with all bracing, gusset plates etc. as per detailed designs and drawings or as directed including cutting, fabricating, hoisting, erecting fixing in position, Making riveted/ bolted/ welded connection and one coat of anticorrosive paint and over it 2 coats of oil painting approved quality and shade etc. complete. Bd.C.8 Page No. 278 SSR Item No. 23.04 Reference No.BDC 8 (The approval of Gate Design drawing etc need to be taken from EIC/Consultant before fabrication of Gate)	3.08	MT			**0.00**	**0.00**	INR Zero Only
2.02	Providing and fixing H.D.P container Syntex or alike one piece moulded water tank made out of low density polythyler and built corrugation including of delivery up to destination hoisting and fixing of accessories such as inlet, outlet overflow of all tanks capacity above 1000 to 20,000 litres As directed by engineer-in-charge. SSR Item No.42.54 Reference No. BDV	1000.00	LITRES			**0.00**	**0.00**	INR Zero Only

2.03	FRP -Porta cabins (Size 200 sqft)-Wall thickness 30mm 1)High tolerance, corrosion resistance and durability 2) aesthetically designed 3)Adequate insulation of storage building cabin maintains a 5-7oC ambient temperature difference 4)All electrical facility – wiring, socket, light fixtures are provided. 5)Foundation to be set up. 6)Great resistance to natural disasters and weatherproof	200.00	SQFT			**0.00**	**0.00**	INR Zero Only
2.04	FRP -Porta cabins (Size 40 sqft)-Wall thickness 30mm 1)High tolerance, corrosion resistance and durability 2) aesthetically designed 3)Adequate insulation of storage building cabin maintains a 5-7oC ambient temperature difference 4)All electrical facility – wiring, socket, light fixtures are provided. 5)foundation to be set up. 6)Great resistance to natural disasters and weatherproof	40.00	SQFT			**0.00**	**0.00**	INR Zero Only
2.05	FRP Portable Toilet & Bathroom Size 8'x4'x h-8.5'-30mm wall thickness	32.00	SQFT			**0.00**	**0.00**	INR Zero Only
Total in Figures						**0.00**	**0.00**	INR Zero Only
Quoted Rate in Words		**INR Zero Only**						

Note: 1.The prices quoted above are including labour charges, loading, unloading charges and all incidental charges.
2.The rate quoted shall be in form of Basic Rate + Applicable GST/OTHER TAXES.
3.While raising bills ,the vendor has to specifically mention tax components for each items.

ANNEXURE – A: COVERING LETTER

Date:

To:
The Executive Director,
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchavati, Pashan Road,
Pune - 411008 Maharashtra, INDIA

Subject: Submission of bid for construction of compound wall

Dear Sir,

We, the undersigned, submit our bid for construction of compound wall in response to your Tender No **CDACP/Compound Wall/2020/302**.

We hereby declare that all the information and statements made in this bid are true and we accept that any misinterpretation contained in it, may lead to our disqualification.

We hereby certify that my/ our firm has not been disqualified and / or blacklisted by any Office/ Department/ Undertaking of the State Government / Central Govt. of India, PSU/ Autonomous Body of Government of India, at the time of submission of this bid.

We agree to abide by all the terms and conditions of the tender document, including corrigenda. We would hold the terms of our bid valid for 90 days as stipulated in the tender document.

We understand you are not bound to accept any Proposal you receive.

The undersigned is authorized to sign this bid document. The authority letter to this effect is enclosed.

Yours sincerely,

Authorized Signatory:

Name and Title of Signatory:
e-mail:
Mobile No:

ANNEXURE – B: AUTHORITY LETTER

Date:

To:
The Executive Director,
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchavati, Pashan Road,
Pune - 411008 Maharashtra, INDIA

Subject: Authority Letter

Reference: Tender No **CDACP/Compound Wall/2020/302**

Dear Sir,

We, M/s _____ (Name of the bidder) having registered office at _____ (address of the bidder) herewith submit our bid against the said tender document for construction of compound wall.

Mr./Ms. _____ (Name and designation of the signatory), whose signature is appended below, is authorized to sign and submit the bid documents on our behalf against said tender.
Specimen Signature:

The undersigned is authorised to issue such authorisation on behalf of us.
For M/s _____ (Name of the bidder)

Signature and company seal
Name
Designation
Email
Mobile No

Annexure – C: Undertaking for EMD

Date:

To:
The Director General,
Centre for Development of Advanced Computing (C-DAC)
Innovation Park, Panchavati, Pashan Road,
Pune - 411008 Maharashtra, INDIA

Subject: Undertaking as per GFR – 2017, Rule 170(iii)

Dear Sir,

We, the undersigned, offer to Supply the ----------as per tender at C-DAC Pune, in response to your Tender No----------. We are hereby submitting our proposal for same, which includes Technical bid and the Financial Bid. As a part of eligibility requirement stipulated in said tender document, we hereby submit a declaration in lieu of Earnest Money Deposit (EMD), as given below:

1. Our bid shall remain valid for 120-days from the date of submission and that we will not withdraw or modify our bid during the validity period,
2. In case, we are declared as successful bidder and an order is placed on us, we will submit the acceptance in writing within 7 days of placement of order on us.
3. In case, we are declared as successful bidder and an order is placed on us, we undertake, to submit a Security Deposit of 5 % of the order value, as per terms stipulated in the tender.
4. In case of failure on our part to comply with any of the above said requirements, we are aware that we shall be declared as un-eligible for said tender and /or debarred from any **future bidding process of C-DAC for a period of minimum one year.**
5. The undersigned is authorized to sign this undertaking.

Yours sincerely,

Authorized Signatory:
Name and Title of Signatory:
e-mail:
Mobile No:

Annexure – D: Advance Bank Guarantee

BANK GUARANTEE FOR ADVANCE PAYMENT

To: The Executive Director,
Centre for Development of Advanced Computing (c-DAC)
Pune University Campus, Pune – 411007

Reference: Contract executed between C-DAC & ---------- on (date)

In accordance with the provisions of the conditions of Contract, sub-clause 51.1 ("Advance Payment") of the above mentioned contract [name and address of contractor] (hereinafter called " the Contractor") shall deposit with [name of employer] a bank guarantee to guarantee his proper and faithful performance under the said Clause of the contract in an amount of [amount of guarantee] [in words].

We, the [bank or financial institution], as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as surely merely, the payment to and without his first claim to the contractor, in the amount not exceeding [amount of guarantee] .

We further agree that no change or addition to r other modification of the terms of the Contract or of work to be performed there under or of any of the Contract documents which may be made between [name of Employer] and the Contractor, shall in any way release us from any liability under this guarantee, and we hear by waive notice of any such change, addition or modification.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until [name of the employer] receives full repayment of the same amount from the Contractor.

Yours truly,

Signature and seal : _____
Name of Bank / Financial Institution : _____
Address : _____
Date : _____

(End of Document)