



KERALA STATE INDUSTRIAL DEVELOPMENT CORPORATION LTD.

2nd floor, Choice Towers, Manorama Jn., Kochi-682016, Kerala.

Phone: 0484 2323010 Fax: 0484 2323011

TENDER DOCUMENT

**CONSTRUCTION OF ROADS AND STORM WATER DRAINS FOR THE PART
DEVELOPMENT OF PHASE II AT IGC KOZHIKODE- BALANCE WORKS**

TECHNICAL BID

TENDER NO. KSIDC/IGC/Kozhikode/03/2018-19 Dt.05.03.2019

PROJECT MANAGEMENT CONSULTANTS

**KITCO LTD
P.B.NO 4407, PUTHIYA ROAD,
NH BYPASS, VENNALA
KOCHI-682028**

TECHNICAL BID**NAME OF WORK: CONSTRUCTION OF ROADS AND STORM WATER DRAINS FOR THE PART DEVELOPMENT OF PHASE II AT IGC KOZHIKODE- BALANCE WORKS****NIET No: KSIDC/IGC/Kozhikode/03/2018-19 Dt 05/03/2019**

- (1). NOTICE INVITING E- TENDER (NIET).
- (2). INSTRUCTIONS TO TENDERERS.
- (3). TECHNICAL BID.
- (4). GENERAL CONDITIONS OF CONTRACT.
- (5). SAFETY CODE & MODEL RULES FOR PROTECTION OF HEALTH AND SANITARY ARRANGEMENT FOR WORKERS.
- (6). SPECIAL CONDITIONS OF CONTRACT.
- (7). TECHNICAL SPECIFICATIONS.

ISSUED TO: M/s. _____

***KSIDC*****KERALA STATE INDUSTRIAL DEVELOPMENT CORPORATION LTD.**

TECHNICAL BID

1.	Name of work	CONSTRUCTION OF ROADS AND STORM WATER DRAINS FOR THE PART DEVELOPMENT OF PHASE II AT IGC KOZHIKODE – BALANCE WORKS
2.	Completion period for construction	6 Months
3.	Date & Time of issue of tender document	Tender document will be available from 05/03/2019 to 30/03/2019 up to 3.00 PM on the net and it may be downloaded
4.	Website address for purchasing bid document	https://etenders.kerala.gov.in
5.	Time, date and place of pre-bid meeting.	Time: 11.00 am Date: 12.03.2019 Place: KSIDC Office, Kochi
6.	Last date for receiving bids	Time: 3.00 pm Date: 30.03.2019 Place: KSIDC Office, Kochi
7.	Time, date and place of opening technical bid	Time: 3.30 pm Date: 03/04/2019. Place: KSIDC Office, Kochi
8.	Time, date and place of opening financial bid	Time: 3.30 pm Date: 06/04/2019 Place: KSIDC Office, Kochi
9.	Last date of bid validity	120 days from the last date of submission of tender
10.	Officer inviting bid documents	General Manager, KSIDC
11.	Officer accepting bid documents	General Manager KSIDC , 2 nd Floor, Choice Towers, Manorama Jn, Kochi -16

LIST OF TENDER DOCUMENTS

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1.0 CONTRACT DATA

1. Tender No. : KSIDC/IGC/Kozhikode/03/2018-19 Dt.28.02.2019
2. Name & address of Client : GENERAL MANAGER
KSIDC, 2nd Floor, Choice Towers,
Manorama Jn, Kochi -16
3. Name of Project : Construction of Roads And Storm Water Drains
For The Part Development of Phase II At IGC
Kozhikode – Balance works
4. Place of work : KSIDC - Industrial Growth Centre,
Kinalur, Via Balussery,
Kozhikode - 673 621
5. Scope of work : Construction of Roads And Storm Water Drains
For The Part Development of Phase II At IGC
Kozhikode – Balance works
6. Probable amount of contract : **Rs. 3.10 Cr (Approximately)**
7. Type of tender : Item Rate Tender
8. Schedule of rates applicable : CPWD-DSR 2014 with cost index 38.10%
9. Completion Period : Six calendar months
10. Bid submission fee : **Rs. 8,850/- (inclusive of GST) , Bid submission fee**
through online payment system at
www.etenders.kerala.gov.in.
11. Downloading of Tender Documents : Tender documents and tender schedule may be
downloaded free of cost from the e-GP Website
www.etenders.kerala.gov.in.
12. Tender document issuing authority : GM, KSIDC, 2nd Floor, Choice Towers,
Manorama Jn, Kochi -16
13. Last date of Receipt of Tender : Online submission till 3.00 p.m. on 30.03.2019.
14. Date & Time of Technical Bid opening : Online opening at 3.30 p.m. on 03.04.2019.
15. Place, Date & Time of Pre-bid meeting: KSIDC, Cochin Office, 12.03.2019 at 11.00 AM
16. Tender receiving authority : GM, KSIDC, 2nd Floor, Choice Towers,
Manorama Jn, Kochi -16
- 17.1 Earnest Money Deposit : **Rs.1,00,000/-** (remitted through online payment
mechanism for e-procurement system of Govt. of
Kerala).

- 17.2 Performance Security deposit : The successful bidder, on receipt of the Letter of intimation/work order, shall remit to KSIDC, an amount of 5% of the contract value (agreed PAC) as performance Security Deposit and the deposit shall be retained till the expiry of defect liability period. At least 50% of this deposit shall be collected in the form of Bank Guarantee from a scheduled / Nationalized Bank. The validity of BG shall be up to the expiry of defect liability period plus one month.
(Performance Security deposit shall be made Within 7 days from the date of letter of acceptance)
- 17.3 Retention Money : Retention money for the work shall be collected by deduction from the running/final bill of the contractors @2.5% of gross amount of each running and/or final claims till expiry of defect liability period.
18. Bid Validity period : 120 days from the last date of submission of tender documents.
19. Defect liability period : 60 Months from the date of completion of the work
20. Minimum value of similar works required to be executed by the contractor during the last 7 years in a single contract as Prime Contractor : One work of 80% value or Two works of each 60% value or Three works each of 40% value
21. Minimum average annual turnover required to be attained by the contractor during the three Preceding financial years. (2015 -16, 2016-17 & 2017-18) : Rs. 101 lakhs
22. Minimum Value for the Solvency Certificate : Rs.135 Lakhs

24. Contractor should not have incurred any loss in the last three financial years (2015 -16, 2016-17 & 2017-18) : Audited balance sheet and P&L statement of last three years to be submitted.
25. Interval of interim Bills : The contractors can claim their bills based on the milestones mutually agreed upon during the signing of agreement

KERALA STATE INDUSTRIAL DEVELOPMENT CORPORATION LTD.
2nd floor, Choice Towers, Manorama Jn., Kochi-682016, Kerala.
Phone:0484 2323010 Fax: 0484 2323011

INFORMATION REGARDING e-TENDERING PROCESS

1. The bidders shall have to submit their bids online in Electronic formats both for technical and financial proposals.
2. For participation in the e-tendering process, the Bidders need to register themselves on Kerala e –tendering portal. On registration, they will be provided with a user ID and a system generated password enabling them to submit their Bids online using Digital System Certificates (DSC).
3. Tenders without digital signatures will not be accepted by the Electronic Tendering System.
4. No Tender will be accepted in physical form in case, it is not submitted through the Electronic Tendering System.
5. Bids will be opened online as per time scheduled.
6. Tender Fees and EMD shall be remitted to the SBI account provided in the e-tendering portal and the scanned copy of the payment details shall be uploaded along with the online bid.
7. Before submission of online Bids, Bidders must ensure that scanned copies of all the necessary documents have been uploaded with the Bid.
8. KSIDC will not be responsible for any delay in online submission of the bids due to any reason whatsoever.
9. It will be mandatory for all the bidders to upload all the documents mentioned under 'Tender Details'.
10. The details of EMD specified in the Tender documents should be the same as submitted online (scanned copies) otherwise tender will be rejected summarily.

(1)

NOTICE INVITING E- TENDER (NIET)**NIET No: KSIDC/IGC/Kozhikode/03/2018-19 Dt.05.03.2019**

Tenders are invited through electronic bidding system (e-BID) from Class A and above registered contractors registered under central or state government Department for executing the work with the prequalification criteria mentioned in page no 6 & 7 of contract data.

Sl no	Name of Work	Estimated cost (Rs. In lakhs)	EMD (Rs.)	Tender Document Cost Non-refundable (Rs.)	Time of completion
1	Construction of Roads And Storm Water Drains For The Part Development of Phase II At IGC Kozhikode – Balance works	310.00 (Approx)	1,00,000/-	8,850/- (inclusive of GST)	6 months

1. Tenders shall be in 2 bid format – Technical bid and Priced bid. The tender documents can be available on the net and it may be downloaded. Digital signature will be available on website. The technical bid and price bid shall be uploaded separately.
2. Tender documents can be accessed through website on payment of **Rs 8,850/- (inclusive of GST)** in the SBI account mentioned in the website (non – refundable- scanned copy of payment shall be uploaded).
3. The Earnest Money as specified for work shall also remitted in the SB account provided in the website (Scanned copy of payment shall be uploaded).
4. The tenders can be submitted through online up to 30/03/2019 at 3.00 PM and the same shall be opened on 03/04/2019 at 3.30pm in the office of General Manager (Infrastructure), KSIDC, 2nd Floor, Choice Towers, Manorama Junction, Kochi-682016, Kerala.
5. The price bid of contractor who fulfills the technical bid conditions shall only be opened.
6. KSIDC reserves the right to accept or reject any or all tenders in part or full without assigning any reason there so.

General Manger

(2)
INSTRUCTIONS TO TENDERERS (ITT)

READ & FOLLOW THE INSTRUCTIONS CAREFULLY REGARDING MODE OF SUBMISSION OF TENDERS

1. Kerala State Industrial Development Corporation Ltd (KSIDC) is the agency of the Government of Kerala for the promotion of industries in Kerala. As part of its promotional role, KSIDC has taken steps for developing the infrastructure at IGC Kinalur.
2. KSIDC has now invited item rate tenders from qualified contractors for DEVELOPING OF INTERNAL ROADS AND DRAINS AT KINALUR INDUSTRIAL PARK – BALANCE WORK
3. Tender documents can be purchased through website etenders.kerala.gov.in on payment of Rs.8,850/- (inclusive of GST) to the SBI account provided in the website (non – refundable-scanned copy of payment shall be uploaded).
4. The tenderers shall be required to deposit the Earnest Money as specified in the NIET for work by remitting to the SBI account provided in the website. (Scanned copy of payment shall be uploaded). The tenders received without requisite Earnest Money shall be summarily rejected. In case, the date of opening of tenders happens to be a holiday, the tenders would be opened on the next working day at the same time.
5. The tenderer shall quote the rate and the amount tendered by him against each item mentioned in the Price Bid in figures as well as in words (English/Malayalam).
6. The tenders can be submitted through online up to 30/03/2019 at 3.00 PM and the technical bid shall be opened on 03/04/2019 at 3.30 PM in the office of General Manager (Infrastructure), KSIDC, 2nd Floor, Choice Towers, Manorama Junction, Kochi-682016.
7. The price bid of contractor who fulfills the technical bid conditions shall only be opened
8. **Mode of Submission:**
The tender document is to be submitted through online in two parts
 - a) **Part– I (Technical bid)**

This shall contain the following

- i) Requisite EMD as specified in para. 4.0 above.

- ii) Letter of Unconditional Acceptance of tender conditions as per proforma given in Annexure – I.
- iii) E- Tender Notice, Instructions to Tenderers (ITT) duly signed using Digital Signature.
- iv) General Conditions of Contract duly signed using Digital Signature.
- v) Special Conditions of Contract duly signed using Digital Signature.
- vi) Copy of Power of Attorney / Partnership Deed duly attested by Notary Public authorizing the person to sign the tender to upload.
- vii) Each bid should contain following technical details of the bid offered by them.
 - (i) The bidder should justify their capability of completing the work as per the milestones specified within the stipulated completion period with the following documents.
 - Proposed work plan
 - Methodology of construction.
 - Equipment planning with broad calculations.
 - Quality Control procedure.
 - (ii) Qualification and experience of key site management and technical personnel proposed for the contract.
 - (iii) Proposed site organisation.
- viii) Any other information required to be submitted along with the tender.
- b) **Part II (Price Bid)**

The Price bid is prepared as item rate tender as per format attached.

9. VALIDITY OF TENDERS:

The tenders for the works shall remain open for acceptance for a period of 120 (One hundred and twenty) days from the date of opening of the Price Bids. In case the offer is withdrawn during the validity period, the Earnest Money so deposited shall be forfeited without any prejudice to any other right or remedy. The validity period may be extended on mutual consent.

10. The tenders shall be submitted strictly as per the conditions of E -Tender Notice. Tenders with any additional condition(s)/modifications shall be rejected.
11. KSIDC reserves the right to award the work of various packages at L-1's accepted rates amongst more than one bidder.
12. The acceptance of tender will rest with KSIDC, who does not bind itself to accept the lowest tender and reserves the right to reject any or all the tenders received without assigning any reason thereof. Incomplete Tenders or those not fulfilling the prescribed conditions are liable to be rejected.
13. Canvassing whether directly or indirectly in connection with tenders is strictly prohibited and the tenders submitted by the Tenderers / firms who resort to canvassing will be liable to rejection.
14. Upon acceptance of tender, the successful tenderer shall within the time specified in the letter of award, deposit with KSIDC a Security Deposit @ 5% of the Contract Amount. The EMD paid by the successful tenderer will form part of the Security Deposit and hence liable to pay only the balance amount.
15. The Tenderer shall not be permitted to tender for works if his near relative is posted as an Accountant or an Engineer or any higher ranks in the project or Head Office of KSIDC. The Tenderer / firm shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any of the employees in KSIDC. Any breach of this condition by the Tenderer would render him liable to the withdrawal of the work awarded to him and forfeiture of Earnest Money and Security Deposit. This may also debar the Tenderer from tendering for future works under KSIDC.
16. The time of completion of the entire work, as stipulated in the NIET, shall be reckoned from the 07 th day after issue of the letter/telegram/fax of Intent by the KSIDC.
17. The tender award, execution and completion of work shall be governed by tender documents, consisting of (but not limited to) Letter of Intent /Letter of Work Order, Scope of work, General Conditions of Contract, Special Conditions of Contract, Technical specifications, Contract Amount etc. The tenderers shall be deemed to have gone through the various conditions and clauses of the tender or any other condition, which in the opinion of tenderer will affect his

price/rates before quoting their rates. No claim, whatsoever, against the foregoing shall be entertained.

18. In case the conditions mentioned above are found violated at any time before opening of tenders, the tender shall be summarily rejected and KSIDC, shall without prejudice to any other right or remedy, be at liberty to forfeit the full Earnest Money.

General Manager

Annexure – I.

UNCONDITIONAL ACCEPTANCE OF TENDER CONDITIONS

NAME OF WORK: _____

I/We of M/s. _____ bidder for the above noted work do hereby unconditionally accept all the terms and conditions mentioned in the tender documents.

Further, we have noted that after unconditionally accepting the tender conditions in its entirety, it is not permissible to put any remarks/conditions in the Price Bid and the same has been followed in the present case. In case this provision is found violated at any time after opening of Price bid, we agree that the tender shall be summarily rejected and KSIDC, shall without prejudice to any other right or remedy, be at liberty to forfeit the full said earnest money absolutely.

Signature of the Bidder
Or Authorized Person _____

Name of Firm _____

Seal of Firm _____

(3)
TECHNICAL BID

INFORMATION & INSTRUCTIONS FOR APPLICANTS

1.0 GENERAL:

- 1.1** Letter of transmittal and forms for pre-qualification are given in Annexure - II.
- 1.2** All information called for in the enclosed forms should be furnished against the relevant columns in the forms. If for any reason, information is furnished on a separate sheet, this fact should be mentioned against the relevant column. Even if no information is to be provided in a column, a “nil” or “no such case” entry should be mentioned in that column. If any particulars/query is not applicable to that tenderer, it should be stated as “not applicable”. The applicants are cautioned that not giving complete information called for in the application forms or not giving it in clear terms or making any change in the prescribed forms or deliberately suppressing the information may result in the applicant being summarily disqualified.
- 1.3** The application as per Annexure-II should be type written. The applicant should sign each page of the application.
- 1.4** References, information and certificates from the respective clients certifying suitability, technical know-how or capability of the applicant should be signed by an officer not below the rank of Executive Engineer or equivalent.
- 1.5** The applicant may furnish any additional information, which he thinks is necessary to establish his capabilities to successfully complete the envisaged work. He is however, advised not to furnish superfluous information. No information shall be entertained after submission of pre-qualification document unless it is called for by KSIDC.
- 1.6** Any information furnished by the applicant found to be incorrect either immediately or at a later date, would render him liable to be debarred from tendering/ taking up of work in KSIDC.

1.7 The applicant should attach attested copies of valid Registration under GST, Labour License, Building and Other Construction Works Welfare Cess Act 1996, ESIC, Permanent Account No. etc. The successful tenderer is required to submit the valid PF registration details after awarding the work.

2.0 DEFINITIONS

2.1 In this document the following words and expressions have the meaning hereby assigned to them.

2.2 Employer: - Means the Kerala State Industrial Development Corporation Ltd (KSIDC)

2.3 Applicant: - Means the individual, proprietary firm, firm in partnership, limited company, private or Public or corporation.

2.4 "Year" means "Financial Year" unless stated otherwise.

3.0 METHOD OF APPLICATION:

3.1 If the applicant is an individual, the application shall be signed by him above his full typewritten name and current address.

3.2 If the applicant is a proprietary firm, the application shall be signed by the proprietor above his full typewritten name and the full name of his firm with its current address.

3.3 If the applicant is a firm in partnership, the application shall be signed by the Managing Partner of the firm above his full typewritten name and current addresses or duly authorized person-holding power of attorney for signing the application accompanied by a copy of the Power of Attorney. In both cases a certified copy of the partnership deed and current address of all the partners of the firm should accompany the application.

3.4 If the applicant is a limited company or a corporation, the application shall be signed by The Managing Director or duly authorized person-holding power of attorney for signing the application accompanied by a copy of the Power of Attorney. The applicant should also furnish a copy of the Memorandum and Articles of Association duly attested by a Public Notary/ Gazette Officer.

3.5 If the applicant is a Joint Venture, an SPV shall be formed and the application shall be signed by an authorized person. Certified copies of all the supporting documents shall be furnished by the applicant. Copy of the JV agreement with JV partners also shall be submitted. The bidders who are quoting by Joint venture should mention J.V name in the JV agreement.

4.0 FINAL DECISION MAKING AUTHORITY:

The KSIDC reserves the right to accept or reject any application and to annual the pre-qualification process and reject all applications at any time, without assigning any reason or incurring any liability to the applicants.

5.0 PARTICULARS PROVISIONAL

The particulars of the work given in NIET are provisional. They are liable to change and must be considered only as advance information to assist the applicant.

6.0 SITE VISIT

The applicant is advised to visit the site of work, at his own cost, and examine it and its surroundings to him collect all information that he consider necessary for proper assessment of the prospective assignment.

7.0 INITIAL CRITERIA FOR ELEGIBILITY FOR PRE-QUALIFICAITON

7.1 Successful completion of three works each of similar nature costing not less than 40% of estimated cost or two works each of 60% estimated cost or one work of 80% estimated cost (rounded off to nearest Rs.10 lakh) in the last 7 years ending last day of the month previous to the month in which tenders are invited. The bidders should produce copy of TDS certificates of work done on request by KSIDC.

For this purpose, 'cost of work' shall mean gross value of the completed work including the cost of materials supplied by the Govt./ Client, but excluding those supplied free of cost. This should be certified by an officer not below the rank of Executive Engineer/ Project Manager or Equivalent. The experience certificate produced by the applicant should clearly mention the capacity and the project cost.

7.2 The applicant should have an average annual financial turnover (gross) on construction works of 30% of the PAC during the last three years ending 31st March 2018.

7.3 The applicant should not have incurred any loss during the last three years ending 31st March 2018.

7.4 The applicant should have a solvency of 40% of estimated cost certified by his Bankers. The solvency certificate should not be more than 6 months old as on the date of opening the tender.

7.5 The applicant should possess adequate construction equipment required for the proper and timely execution of the work, else, he should certify that he would be able to manage the

equipment by hiring etc. and submit the list of firms from whom he proposes to hire.

- 7.6 The applicant should have sufficient number of Technical and Administrative employees for the proper execution of the contract. The applicant should submit a list of these employees stating clearly how these would be involved in this work.
- 7.7 The applicant shall furnish the details of each work completed in the last 7 years and in hand should be certified by an officer not below the rank of Executive Engineer or Equivalent.
- 7.8 The applicant should obtain requisite certificate duly signed by client/govt officer/architect/consultant.
- 7.9 Mini batching plant of required capacity to be made available at site or within reasonable distance from site during Constriction.
- 7.10 Testing Laboratory/Equipments to be made available at site during construction.

8.0 FINANCIAL INFORMATION

Applicant should furnish the following financial information: Annual financial statement for the last three years (in Form "A").

9.0 EXPERIENCE OF WORKS HIGHLIGHTING EXPERIENCE IN SIMILAR WORKS

9.1 Applicant should furnish the following:

- a) List of all works of similar class successfully completed during the last SEVEN years (in form "B")
- b) List of the projects under execution or awarded (in Form "C")

10.0 ORGANISATION INFORMATION

Applicant is required to submit the following information in respect of his organization (in Form "D")

- a) Name & Postal Address, Telephone, and Fax Numbers etc.
- b) Copies of original documents defining the legal status, place of Registration and principal places of business.
- c) Names & Title of Directors and Officers to be concerned with the work, with designation of individuals authorized to act for the organization.
- d) Information on any litigation in which the applicant was involved during the last five years, including any current litigation.

- e) Authorization for employer to seek detailed references.

11.0 CONSTRUCTION PLANT & EQUIPMENT

Applicant should furnish the list of construction plant and equipment including steel shuttering, centering and scaffolding likely to be used in carrying out the work (in Form "E"). Details of any other plant & equipment required for the work (not include in Form "E") and available with the applicant may also be indicated.

12.0 LETTER OF TRANSMITTAL

The applicant should submit the letter of transmittal attached with pre-qualification document.

13.0 OPENING OF PRICED BID

After evaluation of pre-qualification applications, a list of qualified agencies will be prepared. Thereafter, the Priced Bids of the pre-qualified agencies only would be opened.

14.0 DISCRETIONARY POWER OF KSIDC

14.1 The KSIDC reserves the right, without being liable for any damages or obligation to inform the applicant to:

- a) Amend the scope and value of contract to the applicant.
- b) Reject any or all of the applications without assigning any reasons.

14.2 Any effort on the part of the applicant or his agent to exercise influence or to pressurize KSIDC would result in rejection of his application. Canvassing of any kind is prohibited.

15.0 AGREEMENTS. : Acceptance of the tender will be intimated to the successful tenderer through a letter of Award. The contractor shall then be required to execute an agreement within a time specified in the letter of Award. In the event of failure on the part of the tenderer to sign the agreement within the specified time, the EMD amount shall be forfeited and the acceptance of his tender will be treated as withdrawn.

The work, however petty it be, shall be done only after executing agreement with KSIDC or on a special written order from the Authorised Official of KSIDC.

No agreement is valid unless it has been signed by the contractor or his duly authorized agent and by the Authorised Official of KSIDC.

Any details of drawing which are not supplied along with the tender documents for the work

may be obtained / clarified from KSIDC office during working hours from 10 am to 5.00 pm on weekdays.

The form of preliminary agreement, tender schedule, invitation to tender, form of tender, instructions to tenderer, Notice inviting tenders (Form 83), special conditions of contract, specifications, technical specifications, drawings, time schedule and the rates and amount quoted against the items of tender schedule together with letter of intent awarding the work shall form the contract. If there is any conflict between any of the provisions in the special condition or in any of the other documents referred, the provision in the special conditions shall prevail. Similarly if there is any difference between the description in the specification and drawings, the work items in the tender schedule shall prevail for determining the rate.

16. GUARANTEE AND INSURANCE

The contractor should give a minimum guarantee of 60 MONTHS from the certified date of completion of the work against any defective workmanship or usage of defective material or equipments for the work. This will be the defects liability period in respect of this contract.

The contractor should at his cost take and maintain an insurance policy during the course of construction in the joint name of the KSIDC and the contractor for a sum equivalent to the contract amount in respect of the construction and maintenance of the project for FIVE YEARS from the date of commencement of the defects liability period.

Annexure - II
LETTER OF TRANSMITTAL

From :

Deputy General Manager (Infrastructure)
KSIDC Ltd, 2nd Floor,
Choice Towers, Manorama Jn
Kochi-682016

SUBJECT: Submission of pre-qualification for the work of Construction of Roads And Storm Water Drains For The Part Development of Phase II At IGC Kozhikode – Balance works

Sir,

Having examined the details given in pre-qualification press-Notice and Pre-qualification document for the above work, I/We hereby submit the pre-qualification document and other relevant information.

1. I /We hereby certify that all the statements made and information supplied in the enclosed forms A to E and accompanying statement are true and correct.
2. I / We have furnished all information and details necessary for pre-qualification and have no further pertinent information to supply.
3. I /We submit the requisite certified solvency certificate and authorize KSIDC or its authorized representatives to approach the Bank issuing the solvency certificate to confirm the correctness thereof. I/We also authorize KSIDC or its authorized representative to approach individuals, employers, firm and corporation to verify our competence and general reputation.
4. I /We submit the following certificates in support of our suitability, technical know- how and capability for having successfully completed the following works.

Sl. No.	Name of work	Certificate from

Enclosures:
Seal of Applicant
Date of Submission

Signature of Applicant(s)

FORM 'A'**FINANCIAL INFORMATION**

Financial Analysis - Details to be furnished duly supported by figures in balance sheet/ profit & loss account for the last three years duly certified by the Chartered Accountant, as submitted by the applicant to the Income Tax Department (Copies to be attached)

YEARS

- | I. | i) Gross Annual Turnover on construction works | | | | |
|----|--|--|--|--|--|
| | ii) Profit/ Loss | | | | |
- II. Financial arrangement with the Financial Institution like over drafts/loan, Bank Guarantee Limit etc. for carrying out the proposed work
- III. The following certificates are enclosed:
- a) Solvency Certificate from Bankers of Applicant.
 - b) Current Income Tax Return filed with Income Tax Dept. duly acknowledged (with seal).

Seal of Applicant

Signature of Applicant(s)

Date of Submission

FORM 'B'**DETAILS OF ALL WORKS OF SIMILAR CLASS COMPLETED DURING THE LAST SEVEN YEARS ENDING 31st MARCH, 2018.**

Sl. No.	Name of work/ project and location	Owner or sponsoring organization	Cost of work in Rs crores	Date of commencement as per contract	Stipulated date of completion	Actual Date of completion	Litigation /Arbitration pending/ in progress with details*	Name and address /telephone number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

*Indicate gross amount claimed and amount awarded by the Arbitrator.

Seal of Applicant

Signature of Applicant (s)

Date of Submission

FORM 'C'
PROJECT UNDER EXECUTION OR AWARDED

S No:	Name of work/ project and location	Owner or sponsoring organization	Cost of work	Date of commencement as per contract	Stipulated date of completion	Upto date percentage progress of work	Slow progress if any, and reasons thereof	Name And Address/ Telephone Number of officer to whom reference may be made	Remarks
1	2	3	4	5	6	7	8	9	10

Seal of Applicant

Signature of Applicant (s)

Date of Submission

FORM "D"**STRUCTURE & ORGANISATION**

1. Name of Address of the applicant
2. Telephone No./Fax No.
3. Legal status of the applicant
(Attach copies of original document defining the legal status)
 - a) An individual
 - b) A proprietary firm
 - c) A firm in partnership
 - d) A limited company or Corporation
4. Particulars of registration with various Government bodies (attach attested Photocopy)

Organization/ Place of registration	Registration No.
1.	
2.	
3.	
5. Name and Titles of Directors & Officers with designation to be concerned with this work.
6. Designation of individuals authorized to act for the organization.
7. Was the applicant ever required to suspend construction for a period of more than six months continuously after you commenced the construction? If so, give the name of the project and reasons of suspension of work.
8. Has the applicant or any constituent partner in case of partnership firm, ever abandoned the awarded work before its completion? If so give name of the project and reasons for abandonment.
9. Has the applicant or any constituent partner in case of partnership firm, ever been debarred/ black listed for tendering in any organization at any time? If so, give details.
10. Has the applicant or any constituent partner in case of partnership firm, ever been convicted by a court of law? If so, give details.
11. In which field of Civil Engineering construction the applicant has specialization and interest?
12. Any other information considered necessary but not included above.

Seal of Applicant(s)
Date of Submission

Signature of Applicant (s)

FORM 'E'**DETAILS OF CONSTRUCTION PLANT AND EQUIPMENT LIKELY TO BE USED IN CARRYING OUT THE WORK**

S.No.	Name of equipment	Nos	Capacity or type	Age	Condition	Ownership status			Current location	Remarks
						Presently owned	Leased	To be purchased		

Seal of Applicant

Signature of Applicant (s)

Date of Submission

FORM 'F'**KEY PERSONNEL PERMANENTLY EMPLOYED IN YOUR ORGANIZATION**

S. No.	Name, age & Contact details	Designation	Qualification	Experience	Employed in your firm since	Nature of works handled	Name of project handled	Remarks

FORM OF PRELIMINARY AGREEMENT

(To be executed on stamp paper of value Rs.100/- and submitted along with tender)

Preliminary agreement entered into on this.....day ofTwo thousand and Nineteen between M/s. KERALA STATE INDUSTRIAL DEVELOPMENT CORPORATION Ltd. 2nd floor, Choice Towers, Manorama Jn., Kochi-682016, Kerala., (Hereinafter called KSIDC on one part and Shri (Name and address of the contractor) (Hereinafter called the contractor) on the other part for the execution of the agreement as well as the execution of the work of “Construction of Roads And Storm Water Drains For The Part Development of Phase II At IGC Kozhikode – Balance works.”

Whereas KSIDC invited Item rate tenders for the above work at Alappuzha district, Kerala State by Press Notification dated 05.03.2019.

And whereas in the notice inviting tenders it is stated as follows:

Before commencing the work, or within a week of the date when the acceptance of tender has been intimated to him, the tenderer shall deposit the security deposit in full by way of DD, which together with the amount of earnest money deposited shall be treated as security (5% of Contract Amount) for the proper fulfillment of the same and he shall execute an agreement for the work in the prescribed form of agreement. If he fails to do this or fails to maintain a specified rate of progress, the security deposit shall be forfeited to KSIDC and fresh tenders shall be called for or the matter otherwise disposed. If as a result of such measures due to the default of the tenderer to pay the requisite deposit, sign contracts or take possession of the work, any loss to the KSIDC results, the same will be recovered from him as arrears of land revenue but should it be a saving to KSIDC, the original contractor shall have no claim whatever to the difference. Recoveries to this or any other account will be made from the sum that may be due to the contractor on this or any other contracts or under the Revenue Recovery Act or otherwise as the KSIDC may decide.

Now, therefore these present witnesseth and it is mutually agreed as follows.

The terms and conditions for the said contract having been stipulated in the said tender form to which the contractor has agreed, a copy of which is appended, and which forms part of this agreement, it is agreed that the terms and conditions stipulated therein shall bind the parties to this agreement, except to the extent to which they are abrogated or altered by express terms and conditions herein, agreed to and in which respect the express provisions herein shall supersede those of the said tender form. The contractor hereby agrees and undertakes to perform and fulfill all the operations and obligations connected with the execution of the said contract work.

If the contractor does not come forward to execute the original agreement after the said work is awarded and selection notice issued in his favour or commits breach of any of the conditions of the contract, KSIDC may rearrange the works otherwise or get it done otherwise at the risk and cost of the contractor and the loss so sustained by KSIDC can be realized from the contractor under the Revenue

Recovery Act as if arrears of land revenue as assessed, quantified and fixed by an adjudicating authority consisting of KSIDC or any other officer or officers authorized by KSIDC taking into consideration the prevailing rates and after giving due notice to the contractor. The decision taken by such authorized officer or officers shall be final and conclusive and shall be binding on the contractor.

The contractor further agrees that any amount found due to KSIDC under or by virtue of this agreement shall be recoverable from the contractor from his security deposit and his properties, movable and immovable as arrears of land revenue under the provisions of the Revenue Recovery Act for the time being in force or in any other manner as KSIDC may deem fit in this regard.

In witness where of Sri.....

(the name of the officer of the KSIDC) for and on behalf of the KSIDC

and

Sri.....

the contractor have set their hands on the day and year first above written.

Signed by Sri.....

Officer/Officers of KSIDC in the presence of witnesses

1.

2.

Signed and delivered by Sri.....

(the contractor) in the presence of witness

1.

2.

SOLVENCY CERTIFICATE

This to certify that to the best of our knowledge and information, M/s/Mr.....(address).....is a customer of our bank, respectable and can be treated as solvent up to a sum of Rs.....(Rupees.....only) as disclosed by the information and records which are available with us. This certificate is issued at the specific request of the customer for the purpose of participating in KSIDC Tender No. KSIDC/IGC/Kozhikode/03/2018-19 Dt.05.03.2019

This certificate is issued without any responsibility, liability or risk on part of the Bank or its officers and same is not as guarantee or otherwise.

Authorised Signatory

Name.....

Date.....

Seal.....

DEFINITIONS AND TERMS

In the contract (as hereinafter defined) the following words and expression shall have the meaning hereby assigned to them except wherein the context otherwise required.

1	Owner/Client/Employer	:	Kerala State Industrial Development Corporation, Kochi, Kerala. (in short, written as KSIDC)
2	Tenderer	:	The firm/party/individual who quotes against enquiry
3	Contractor	:	The successful tenderer whose tender has been accepted by KSIDC and to whom a letter of intend or work order has been placed and shall include his heirs, legal representatives and assigns
4	Contract price	:	Prices referred to in the agreement
5	This contract	:	Invitation to tender, preliminary agreement, notice inviting tenders, (Form No.83), Form of tender, instruction to tenderers, special conditions, general conditions of contract, technical specifications, schedule of quantities with rates and amounts against each items with specifications, drawings of the work, pre-qualification bid, Priced Bid and correspondences or negotiations, if any.
7	PAC	:	Probable amount of contract as per the contract
8	Site	:	The actual place of the proposed project where the work is to be executed under this contract
9	Month	:	Thirty days
10	Earnest money	:	The sum paid along with the tender as token to bind a contract
11	Award	:	The written acceptance of tender by KSIDC given to the successful tenderer.
12	Security deposit	:	The amount deposited with KSIDC for faithful and satisfactory performance of contract
13	Retention amount	:	The amount deducted from the running bills
14	Engineer/Supervisor	:	The Project Engineer or Architect's supervisor or consultants or any officer representing KSIDC.
15	Materials	:	Materials include all construction materials such as river sand, steel, cement, bricks, aggregates, rubble, water, bitumen, all pipes, specials and valves etc.
16	Signature in the bids	:	Digital Signature

(4)**GENERAL CONDITIONS OF CONTRACT****PRELIMINARY AND GENERAL CONDITION OF CONTRACT**

Except where provided for in the description of the individual items in the schedule of quantities and in the specifications and the conditions laid down herein after and in the drawings, the work shall be carried out as per standard I.S, P.W.D/MoRTH specifications and under the direction of KSIDC official/Architects.

1. DEFINITIONS, TERMS, INTERPRETATION

In constructing these conditions, the specification, the schedule of quantities, tender and agreement, the following words shall have the meaning here in assigned to them except where the subject or context otherwise requires:

i)KSIDC

The term KSIDC shall denote Kerala State Industrial Development Corporation Ltd with its head office at Thiruvananthapuram and any of its representatives authorized on their behalf.

ii) ENGINEER – means the Engineer appointed by KSIDC who shall supervise and be in charge of the work.

iii) ARCHITECTS/PMC CONSULTANTS

The term Architects shall mean M/s.KITCO Ltd, P.B.No.4407, Puthiya Road, NH bypass, Vennala, Kochi-682028 or in the event of his/their ceasing to be the Architects for the purpose of this contract such other person/s as KSIDC shall nominate for the purpose. The Architect with the approval of KSIDC may engage a local Architect/Consulting Engineer for supervision and co-ordination of the work at the site. He will be considered a representative of the Architect.

iv) CONTRACTOR

The term contractor shall mean (Name of the contractor and address of the contractor) and his/ their heirs, legal representatives, assigns and successors.

v) SITE

The site shall mean the site where the works are to be executed as shown within boundary in red border in the site layout plan including any building and erections thereon allotted by KSIDC for the contractors use.

vi) DRAWING

The work is to be carried out in accordance with drawings, specifications and any other details shall be approved by KSIDC/Architects during the execution of the work. All drawings relating to the work approved by KSIDC/Architects and given to the contractor together with a copy of schedule of quantities are to be kept at site and KSIDC/Architects/shall be given access to such drawings or schedule of quantities whenever necessary.

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

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

vii)"The works" shall mean the work or works to be executed or done under this contract.

viii)"Act of Insolvency" shall mean any act as such as defined by the Presidency towns insolvency act or in provincial insolvency act or any amending status.

ix)"The schedule of quantities" shall mean the schedule of quantities and forming part of this contract.

x)"Priced schedule of quantities" shall mean the schedule of quantities duly priced with the accepted quoted rates of the contractor.

2. SCOPE

The works consist of "DEVELOPING OF INTERNAL ROADS AND DRAINS AT KINALUR INDUSTRIAL PARK-BALANCE WORK", in accordance with the requirement and process approved by KSIDC. It includes furnishing all materials, labour, tools and equipment and management necessary for and incidental to the construction and completion of the work. All work, during its progress and upon completion, shall conform to the lines, elevations and grades as shown on the drawings approved by KSIDC/Architects. Operation and Maintenance for a period of 60 months is in the scope of successful bidder and to be included in the price

Contractor should prepare the detailed design for the proposed Cold storage plant and the same should obtain the approval from the KSIDC / Architects and also should obtain approval from the any government institutions like NIT/IIT or equivalent etc.,

KSIDC / Architects may in their absolute discretion issue further drawings and. / or written instructions, details, directions and explanations, which are hereafter collectively referred to as

“KSIDC’s/Architect’s instructions” in regard to:

- a) The variation or modification of the design quality or quantity of works or the addition or omission or substitution of any work.
- b) Any discrepancy in the drawings of the schedule of quantities and/or drawings and/ or specification.
- c) The removal from the site of any defective material brought thereon by the contractor and the substitution of any other material thereof.
- d) The demolition removal and /or re-execution of any work executed by the contractor/s
- e) The dismissal from the work of any persons employed thereupon
- f) The opening up for inspection of any work covered up
- g) The rectification and making good of any defects under clauses herein after mentioned and those arising during the maintenance period (retention period).

The contractor shall set up a field laboratory with necessary equipment for day to day testing of materials like grading of coarse and fine aggregates, silt content and bulkage of sand etc.

3. SITE VISIT

The tenderer shall visit the site and make himself thoroughly acquainted with the local site condition, approach road to the site, availability of water, power supply, nature of ground soil and subsoil conditions, availability of water, power access and storage for materials and removal of rubbish etc for the smooth execution of the work. The rate quoted by tender shall include cost for carriage, freight and other charges as also for any special difficulties and including police restriction for transport etc. for proper execution of work as indicated in the drawing. The successful tenderer will not be entitled to any claim of compensation for difficulties faced or losses incurred on account of any site condition which existed before commencement of the work or which in the opinion of the Employer or his agent/Architect might be deemed to have reasonably been inferred to be so existing before commencement of work.

4. TENDERS

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

The works will be paid for on the basis of actual work done based on the agreed terms.

All items of works are to be deemed and paid as complete works in all respects and details including preparatory and finishing works involved, directly, related to and reasonably detectable from the drawings, specification and schedule of quantities and no further extra charges will be allowed in this connection.

KSIDC has power to add to, omit from any work as described in specifications and intimate the same in writing but no addition, omission or variation shall be made by the contractor without the authorization from KSIDC. No variation shall vitiate the contract.

5. AGREEMENT

The successful contractor may be required to sign agreement as may be drawn up to suit local conditions and shall pay for all stamps and legal expenses, incidental thereto.

6. PERMITS AND LICENSES

Permits and licenses for release of materials, which are under Government control, will be arranged by the contractor. KSIDC will render necessary assistance, sign any forms or applications that may be necessary. The basic price of controlled materials, if any, for the purpose of valuing the tender is to be considered as stipulated below. This will also be the basis of adjustments in settling the contractors bills.

The contractor will however, be eligible to a proportionate extension of time on this account which in the opinion of KSIDC/Architect is reasonable. The contractor shall at his own cost arrange for storage shed adequate for taking delivery and storing of the quantity of controlled materials released by the authorities or supplied by KSIDC. The costs of storing, transporting etc., of all materials included by the tenderer on his quoted rates.

KSIDC/Architect shall be indemnified against all Government or legal actions for theft or misuse of cement, MS rods and any controlled materials in the custody of the contractor.

7. GOVERNMENT AND LOCAL RULES

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

8. TAXES AND DUTIES

The bidders must quote their tender prices exclusive of GST and inclusive of all duties, royalties, cess, other taxes or any other levies or local charges if applicable. No extra claim on this account will in any case be entertained.

KSIDC reserves the right to deduct applicable taxes as per tender terms from the running bills in the absence of clearance certificate from concerned authorities. Construction workers welfare fund at 1% on the value of work or at the rate prevailing during the pendency of the contract including the extension of time, if any will be deducted from the contractors running bill. The contractor should register himself / itself with construction labour welfare board and produce receipt to KSIDC. Contractor should have valid GST registration and furnish the proof of registration.

9. QUANTITY OF WORK TO BE EXECUTED

The quantities shown in the schedule of quantities are intended to cover the entire new structure indicated in the drawings but KSIDC reserves the right to execute only a part or the whole or any excess thereof without assigning any reason therefore.

10. OTHER PERSONS ENGAGED BY KSIDC

KSIDC reserves the right to execute any part of the work included in this contract by other Agency or persons and contractor shall allow all reasonable facilities and use of his scaffolding for the execution of such work. The main contractor shall extend all cooperation in this regard.

11. EARNEST MONEY & SECURITY DEPOSIT

The contractor will have to deposit an amount of Rs.1,00,000/- by remitting to the SBI account provided in the website. KSIDC is not liable to pay any interest on the Earnest money. The Earnest money of the unsuccessful tenderers will be refunded without any interest soon after the execution of agreement by the successful tenderer or after the expiry of the validity period of the tender.

The successful tenderer to whom the contract is awarded will have to deposit as initial security deposit, a further sum to make up 5% of the value of the accepted tender including the Earnest money. At least fifty percent (50%) of this deposit shall be collected in the form of Demand Draft and the rest in the form of Bank Guarantee. The security deposit will have to be made within 14 days from the date of acceptance of tender, failing which KSIDC at his discretion may revoke the letter of acceptance and forfeit the earnest money deposit furnished along with the tender.

Apart from the above additional performance Guarantee is the additional amount to be deposited for unbalanced price i.e. for works quoted below estimate rate. Additional bank guarantee for all the work quoted between 11% to 25% below estimate rate and do away with less than 10% estimated rate.

12. RETENTION MONEY

Apart from the Security Deposit made as above, retention money shall be deducted from progressive running bills @ 2.5% of the gross value of each running bill.

The retention amount and additional performance guarantee if any will be refunded/released to the contractor along with the final bill and the Security Deposit will be released on completion of defect liability period. No interest is allowed on retention money and security deposits.

13. DEFECTS LIABILITY PERIOD

The contractor shall be responsible for the maintenance of the work executed by him for a period of 60 months from the date of commissioning of work as certified by KSIDC and any defects notified to the construction during this period will have to be rectified by the contractor at his own cost. The security deposit shall be released to the contractor only after satisfactory rectification of such defects noticed if any. If the contractor fails to rectify any such defects within 7 days, when notified, KSIDC shall recover the cost of such rectifications from this amount.

14. CONTRACTOR TO PROVIDE EVERYTHING NECESSARY.

The Contractor shall provide everything necessary for the proper execution of the work according to the intent and meaning of the drawings, schedule of quantity and specification taken together whether the same may or may not be particularly shown or described therein provided that the same can reasonably be inferred there from and if the contractor find any discrepancies therein he shall immediately and in writing, refer same to KSIDC/Architects whose decision shall be final and binding. The contractor shall provide himself for ground, fresh water and electricity for carrying out of the works at his own costs. KSIDC shall on no account be responsible for the expense incurred by the contractor for hired ground or fresh water obtained from elsewhere.

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

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

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

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

15. TIME OF COMPLETION, EXTENSION OF TIME AND PROGRESS CHART

15.1. TIME OF COMPLETION

The entire work is to be completed in all respects within **6 calender months**. The work shall be deemed to be commenced within 7 days from the date of acceptance letter or date of handing over of site, whichever is earlier. Time is the essence of the contract and shall be strictly observed by the contractor.

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

15.2. EXTENSION OF TIME

If in the opinion of KSIDC/Architects the works be delayed

- (a) by reason of any exceptionally inclement weather, or
- (b) by reason of instructions from KSIDC in consequence of proceedings taken or threatened by or disputes, with adjoining or neighboring owners or
- (c) by the works, or delay, of other contractors or tradesmen engaged or nominated by KSIDC and not referred to in the specification or
- (d) by reason of authorized extra and additions or
- (e) by reason of any combination of workmen or strikes or lock-out affecting any of the building trades or
- (f) from other causes which KSIDC may consider being beyond the control of the contractor,

KSIDC at the completion of the time allowed for the contract shall make fair and reasonable extension of time for completion in respect therefore. In the event of KSIDC failing to give possession of the site upon the day specified above the time of completion shall be extended suitably.

In case of such strikes or lock outs as are referred to above, the contractor shall immediately give KSIDC, written notice thereof. Nevertheless, the contractor shall use his best endeavors all that to

prevent delay, and shall do all that may be reasonably required, to the satisfaction of KSIDC to proceed with the works and on his doings so that it will be ground of consideration by KSIDC for an extension of time as above provided. The decision of KSIDC as to the period to be allowed for an extension of time for completion hereunder (which decision shall be final and binding on the contractor) shall be promulgated at the conclusion of such strike or lockout and KSIDC shall then, in the event of an extension being granted, determine and declare the final completion date. In case of any extension of time the contractor will be required to execute a supplementary agreement to that effect at his cost.

15.3. PROGRESS OF WORK.

During the period of construction, the contractor shall maintain proportionate progress on the basis of a Programme Chart (Preferably prepared using Microsoft Project or similar software) submitted by the contractor immediately before commencement of work and agreed to by KSIDC/Architects. Contractor should also include planning for procurement of scarce material well in advance and reflect the same in the program chart so there is no delay in completion of the project. The progress of work shall be monitored and managed through periodic site meetings in which the contractor, architect and KSIDC shall be present.

16. LIQUIDATED DAMAGES.

Time shall be the essence of the contract. The contractors' endeavor shall be to prevent any delay and complete the work within the time agreed. Should the work be NOT completed to the satisfaction of KSIDC/Architects within the stipulated period, the contractor shall be bound to pay to KSIDC a sum calculated as given below by way of liquidated damages and not as penalty during which the work remains uncommenced or unfinished after the expiry of the completion date. 1.00% of the estimated amount shown in the tender per week subject to a ceiling of 10% of the accepted contracted sum.

17. TOOLS, STORAGE OF MATERIALS, PROTECTIVE WORKS & SITE OFFICE REQUIREMENTS

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

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

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

The contractor shall arrange for temporary latrines for the use of workers and field staff and keep the same in clean and sanitary conditions to the satisfaction of the public health authorities and shall

cause such latrines and soil to be cleared away whenever necessary and shall make good all the works distributed by these conveniences.

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

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

17.1. PROTECTIVE MEASURES

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

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

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

17.2. STORAGE OF MATERIALS:

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

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

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

17.3. TOOLS

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

All measuring tapes shall be of steel and suitable scaffolding and ladders that may be required for safely taking measurement shall be supplied by the contractor.

The supervisors on the works shall carry with them always a one meter or two meter steel tape, a measuring tape of 30 meters, a spirit level, a plumb bob and a square and shall check the work to see that the work is being done according to the drawing and specifications. The site Engineer will use any or all he chooses for checking the works executed or being executed on the contract.

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

18. NOTICE AND PATENTS OF APPROPRIATE AUTHORITY & OWNERS

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

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

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

19. CLEARING SITE & SETTING OUT WORKS

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

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

20. DATUM

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

21. BENCH MARKS

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

22. CONTRACTOR TO REMOVE IMMEDIATELY ALL OFFENSIVE MATTERS

All soil, filth or other matters of any offensive nature taken out of any trench, sewer, drain, cesspool or other place shall not be deposited on the surface but shall be at once carted away by the contractor to place provided by him.

The contractor shall keep the foundations and works free from water and shall provide and maintain at his own expenses, electrically or other power driven pumps and other plant to the satisfaction of KSIDC for the purpose, until the building is handed over to KSIDC. The contractor shall arrange for the disposal of the water so accumulated to the satisfaction of KSIDC and the local authority and no claims will be entertained afterwards if he does not include in his rates for the purpose.

23. ACCESS

Any authorized representative of KSIDC shall at all reasonable times have free access to the works and/or to the workshops, factories or other places where materials are being prepared or constructed for the work and also to any place where the materials are lying or from where they are being obtained, and the contractor shall give every facility to KSIDC or their representatives necessary for inspection and examination and test of materials and workmanship. Except the representatives of KSIDC no person shall be allowed at any time without the written permission of KSIDC.

24. MATERIALS, WORKMANSHIP, SAMPLES, TESTING OF MATERIALS

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

If required by KSIDC/Architects the contractor shall have to carry out tests on materials and workmanship approved materials testing laboratories or as prescribed by KSIDC/Architects at his own

cost to prove that the materials etc, under test confirm to the relevant IS standards or as specified in the specifications. The necessary charges for preparation of mould (in case of concrete cube) transporting, testing etc, shall have to be borne by the contractor. No extra payment on this account should any case be entertained.

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

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

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

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

25. REMOVAL OF IMPROPER WORK.

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

26. SITE ENGINEER /PROJECT MANAGEMENT CONSULTANT (PMC)

The term "Site Engineer/PMC" shall mean the Engineer/ Supervisor of KSIDC/ Architect. He may

authorize any of the technical staff from KSIDC/ architect to be his representative. The contractor shall afford the "Site Engineer/PMC" every facility and assistance for examining the works and materials and for checking and measuring work and materials. The "Site Engineer/PMC" shall have no power to revoke, alter, enlarge or relax any requirements of the contractor or to sanction any day work, additions , alterations , deviations, or omissions or any extra work whatever , except in so far as such authority may be specially conferred by a written order of KSIDC.

The Site Engineer/PMC shall have power to give notice to the contractor or to his foreman, of non-approval of any work or materials and such works shall be suspended or the use of such materials shall be discontinued until the decision of KSIDC is obtained. The work will from time to time be examined by the Architects, Engineer from the Premises Department of KSIDC and the Site Engineer if any. But such examination shall not in any way exonerate the contractor from the obligation to the remedy any defects, which may be found to exist at any stage of the work or after the same is complete. Subject to the limitations of this clause the contractor shall take instructions only from the Architects /KSIDC or his representative.

27. CONTRACTOR'S EMPLOYEES

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

The contractor shall employ local labourers as far as possible. No labourer below the age of 18 yrs and who is not an Indian National shall be employed on the work.

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

The contractor shall comply with the provisions of all labour legislation including the requirements of The payment of wages act.

Workmen's compensation act.

Contract labour (regulation and abolition) act, 1970 and Central rules 1971.

Apprentices act 1961

Minimum wages act

Equal Remuneration Act, 1973.

Inter-state Migrant Workman (Regulation of Employment & Conditions of Services) Act, 1979.

Employees State Insurance Act.

Provident Fund Act.

Any other act or enactment relating thereto and rules framed there under from time to time.

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

The contractor shall comply at his own cost with the order of the requirement of any health officer of the State or any local authority or of KSIDC regarding the maintenance of proper environmental sanitation of the area where the contractors labourers are housed or accommodated, for the prevention of small pox, malaria and other contagious diseases. The contractor shall provide and maintain good sanitary conditions, adequate sanitary accommodation and provide facilities for pure drinking water at all times for use for men engaged on works and shall remove and clear away the same on completion of work.

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

28. DISMISSAL OF WORKMEN

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

29. ASSIGNMENT

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

30. DAMAGE TO PERSONS AND PROPERTY INSURANCE ETC.

The contractor shall be responsible for all injury to the work or workmen to persons, animals or things and for all damages to the structural and/or decorative part of property which may arise from the operations or neglect of himself or of any sub-contractor or of any of his or a sub-contractor's employees, whether such injury or damage arise from carelessness, accident or any other cause

whatsoever in any way connected with the carrying out of this contract. The clause shall be held to include inter-alia, any damage to buildings whether immediately adjacent or otherwise, and any damage to roads, streets, foot paths or ways as well as damages caused to the buildings and the works forming the subject of this contract by rain, wind or other inclemency of the weather. The contractor shall indemnify KSIDC and hold harmless in respect of all and any expenses arising from any such injury or damages to persons or property as aforesaid and also in respect of any claim made in respect of injury or damage under any acts of compensation or damage consequent upon such claim.

The contractor shall reinstate all damage of every sort mentioned in this clause, so as to deliver the whole of the contract works complete and perfect in every respect and so as to make good or otherwise satisfy all claims for damages to the property or third parties.

The contractor shall effect the insurance necessary and indemnify KSIDC entirely from all responsibility in this respect. The Insurance must be placed with a company approved by KSIDC and must be effected jointly in the name of the contractor and KSIDC and the policy lodged with the latter. The scope of insurance is to include damage or loss to the contract itself till this is made over in a complete state. Insurance is compulsory and must be effected from the very initial stage. The contractor shall be responsible for anything which may be excluded from damage to any property arising out of incidents, negligence or defective carrying out of this contract.

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

31. INSURANCE

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

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

32. ACCOUNTS RECEIPTS & VOUCHERS

The contractor shall, upon the request of KSIDC furnish them with all the invoice accounts receipts and other vouchers that they may require in connection with the works under this contract. If contractor shall use materials less than what he is required under the contract, the value of difference in quantity of the materials he was required to use and that he actually used shall be deducted from his dues. The decision of KSIDC shall be final and binding on the contractor as to the amount of materials the contractor is required to use for any work under this contract.

Before taking any measurement of any work, the site engineer or his depute shall give reasonable notice to the contractor. If the contractor fail to attend at the measurements after such notice, and fails to counter sign or to record the difference with a week from the date of measurement in the manner required by the site engineer, then in any such event the measurement taken by the site engineer or by his depute will be final and binding on the contractor and the contractor shall have no right to dispute the same.

33. PAYMENTS

All bills shall be prepared by the contractor in the form prescribed by KSIDC /Architects. The bill in proper forms must be duly accompanied by detailed measurements in support of the quantities of work done and must show deductions for all previous payments, retention money, etc.

The Contractor shall submit GST invoice at the rate as applicable to Govt. work by a Govt. Entity.

KSIDC / Architect shall issue a certificate after due scrutiny of contractor's bill stating the amount due to the contractor from KSIDC and the contractor shall be entitled to payment thereof. Payment shall be released directly to the Contractor by the Government from the Treasury with due verification by treasury office.

The amount stated in an interim certificate shall be the total value of work properly executed less the amount to be retained by KSIDC as retention money and less installments previously paid under these conditions.

KSIDC will deduct retention money as described in clause 12 of these conditions. The refund of retention money will be made as specified in the tender condition.

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

All the interim payments shall be regarded as the payments by way of advance against the final payment only and not as payments for work actually done and completed, and shall not preclude the

requiring of bad, unsound and imperfect or unskilled work to be removed and taken away and reconstructed, or re-erected or considered as an admission of the due performance of the contract, or any part thereof in any respect or the accruing of any claim, nor shall, which conclude, determine or affect in any way the power of KSIDC under these conditions or any of them as to the final settlement and adjustment of the accounts or otherwise or in any other way or affect the contract. The contractor shall submit the final bill within one month of the date fixed for completion of the work or the date of certificate of completion furnished by the site engineer and payment shall be made within three months.

34. MOBILIZATION ADVANCE

There will be no mobilization advance or adhoc advance or advance against supplies, for executing this work.

35. FINAL PAYMENT

A certificate of completion shall accompany the final bill from KSIDC/Architects. Payment of the final bill shall be made after deduction of the Retention of money as specified in clause 12 of these conditions which sum shall be refunded after the completion of the Defects liability period after receiving KSIDC's/Architect's certificate that the contractor has rectified all the defects to the satisfaction to KSIDC/Architects. The acceptance of the payment of the final bill by the contractor would indicate that he will have no further claim in respect of the work executed.

36. VARIATION / DEVIATION

Deleted

37. SUBSTITUTION

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

38. CLEARING SITE ON COMPLETION

On completion of the works, the contractor shall clear away and remove from the site all constructional plant, surface materials, Rubbish and temporary works of every kind and leave the whole of the site and the works clean and in a workman like condition to the satisfaction of KSIDC/Architects.

39. DEFECTS AFTER COMPLETION

The contractor shall make good at his own cost and to the satisfaction of KSIDC all defects, shrinkage, settlements or other faults which may appear within 60 months after completion of the work. In

default KSIDC may employ and pay other persons to amend and make good such damages, losses and expenses consequent thereon on incidental there to shall be made good and borne by the contractor and such damages, loss and expenses shall be recoverable from him by KSIDC or may be deducted by KSIDC, in lieu of such amending and making good by the contractor, deduct from any money due to the contractor a sum equivalent to the cost of amending such work and in the event of the amount retained being insufficient, recover that balance from the contractor from the amount retained under clause No:12 together with any expenses KSIDC may have incurred in connection with.

40. CONCEALED WORK

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

41. IDLE LABOUR

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

42. SUSPENSION

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

After such notice shall have been given the contractor shall not be at liberty to remove from the site of the works or from any ground contiguous there to any plant or materials to subsist from the date of such notice being given until the notice shall have been complied with. If the contractor fails to start the work within seven days after such notice has been given to proceed with the works as therein prescribed, KSIDC may proceed as provided in clause 42 (Termination of Contract by KSIDC).

43. TERMINATION OF CONTRACT BY KSIDC

If the contractor,

- i) being a company going to liquidation whether voluntary or compulsory
or
- ii) being a firm shall be dissolved
or

- iii) being an individual shall be adjudicated or shall make an assignment or a composition for the benefit of the greater part, in number or amount of his creditors or shall enter to a Deed or number arrangement with his creditors or if the Official Assignee Insolvency, or the Receiver of the contractor's firm appointed by the court shall be unable,

within fourteen days after notice to him requiring him to do so, to show to the reasonable satisfaction of KSIDC that he is able to carry out and fulfill the contract, and if so required by KSIDC to give reasonable security therefore, or if the contractor shall suffer execution to be issued, or shall suffer any payment under this contract to be attached by or on behalf of and of the creditors of the contractor, or shall assign, charge or encumber this contract or any payments due or which may become due to the contractor, hereunder, or shall neglect or fail to observe and perform all or any of the acts matters of things by this contract, to be observed and performed by the contractor within three clear days after the notice shall have been given to the contractor in manner hereinafter mentioned requiring the contractor to observe or perform the same or shall use improper materials or workmanship in carrying on the works ,shall in the opinion of KSIDC not exercise such due diligence and make such due progress as would enable the work to be completed within due time agreed upon , and shall fail to proceed to the satisfaction of KSIDC after three clear days notice requiring the contractor as hereinafter mentioned, or shall abandon on the contract, then and in any of the said cases, KSIDC may notwithstanding previous waiver determine the contract by a notice in writing to the effect as hereinafter mentioned, but without thereby effecting the powers of KSIDC of the obligations and liabilities of the contractor the whole of which shall continue in force as if the contract, had not been so determined and as if the works subsequently executed had been executed by or on behalf of the contractor (without thereby creating any trust in favor of the contractor) further KSIDC or his agent, or servants, may enter upon and take possession of the work and all plants, tools, scaffolding, sheds, machinery, steam and other power, utensils and materials lying upon premises or the adjoining lands or roads and sell the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by employing any other contractor shall not in any way interrupt or other person employed from completing and finishing or using the materials and plants for the works when the works shall be completed, or as soon thereafter as conveniently may be, KSIDC shall give notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within a period of 14 days after receipt by him KSIDC may sell the same by public Auction and shall give credit to the contractor for the amount so realized. Any expenses or losses incurred by KSIDC in getting the works carried out by other contractors shall be adjusted against the amount payable to the contractors by way of selling his tools and plants or due on account of work carried out by the contractor prior to engaging other contractors or against the security Deposit.

44. JURISDICTION

All disputes or differences of any kind whatsoever which shall at any time arise between the parties hereto touching or concerning the works or the execution or maintenance thereof of this contract or the rights touching or concerning the works or the execution of maintenance thereof of this contract or the construction remaining operation or effect thereof or to the rights or liabilities of the parties or arising out of or in relation thereto whether during or after determination foreclosure or branch of the contract hereinafter mentioned shall be subject to the jurisdiction of Courts in Ernakulum.

(5)

45. SAFETY CODE & MODEL RULES FOR PROTECTION OF HEALTH AND SANITARY ARRANGEMENT FOR WORKERS.

45.1. SAFETY CODE

i. Suitable scaffolds shall be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except in the case of short duration work, which can be done safely from ladders. When a ladder is used, it shall be of rigid construction made either of good quality wood or steel. The steps shall have a minimum width of 450mm and maximum rise of 300mm. Suitable hand holds of good quality wood or steel shall be provided and the ladder shall be given an inclination not steeper than $\frac{1}{4}$ to 1 {1/4 horizontal and 1 vertical}

ii. Scaffolding or staging more than 4m above the ground floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly bolted, braced or otherwise secured, at least 1m above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.

iii. Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally and if the height of the platform, gangway or stairway is more than 4m above the ground level or floor level, they shall be closely boarded and shall have adequate width and be suitably fenced as described in ii above.

iv. Every opening in the floor of a building or in working platform shall be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1m.

Wherever there are open excavations in ground, they shall be fenced off by suitable railing and danger signals installed at night so as to prevent persons slipping in to the excavations.

v. Safe means of access shall be provided to all working places. Every ladder shall be securely fixed. No portable signal ladder shall be over 9m in length while the width between side rails in rung ladder shall in no case be less than 290mm for ladder up to and including 3m in length. For lower ladders this width shall be increased at least 20mm for each additional meter of length.

vi. A sketch of ladders and scaffold proposed to be used shall be prepared and approval of the Engineer obtained prior to construction.

45.2. OTHER SAFETY MEASURES

vii. All personnel of the contractor working within the plant site shall be provided with safety helmets. All welders shall wear welding goggles while doing welding work and all metal workers shall be provided with safety gloves. Persons employed on metal cutting and grinding shall wear safety glasses.

viii. Adequate precautions shall be taken to prevent danger from electrical equipments. No materials on any of the site of work shall so stacked or placed as to cause danger or inconvenience to any person or the public.

Excavation & Trenching

ix. All trenches, 1.25m or more in depth shall at all times be supplied with at least one ladder for each 30m in length or fraction thereof. The ladder shall be extended from bottoms of trench to at least 1m above the surface of the ground. Sides of trenches which are 1.5m or more than the depth shall be stepped back to give suitable slope or securely held by timber bracing so as to avoid the danger of sides collapsing. The excavated material shall not be placed within 1.5m of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

x. The contractor shall take all measures on the site of the work to protect the public from accidents and shall be bound to bear the expenses of the defense of every suite, action or other proceedings at law that may be brought by persons for injury sustained owing to neglect of the content of the contractor, be paid to compromise any claim by any such persons.

45.3. DEMOLITION

xi. Before any demolition work is commenced and also during the process of the work:

a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.

b) No electric cable or apparatus, which is liable to be a source of danger or a cable or apparatus used by the operator shall remain electrically, charged.

c) All practical steps shall be taken to prevent danger to persons employed from the risk of fire or explosion or flooding. No floor, roof or other part of the building shall be so over loaded with debris or materials as to render it unsafe.

45.4. PERSONAL SAFETY EQUIPMENT'S

xii. All necessary personal safety equipment as considered adequate by the Engineer should be kept available for the use of the person employed on the site and maintained in a condition suitable for

immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned.

a) Workers employed on mixing asphaltic materials cement and lime mortars shall be provided with protected foot wears and protected goggles.

b) Those engaged in white washing and mixing or stacking of cement bags or any other material which is injurious to the eyes shall be provided with protected goggles.

c) Those engaged in welding works shall be provided with welder's protective eyesight lids.

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

e) When workers are employed in sewers and manholes, which are in use, the contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are to get into manholes and the manhole so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accidents to the public.

f) The contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead or any toxic material in any form. Whenever men above the age of 18 are employed on the work of such painting the following precautions should be taken:

i) No paint containing lead or lead products shall be used except in the form of paste or ready made paint. Paint like vinyl and epoxies having toxic fumes should be applied after following all precautions lay down by manufactures.

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

iii) The contractor to the workmen shall supply overalls and adequate facilities shall be provided to enable the working painters to wash during the cessation of work.

xiii) When the work is done near any public place where there is risk of drowning all necessary equipments should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.

45.5. HOISTING MACHINES

xiv) Use of hoisting machine and tackle including their attachment anchorage and supports shall conform to the following standards or conditions:

1.a) These shall be of good mechanical constructions sound material and adequate strength and free

from patent defects and shall be kept in good repair and in good working order.

b) Every rope used in hoisting or lowering materials or as means of suspension shall be of durable quality and adequate strength and free from patent defects.

2. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffolding winch or give signals to operator.

3. In case of every hoisting machine and of every chain ring hook, shackle shovel and pulley block used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. In case of a hoisting machine and all gear referred to above shall be plainly marked with the safe working load, each safe working load and the conditions under which it is applicable shall be indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.

4. In case of departmental machines, the Engineer shall notify the safe working load. As regards contractor's machines, the contractor shall notify the safe working load of the machine to the Engineer whenever he brings any machinery to site of work and get it verified by the Engineer concerned.

xv) Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards. Hoisting appliances should be provided with such means as will reduce to the minimum, of risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats, wearing apparel, such as gloves, sleeves and boots as may be necessary, should be provided. The worker's should not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.

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

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

xvii) These safety provisions should be brought to the notice of all concerned by display on a notice board at a prominent place at work spot. The person responsible for compliance of the safety code shall be named therein by the contractor.

xviii) To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer, Engineers of the Department or their representatives.

xix) Notwithstanding the above clause from (i) to (xviii), there is nothing in these to exempt the contractor from the operations of any other Act or rule in force in the Republic of India.

45.6. MODEL RULES FOR PROTECTION OF HEALTH & SANITARY ARRANGEMENTS FOR WORKERS

APPLICATION : These rules shall apply to all building and construction work in charge of “Construction of Roads And Storm Water Drains For The Part Development of Phase II At IGC Kozhikode – Balance works”.

DEFINITION:

- a. “Work place” means a place at which, an average 50 workers are employed in connection with construction work.
- b. “Large work place” means a place at which average 500 or more workers are employed in connection with construction work.

FIRST AID:

- a. At every work place, there shall be maintained in readily accessible place first aid appliance including an adequate supply of sterilized dressings and sterilized cotton wool. The appliance shall be kept in good order and in large workplace they shall be placed under the charge of responsible person who shall be readily available during working hours.
- b. At large work places, where hospital facilities are not available within easy distance of the workers, first aid posts shall be established and be run by a trained compounder.
- c. Where large places are remote from regular hospitals, and indoor ward shall be provided with one bed every 250 employees.

45.7. DRINKING WATER:

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

Every water supply of storage shall be at a distance of not less than 15m from any latrine, drain or other sources of pollution. Where water has to be drawn from an existing well which is within the proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door, which shall be dust and waterproof.

A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month. Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage

where such drinking water shall be stored.

45.8. WASHING & BATHING PLACES

- a) Adequate washing and bathing places shall be provided, separately for men and women.
- b) Such places shall be kept in clean and drained condition.

45.9. SCALE OF ACCOMMODATION IN LATRINES & URINALS

There shall be provided within the precincts of every work place latrines and urinals in an accessible place, and the accommodation, separately for each of them shall not be less than the following scale:

No. of seats

- a) 2, Where the number of persons do not exceed 50
- b) 3, Where the number of persons exceeds 50, but does not exceed 100
- c) 3 per 100, for every additional 100

In particular cases, the engineer shall have the powers to vary the scale where necessary.

45.10. LATRINES AND URINALS FOR WOMEN

If women are employed separate latrines and urinals screened from those for men and marked in vernacular in conspicuous letters "for women only" shall be provided on the scale laid in rule 2.6. Those for men shall be similarly marked "men only". A poster showing the figure of a man or a woman shall also be exhibited at the entrance of latrines for the respective sex. There shall be adequate supply of water close to the urinals and latrines.

45.11. LATRINES & URINALS

All latrines shall be provided with septic tanks or leach pits in case of small units. All the latrines shall be kept in good sanitary condition.

45.12. CONSTRUCTION OF LATRINES

The inside walls shall be constructed of masonry or some suitable heat resisting non-absorbent materials and shall be cement washed inside and outside at least once a year. The dates of cement washing shall be noted in a register maintained for this purpose and kept available for-inspection. Latrines will not be of a standard lower than bore-hole system and should have thatched roofs.

45.13. DISPOSAL FOR EXCRETA

Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta shall be made by septic tank or leach pit duly approved by the engineer and in conformity

with the requirements of local public health authorities.

45.14. PROVISION OF SHELTER DURING REST

At every work place there shall be provided free of cost, two suitable sheds, one for meals and the other for rest separately for men and women for the use of labour. The height of the shelter shall not be less than 3.5m from the floor level, to the lowest part of the roof. The sheds should be roofed with at least thatch and mud flooring will be provided with a dwarf wall around not less than 750mm. Sheds should be kept clean and the space should be on the basis of at least 0.50 square metre per head.

45.15. CRECHES

At every work place, at which 50 or more women workers are ordinarily employed there shall be provided two huts for the use of children under the age of 6 years belonging to such women, one hut shall be used for infants' games and play and the other as their bed room. The huts shall not be constructed on a lower standard than the following:

- a) Thatched roof
- b) Mud floors and walls
- c) Planks spread over the mud floor and covered with matting.

The huts shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the place clean. There shall be two ladies in attendance. Sanitary utensils shall be provided to the satisfaction of the health officer of the area concerned. The use of the hut shall be restricted to children, their attendants and mothers of the children.

Where the number of women workers is more than 25 but less than 50, the contractor shall provide at least one hut and one lady to look after the children of women workers. The size of Crèche or Crèches shall vary according to the number of women workers. The Crèche or Crèches shall be properly maintain and necessary equipment like toys etc shall be provided

45.16. CANTEEN

A cooked food canteen on a moderate scale shall be provided for the benefit of workers wherever it is considered expedient.

(6)

46. SPECIAL CONDITIONS OF CONTRACT (SCC)

GENERAL

Unless otherwise mentioned elsewhere in the tender document, the work in general shall be carried out as per the latest CPWD Specifications including subsequent Addenda and Corrigenda issued from time to time. Further, if the items are not available in updated CPWD Schedule of Rates, the same are to be executed strictly as per relevant BIS Codes or otherwise as directed by the Engineer In-Charge.

The Special Conditions of Contract (SCC) shall be read in conjunction with the General Conditions of contract (GCC), Specifications of the work / particular specifications, drawings, and any other document forming part of this contract. However, if there is any variation from the GCC, Special Conditions shall prevail over GCC.

The contractor shall abide by the conditions prescribed in the rules for instruction to the tenderers, general and special conditions of contract. The contractors are requested to study and understand the terms and conditions before quoting their rates.

46.1. Time shall be considered as the essence of the contract. If the completion of the contract is delayed KSIDC reserves the right for imposing a penalty for the delayed work, delay being worked out with reference to the time schedule.

46.2. The various materials to be used on the work must comply with the relevant standard specifications of Bureau of Indian standards, or any other special specification given and must be approved by the officer in charge of the work before use in the work. The workmanship should be of high quality as per ISS. Material test certificates must be provided to the engineer in charge prior to starting the work.

46.3. For materials supplied by the contractor from various suppliers, the same are subject to third party inspection at the cost of the contractor arranged by KSIDC. If required, the contractor and his suppliers shall undertake to provide all assistance required to the third party inspectors in the execution of their duties. The contractor shall be responsible for payment of all import duties, taxes, octroi, seignorage, fees etc. whichever they are payable in respect of all materials and articles supplied or procured by him. The responsibilities for safe custody of materials supplied by the contractor rests with him till they used for work and the necessary measurements are recorded by the project Engineer and the contractors sign the measurements book in token of acceptance of measurement.

46.4. The materials which are found to be of inferior quality and not conforming to specific, stipulated standards will be rejected by the site engineer and such materials should be removed from site within 24 hours of notice of such removal and on no account be used for the work. The engineer in charge

will be the authority of passing of the materials prior to usage on works. Rejections can be made by the Project Engineer before or during use on work.

46.5. Any faulty construction noticed and pointed out by the Architect/Project Engineer/ Technical Advisor/Project Manager of KSIDC shall be rectified by the contractor at his cost.

46.6. The direction and advice of the Architect/Project Engineer/ Technical Advisor/Project Manager of KSIDC and their subordinate in all matters including technical matters shall be final and binding and the contractor shall meticulously follow them.

46.7. The contractor shall be prepared to work in three shifts if called for.

46.8. The contractor shall begin to work immediately after the site is handed over and shall regularly and continuously can carry out the work to achieve the rate of progress as indicated in the schedule.

46.9 Payment to the contractor shall be as per measurement books and in stages completed.

46.10. The contractor alone is responsible for the salary of his labourers and damages if any payable under workmen compensation act will be borne by him.

46.11. Defects, if any noticed within the guarantee period prescribed below will be rectified by the contractor in default of which will be attended by KSIDC and cost made good from the contractor.

46.12. The defect liability period for the work will be 60 months from the date of handing over the system to KSIDC.

46.13. Contractor should produce latest sales tax and income tax clearance certificate for receiving final payment. The rate of tax will be applicable as per Government order or notification in the matter from time to time.

46.13.1. Contractor shall be responsible for the payment of the sales tax and other taxes & duties as per the rules in force from time to time and the rates quoted for the various items remain unaffected by any change that may be made from time to time in the rate at which such taxes or duties are levied. Sales tax due to government will be recovered from the contractor's bill of the work as per the advice of the authority concerned.

46.13.2. The contractor for this work shall bound to remit an amount equal to the employer's contribution to the Kerala Construction Workers Welfare fund Act 1989. This amount shall be recovered proportionately from the part bill and the final bill for the work and contractor shall abide such recoveries.

46.13.3. All sums due to the government under or by virtue of this contract shall be recoverable first from the security furnished by the contractor and if the same is found in sufficient such deficit amount shall be recoverable under the provisions of the Revenue Recovery Act for the time being in force as

through the same were arrears of land revenue or in any other manner as KSIDC may deem fit.

46.14. Contractor may agree that before final payment shall be made on the contract he will sign and deliver to the site engineer either in the measurement book or otherwise as demanded a valid release and discharge from any/all claims and demands whatsoever for all matters arising or connected with the contractor, provided that nothing in the clause shall release the contractor from his liabilities under the contract. It is further expressly agreed that the Project Engineer supplying the final measurement certificate need not be bound by the preceding measurements and payments. The final measurements if any of the Project engineer shall be final conclusive and binding on the contractor.

46.15. The date fixed by KSIDC for the commencement and completion of the works as per the agreement shall be strictly observed by the contractor. For any delay the contractor shall pay damages @ 1% of the estimated value of the balance work of the contract for every seven days subject to a maximum of the retention money, in case KSIDC does not grant extension of time under the clause 15.2 of General Conditions of Contract.

46.16. The method of measurements will be as per Indian standard.

46.17. KSIDC shall have the right to deduct from the money due to the contractor any sum required or estimated to be required for making good the loss suffered by the worker or the workers by reasons of non fulfillment of the condition of the contract for the benefit of the workers this non-payment of wages or deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the regulations vis-à-vis the Central Government the contractors shall be primarily liable for all payments to be made under and for the observance of the regulations aforesaid without prejudice to his right to claim from his sub-contractors The regulations aforesaid shall be deemed to be a part of this contract and breach thereof shall be a breach of this contract.

46.18. On the occurrence of an accident which results in the death of any workmen employed by the contractor or which is so serious as to be likely to result in the death of any such workmen the contractor shall within 24 hours of happening of such accidents indicate in writing to KSIDC the fact of such accidents. The contractor shall indemnify KSIDC against all loss or damage sustained by KSIDC resulting directly or indirectly from his failure to give indication in the manner aforesaid including the penalties or fines if any payable by KSIDC as consequence of KSIDC's failure to be notified under the workmen's compensation act or otherwise confirm to the said Act in regard to such accidents.

46.18.1. In the event of an accident in respect of which compensation may become payable under the workmen's compensation Act of 1923 whether by the contractor or by KSIDC as principal it shall be lawful for the Project Engineer to retain out of moneys due and payable to the contractor such sum or sums of money as may be in the opinion of the Project Engineer sufficient to meet such liability. The opinion of the Chief Engineer shall be final in this regard on all matters arising under this clause.

46.19. The person whose tender may be accepted shall, before the date fixed for commencing the work, execute an agreement with KSIDC, and shall pay for all stamps and legal expenses incident thereto after depositing security for the due performance of his contract.

46.20. In every case in which under any clause or clauses of this contract, the contractor shall have rendered himself liable to damages amounting to the whole of his security deposit, KSIDC shall have power to rescind the contract altogether or to have the work completed without further notice at the contractor's risk or expense as KSIDC may deem best suited to the interest of KSIDC and the contractor shall have no claim to compensate for any loss that may accrue from any materials he may have collected or engagements he may have entered into, on account of his work and in the latter case KSIDC shall have power to deduct whatever amount may be extended on the completion of the work, from any sums that may be due or become due from KSIDC to the contractor on account of this or any other work or recover such sums from him and his assets, movable and immovable. And in case the contract shall be rescinded under the provisions aforesaid the contractor shall not be entitled to recover or be paid any sum for any work thereto for actually performed under this contract unless and until KSIDC shall have certified the performance of such work and the value thereof, and he shall only be entitled to be paid the value so certified after deduction of any amounts due to KSIDC.

46.21. If the contractor shall be hindered in the execution of his work or as to necessitate an expression of time allowed for its completion, he shall apply in writing to KSIDC who may, if reasonable grounds be shown authorize such extension of time, if any, as may, in their opinion, be necessary and without such written authority of KSIDC, contractor shall not be exempted from the damages leviable if the work or any part or parts thereof be not completed within the prescribed time. The contractor shall also execute supplemental agreement with KSIDC when such extension of time is authorized.

46.22. No work will be paid for unless thoroughly good and fully in accordance with the specification and should through in advertence bad work be passed and paid for, it will nevertheless be perfectly competent for KSIDC to strike the same out of the account at any future time and recover the value and the contractor will be liable for the same.

46.23. If it shall appear to KSIDC or their representative in charge of the work, that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of an inferior description, the contractor shall on demand in writing, forthwith rectify, remove, or reconstruct the same in whole or in part, as the case may require, at his own proper charge and cost and in the event of his refusing to do so within a period to be specified by KSIDC or his subordinate or if he shall fail to remove, from the site of the work within a specified period, any materials or articles which are considered by the same offices unsound or bad quality or not agreeable to the terms of the contract and to provide immediately suitable materials or articles in lieu of those condemned, KSIDC shall have the power to employ and pay other persons to carry out the same, and all expenses consequent thereon or incidental thereto, as certified by KSIDC and penalties thereon shall be borne by the contractor or may be deducted from any moneys due or that may become due to the contractor, and the contractor shall not have any claim on this.

46.24. All works under execution by the contractor shall at all times be open to the inspection and supervision of KSIDC and the contractor shall always, when he is not himself present, have a responsible agent present at the worksite during the usual working hours, and at all other times, when reasonable notice of the intention of KSIDC to visit the works shall have been given, to receive

their orders and instructions. Orders given to the contractor's agent shall be considered to have the same force as if they have been given to the contractor himself. The appointment of an agent and any change of agent shall be forthwith notified by the contractor to KSIDC who may accord their approval in writing without which the appointment shall not stand.

46.25. The contractor shall give due notice in writing to KSIDC to measure any work which is going to be covered up or otherwise placed beyond the reach of measurements, in order that the correct dimensions may be taken before being so covered and must have the authority in writing of KSIDC to cover it up, in default whereof at the opinion of KSIDC the same shall be uncovered at the contractor's expense or no allowance shall be made for such work or materials.

46.26. If the contractor or his work people break, deface, injure any part of a building they may be working in or any building, road fence, enclosure or grass-land or cultivated ground, or if any damage, shall happen to the work while in progress or any imperfection become apparent in it, he shall make the same good at his own expense or in default KSIDC may cause the same to be made good, and deduct this expense from any sums that may be there or at any time thereafter due to the contractor.

46.27. The rates once agreed will not be revised on any account.

46.28. All materials shall be supplied by the contractor. The contractor has to make own arrangements for the procurement of materials on time. In case when materials have to be measured and paid for, the contractor shall be responsible for such materials until they are formally taken over by KSIDC or used in works.

46.29. The materials brought to site shall not be removed from the site without the prior approval of KSIDC.

46.30. The terms of the contract cannot be added to, varied or, reduced by any oral agreements previous or subsequent to its signature. Any such oral agreements will be repudiated by KSIDC.

46.31. KSIDC does not undertake to relieve the contractor from any difficulties or penalties arising from interference with private property in carrying out his contract.

46.32. The contractor shall pay to the labour engaged by him wages not less than fair wages as defined in the minimum wages act or any other relevant statute. It shall be the responsibility of the contractor to pay wages, compensation or any other dues if payable and it shall also be his sole responsibility to comply with the relevant statutory provisions and rules applicable to the work. The contractor is liable to pay the compensation to KSIDC for any loss caused to KSIDC due to the non-compliance of any statutory provisions.

46.33. The contractor has to prepare a time schedule for the complete work in detail and submit to KSIDC in triplicate within 10 days from the date of award of work.

46.34. The work, as per the specifications and stipulated, shall be completed on time with the agreed quality.

ADDITIONAL SPECIAL CONDITIONS OF CONTRACT

1.0 SCOPE OF WORK

The scope of work in this package includes: Construction of Roads And Storm Water Drains For The Part Development of Phase II At IGC Kozhikode – Balance works

Major items involved are:

- a. Clearing and grubbing
- b. Earth work excavation, embankment & subgrade
- c. GSB
- d. WMM
- e. Bituminous pavement works – BM, DBM, BC
- f. Signages, Road marking and safety furniture
- g. Providing Drainage arrangements
- h. Security cabin, compound wall and gate and other miscellaneous works
- k. Maintenance during defect liability period

2.0 CEMENT FOR WORKS

2.1 Supply of cement

The Contractor shall make his own arrangement for cement. The cement shall be OPC grade 43 for pavement quality concrete and OPC grade 43/53 for other structures as approved by the Engineer. The supply of Cement shall be from approved manufactures conforming to relevant Indian Standards.

Cement bags, preferably in paper bag packings, should bear the following information in legible markings:

- i. Manufacturer's name
- ii. Registered Trade Mark of manufacturer, if any
- iii. Type of cement
- iv. Weight of each bag in Kgs. or No. of bags/tonne
- v. Date of manufacture, generally marked as week of the year/year of manufacture, eg. 30/2009 which means 30th week of 2009.

Tests on cement to be as per IS 4032. Some of the tests, which shall be carried out are:

- i. Compressive strength
- ii. Initial and final setting time
- iii. Consistency
- iv. Soundness

2.2 Consumption of Cement

Quantity of cement will be decided based on the DESIGN MIX. For concreting under water, 10% extra quantity will be allowed. Mix design shall be carried out as per relevant IS codes/IRC codes.

The contractor should submit design for the same before starting the work and after getting the trial mix approved by the Engineer, follow the same for execution of work.

The minimum grade of Plain Cement Concrete shall be M 15 and that of Reinforced Cement Concrete shall be M 25. Only the approved design mix shall be used for the concrete.

The cement consumption for the works, which are not based on design mix, shall be based on the quantity actually used for the work as certified by the Engineer at site. For under consumption beyond 3% of the theoretical requirement, Engineer shall effect recovery at twice the market rate of cement assessed by the Engineer.

3.0 PROCUREMENT OF STEEL

Steel shall be procured from a main producer such as SAIL/TISCO/IISCO/RINL-VSP/JINDAL or their authorised stock yards. Rerolled steel will not be accepted.

4.0 PROCUREMENT OF BITUMEN

Bitumen shall be of 60/70 required viscosity grade and shall comply with the relevant Indian Standards (IS) as defined in the appropriate clause of MORT&H specification. The bitumen shall be directly purchased from BPCL, Kochi Refinery and the Original invoices are to be produced for Engineer's verification.

5.0 ELECTRIC POWER SUPPLY

The Contractor shall make all arrangements for Electric Power for carrying out permanent works, operating plants and equipment, labourer's camps and field offices, etc. as a part of his work plan. The Employer shall issue the necessary certificates, letters of recommendation, etc., to the Contractor for obtaining the power supply. However, the Employer shall accept no responsibility for any delays in obtaining the power connections. In addition, the Contractor shall maintain standby diesel generators of adequate capacity. Non-availability of electric power will not be considered as a reason for delay in progress.

6.0 WATER SUPPLY FOR CONSTRUCTION, LABOUR CAMPS, EMPLOYERS, ENGINEERS AND CONTRACTORS OFFICES, ETC.

The Contractor shall make all necessary arrangements for water required for construction, labour, etc. The Employer shall issue the necessary certificates, letters of recommendation, etc, for obtaining the necessary permissions. The Employer shall assume no responsibility for delay in progress of work due to any delay in obtaining the permissions. The Contractor may drill bore wells as a source of construction water. The water shall be got tested by the Contractor at his own expense and certificates regarding the suitability for construction shall be submitted to the Engineer regularly as per his requirements.

7.0 TELEPHONE/WIRELESS COMMUNICATION FACILITIES FOR ENGINEER, EMPLOYER AND CONTRACTOR

These shall be arranged by the Contractor at his own cost. The Employer shall give the necessary certificates, letters of recommendation, etc., to the Contractor.

8.0 LAND FOR TEMPORARY USE

Land for pre-fabrication yard, labour camps, storage yards, temporary site sheds, etc., shall be arranged by the Contractor at his own cost.

9.0 DRAWINGS

9.1 TENDER PURPOSE DRAWINGS

Dimensions and details given in the tender drawing are indicative only. Actual measurements shall be taken at site to suit the road alignment and levels. The contractor shall visualize the nature and type of work contemplated and shall ensure that the rate and prices quoted by him in the Bill of Quantities have due consideration of the complexities of the work involved during actual execution/construction.

9.2 APPROVED FOR CONSTRUCTION DRAWINGS

- (a) The contractor shall conduct on site joint survey as directed by the Engineer and shall provide all information required by the Engineer for preparation of Approved for Construction drawings. The contractor shall be given two copies of good for construction drawings free of cost for the works to be executed.
- (b) Existing culverts shall be re-constructed/extended as shown in the drawing to suit the road alignment/as approved by the Engineer.
- (c) The contractor shall generate XYZ co-ordinates of road surfaces as directed by the Engineer for approval.

10.0 CONTRACTOR'S MATERIALS, LABOUR, ETC.

The Contractor shall provide everything necessary (except for items to be provided by the Employer as specifically mentioned in the conditions) for the proper execution of the works according to the intent and meaning of the Drawings, Notes, Bill of Quantities and Specifications taken together, whether the same is or is not particularly shown or described therein, provided the same can be reasonably enforced therefrom. If the Contractor finds any discrepancy therein, he shall immediately and in writing refer the same to the Engineer. The decision of the Engineer shall be final and binding on the Contractor. Figured dimensions shall be followed and the drawings shall not be scaled from.

11.0 ENABLING WORKS

11.1 TEMPORARY WORKS

The Contractor shall supply, fix and maintain at his own cost during the execution of works, all the necessary centring, scaffolding, staging, planking, timbering, strutting, shoring, pumping, fencing, hoarding, watching and lighting by night as well as the necessary equipment for protection of public and safety of any adjacent roads and railway lines. Contractor shall construct necessary diversion road wherever required, erect necessary sign boards, warning lights, etc. to facilitate road traffic during construction at no extra cost. The Contractor shall remove any or all such temporary works when ordered to do so by the Engineer and make good all matters and thing disturbed during the execution of works to the satisfaction of Engineer.

11.2 UTILITY SHIFTING

Contractor shall do necessary survey and investigation to identify the services required to be shifted to enable the construction within 30 days of receiving NTP for Engineers review and approval.

Contractor shall obtain estimate from the respective departments to shift the major services approved by the Engineer for shifting. Employer shall directly pay the shifting charges to the concerned department or reimburse the actual amount paid by the Contractor to the department as approved by the Engineer. Contractor shall make necessary arrangements for shifting/installing house connection such as water, communication cables and electricity service connection, etc. at his own cost and later it will be reimbursed by complying on the certificate of Engineer.

12.0 WORK ORDER BOOK

A Work Order Book shall be maintained on the work and the Contractor or his authorised representative shall acknowledge and sign the orders given therein by the Engineer and shall comply these promptly and correctly.

13.0 DISCOVERIES

In the event of discovery by the Contractor or his employees, during the progress of work, of any treasure, fossils materials or other articles of value or interest, the Contractor shall give immediate notice thereof to the Engineer of such treasure or things, which shall be the property of the Government of India and shall not be removed by the Contractor under any circumstances.

14.0 OPPORTUNITIES AND FACILITIES FOR OTHER CONTRACTORS, AGENCIES, ETC.

The Contractor shall, in accordance with the requirements of the Engineer, afford all reasonable opportunities for carrying out their work to any other Contractors employed by the Employer and their workmen and to the workmen of the Employer and of any other duly constituted authorities who may be employed in the execution of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the works. If, however, the Contractor shall, on the written request of the Engineer or Engineer's Representative, make available to any such other Contractor or to the Employer or any such authority any roads or ways for the maintenance of which the Contractor is responsible or permit the use of the Contractor's scaffolding or any other plant on the site or provide any other service of whatsoever nature, the Employer shall pay to the Contractor in respect of such use or service such sum or sums as shall in the opinion of the Engineer be reasonable.

15.0 ENVIRONMENTAL SAFEGUARDS

The Contractor shall take action on following points and note the stipulations as under with regard to environmental safeguards as stipulated by the Ministry of Environment and Forests.

- 15.1 Appropriate measures shall be undertaken while undertaking digging activities to avoid degradation of water quality.
- 15.2 Borrow pits and other scars created during road construction shall be properly levelled and treated
- 15.3 Adequate provision for infrastructural facilities, i.e water supply, fuel, sanitation, etc, shall be ensured for labourers during construction period in order to avoid damage to the environment as per relevant act.

- 15.4 No excavation from or dumping of waste material into any water body/ wetlands shall be done.
- 15.5 Borrow pits for earth, quarry sites for road construction and dump site shall be identified keeping in view:
- a. No excavation or dumping on private property is carried out without written consent of the owner;
 - b. No excavation or dumping shall be allowed on wetlands, forest areas or other ecologically valuable or sensitive locations;
 - c. The excavation work shall be done in consultation with soil conservation and watershed development agencies working in the areas;
 - d. Construction spoil including bituminous and other hazardous material must not be allowed to contaminate water course and the dump sites for such materials must be identified well in advance and be lined properly so that they do not leach into the ground water.
- 15.6 Trees, which are necessary to be felled should be identified within 15days from the date of Notice to Proceed and the Employer will arrange necessary approval from the competent authority before felling the trees.
- 15.7 A contingency plan shall be prepared to combat with accidents so that the victims of accident can be provided immediate medical help. Some essential equipment, building and other facilities may be required for the purpose.
- 15.8 The Employer or any other competent authority may stipulate any other conditions for environmental safeguard subsequently, if deemed necessary, which should be complied with.
- 15.9 The above mentioned stipulations shall be enforced among others under the Water (prevention and Control of Pollution) Act, 1974, the Air (prevention and Control of Pollution) Act, 1981, the Environment (Protection) Act 1986, the Hazardous Chemical (Manufacture, Storage and Import) Rules, 1989, the E*A Notification of January, 1994 and its amendment of May, 1994, the Public Liability Insurance Act, 1991 and the rules made thereunder from time to time.

16.0 TAXES

The rates quoted by the Contractor shall be deemed to be inclusive of all taxes except GST, including octroi on all materials that the Contractor will have to purchase for performance of this Contract.

17.0 QUARRIES

The Contractor will have to make his own arrangement for quarrying. The Contractor shall carry out all quarrying operation without endangering the environment and natural beauty of surroundings.

All excess and unuseful excavated materials shall be transported to dumping places if available, as directed by the Engineer; speed and level.

18.0 CUSTOMS DUTY & FOREIGN EXCHANGE FLUCTUATIONS

For any new construction machinery, if imported for use on this work, the customs (Import) duty shall be paid by the Contractor.

19.0 CONCRETING

All concrete i.e., plain as well as reinforced cement concrete, shall be machine mixed (power driven) and vibrated unless otherwise permitted by the Engineer. Curing/vibrating of the concrete and RCC works shall be done by the Contractor as specified in relevant IS Codes. Test Cubes should be cast at regular intervals and tested to ascertain the strength of concrete. The Contractor should establish cube testing equipment at or near the site of work. The cost of casting of cubes and their testing shall be borne by the Contractor. In case the Contractor desires to use a curing membrane instead of water curing, he may do so after submitting the necessary technical data and approval by the Engineer. No extra payment on this account would however be admissible. It should be noted that no additional payment would be made for curing/vibrating the concrete at different heights and the Contractor should make his own arrangements for the provision of necessary staging/scaffolding, etc., and carryout curing/vibrating at all levels as directed by the Engineer.

If curing is not being done to satisfactory standard, the Engineer may get it done at the Contractor's cost without any notice to him, as the curing cannot wait for any such notice, time, etc. The Engineer's decision shall be final and binding as to whether satisfactory curing is being done or not. The cost of such curing will be recovered from the 'on account bills'.

Water and fine & coarse aggregate shall be got chemically tested from time to time by the Contractor at his cost for ensuring proper quality as per required standards. The results in original shall be submitted to the Engineer and approval obtained to use these ingredients.

20.0 SETTING OUT WORKS

The Contractor shall be responsible for the true and proper setting out of the works for correctness of the position, levels, dimensions and alignment of all parts of the work and for provisions of all necessary pegs, reference pillars, instrument, equipment, appliances and labour in connection therewith. If at any time during the progress of the work, any error shall appear or arise in the position of levels, dimensions, or alignments at any part of the works, the Contractor, on being required to do so by the Engineer, shall at his own expense rectify such errors to the satisfaction of the Engineer and he shall carefully protect, preserve, secure all bench marks, site rails, pegs, reference pillars and other things used in setting out of the works.

The Contractor shall have sufficient number of survey instruments such as theodolites, levelling instruments, levelling staff, etc., and arrange to set out the alignment at his cost and also establish necessary reference pillars as required and directed by the Engineer. He must also set out the location of piers and abutments.

The Contractor must establish sufficient number of bench marks at close intervals and chainage boards at a minimum 50.00 m as directed by the Engineer and take cross sections at specified intervals in the presence of the Engineer or his representative, which shall be jointly signed. Necessary level books will be supplied by the Engineer for recording these levels. The Earthwork/Cross sections based on these will be plotted in AUTOCAD graph sheets by the Contractor and submitted to the Engineer along with the relevant level books and calculations for the quantities of earthwork, for necessary check and approval.

The Contractor must take up the work only after submitting the level books, cross section sheets and quantities and after these are finally approved by the Engineer. Similarly on completion of each layers necessary cross sections must be taken, plotted in AUTOCAD sheets and the quantity worked out and submitted to the Engineer for verification and checking. No extra payment would be made for this and the rates for respective items are deemed to be inclusive of this.

21.0 QUALITY CONTROL LABORATORY

The Contractor shall set up a quality control laboratory at the locations approved by the Engineer, with building, adequate equipment and personnel, in order to carry out all required quality control tests as per specifications and/or as directed by the Engineer. The cost of laboratory including services, cost of all equipment, tools, materials, labour, and all incidentals for tests and other operations of quality control shall be deemed to have included in the rate/amount of the work and no extra payments shall be made.

22.0 CONCRETE PLANT

Modern dependable batch type mixing plants capable of producing concrete at the desired output to meet the scheduled requirements shall be provided at locations and in the manner approved by the Engineer.

23.0 EMPLOYER/PMC's SITE OFFICE AND VEHICLE

The Contractor shall arrange to provide an office accommodation of carpet area 60 sq.m. with all service connections like water, telephone, fax, internet connection, scanner, printer, etc. and required furniture at each location, as required by the Engineer without any additional cost. The following minimum furniture shall be provided at each office.

- a) Executive Tables - 8 Nos.
- b) Chairs - 22 Nos.
- c) Steel Almirah - 4 Nos.

Contractor shall also provide 1 number of car (Indica) or equivalent in good condition with driver and fuel for the use of Employer/Engineer including all maintenance charges, fuel charges, salary and benefits to Driver etc. complete without any additional cost as instructed by the Employer/Engineer by limiting total number of car days to a maximum of 300.

24.0 ENVIRONMENTAL PROTECTION

The Contractor must organize his work in such a way that the ecology of the area is not adversely affected. Particular attention is required in case of making the pits or taking out earth and dumping of cut spoils.

25.0 DUMPED/SUNK MATERIALS

The Contractor shall ensure that no offensive materials or effluents or slurry materials from pile bore are discharged/dumped in the neighbourhood of the work site or in the water ways which may cause inconvenience or danger to the local inhabitants. He shall also comply with any other orders or instructions issued by the Engineer-in-charge or by the representative of the Central/State/Local Government or local body in the matter of environmental pollution.

26.0 The Contractor shall take photograph and make video film of all construction phases and submit the same to the Employer for reference and records.

27.0 Adequate illumination shall be done by the Contractor at the work spot.

28.0 Blasting operations if required shall be done under full protection and with the prior approval of the Engineer, controlled blasting shall be done, if required.

29.0 Precautions to be taken while working

29.1 Any obstruction such as service lines, water pipe lines, cables, sewerage, etc., met with during the progress of work shall immediately be reported to the Engineer and the Contractor shall make necessary arrangements for removal of such obstructions.

29.2 The works shall be carried out without any interference to the normal working of the Railways, Railway properties, Highway, High way properties and other agencies and structures.

29.3 The Contractor shall responsible for any loss/damage to Railway and other Public property or third party's property if it occurs during the course of execution of the work and any such damages shall be made good by the Contractor, promptly at his cost. In case of failure to do so in time, the Engineer shall have the right to make

- good such damages through any other agencies at the risk and cost of the Contractor.
- 29.4 The Contractor must ensure the safety of labourers engaged by him during the course of execution of work and the Employer/Engineer shall not be held responsible for any injury/any fatal accident sustained by the labourer. The Contractor should bear all the loss and expenditure involved in such an eventuality. Contractor shall ensure that their workers are wearing proper personal protective Equipment (PPE) during the entire working time.
- 29.5 All the barricades are to be painted or stuck on with red luminous paint/strips at suitable intervals on the barricades.
- 29.6 Road vehicles employed by the Contractor should have the certificate for its road worthiness and each vehicle numbered and the license particulars maintained. Contractor should ensure that the drivers permitted by them to work on such road vehicles are identified, counseled, certified and are provided with photo identity cards. Contractor shall maintain log books of all vehicles employed by him.
- 29.7 Wherever existing underground oil/gas/naphtha/raw water lines are coming under the new pavement, the pipes shall be exposed and the trench shall be filled with sand up to the required level and properly compacted by flooding. Care shall be taken while doing manual excavation, to avoid damage to the underground lines.
- 29.8 Wherever existing embankment is extended to accommodate the new alignment of road, the former shall be appropriately benched or ploughed/scarified as required by the Engineer, before placing the embankment.

TECHNICAL SPECIFICATIONS – CIVIL WORKS

1. The following technical specification, code of practice etc. referred herein is form a part of the Item Specification and work shall be executed accordingly. Items which are not covered under Technical Specification shall be carried out as per relevant IS Specification or as per manufactures specification or as directed by Engineer-in-charge.
2. In case of discrepancy between technical specification and item specification provided along with Bill of Quantities, the Item Specification shall prevail.
3. All the measurements shall be as per latest edition of B.I.S.

JUNGLE CLEARANCE

Jungle clearance shall comprise uprooting of rank vegetation, grass, brushwood, shrubs, stumps, trees and saplings of girth upto 30 cm measured at a height of one metre above the ground level. Where only clearance of grass is involved it shall be measured and paid for separately.

Uprooting of Vegetations

The roots of trees and saplings shall be removed to a depth of 60 cm below ground level or 30 cm below formation level or 15 cm below sub-grade level, whichever is lower. All holes or hollows formed due to removal of roots shall be filled up with earth rammed and levelled. Trees, shrubs, poles, fences, signs, monuments, pipe lines, cable etc., within or adjacent to the area which are not required to be disturbed during jungle clearance shall be properly protected by the contractor at his own cost and nothing extra shall be payable.

Stacking and Disposal

All useful materials obtained from clearing and grubbing operation shall be stacked in the manner as directed by the Engineer-in-Charge. Trunks and branches of trees shall be cleared of limbs and tops and stacked neatly at places indicated by the Engineer-in-Charge. The materials shall be the property of the Government. All unserviceable materials which in the opinion of the Engineer-in-Charge cannot be used or auctioned shall be removed up to a distance of 50 m outside the periphery of the area under clearance. It shall be ensured by the contractor that unserviceable materials are disposed off in such a manner that there is no likelihood of getting mixed up with the materials meant for construction.

Clearance of Grass

Clearing and grubbing operation involving only the clearance of grass shall be measured and paid for separately and shall include removal of rubbish upto a distance of 50 m outside the periphery of the area under clearance.

Measurements

The length and breadth shall be measured correct to the nearest cm and area worked out in square metres correct to two places of decimal.

Rates

The rate includes cost of all the operation described above.

EARTH WORK**Applicable Codes**

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest revision of the codes shall be referred to.

- a) IS - 4081 Safety code for blasting and related drilling operation.
- b) IS - 1200 Method of measurement of building works.
- c) IS - 3764 Safety code for excavation work.
- d) IS - 3385 Code of practice for measurement of Civil Engineering works.
- e) IS - 2720 Part II Determination of moisture content.

Part VIII	Determination of moisture content dry density relation using light compaction.
Part XXVIII	Determination of dry density of soils, in-place by the sand replacement method.
Part XXIX	Determination of dry density of soils, in-place, by the core cutter method.

General

Contractor shall carry out the survey of the site before excavation and set properly all lines and establish levels for various works such as earthwork in excavation for levelling, basement, foundations, plinth filling, roads, drains, cable trenches, pipelines, etc. It is necessary to establish permanent bench mark at such point which will not be affected by subsequent work. Such survey shall be carried out by taking accurate cross sections of the area perpendicular to established reference/grid lines at 5 m intervals or nearer as determined by Engineer-in-charge based on ground profile.

The area to be excavated/ filled shall be cleared of fences, trees, plants, logs, slumps, bush, vegetations, rubbish slush, etc., and other objectionable matter. If any roots or stumps of trees are found during excavation, they shall also be removed. The material so removed shall be burnt or disposed off as directed by Engineer. Where earthfill is intended, the area shall be stripped of all loose/soft patches, top soil containing deleterious matter/materials before fill commences.

In firm soil if the excavation is deeper than 2 m and in loose, soft or slushy soil, the width of the step shall be suitably increased or the sides sloped or shoring and strutting may be done as per the Engineer's instructions without any extra cost.

For excavation in trenches for pipes nothing extra shall be payable for the lift irrespective of the depth unless specifically mentioned otherwise in the Schedule of Quantities.

The trenches which are ready for concreting shall be got approved by the Engineer.

The excavated stacked earth shall be refilled in the trenches and sides of foundation in 200 mm layers and the balance surplus shall be first filled in layers in plinth and the remaining surplus shall be disposed off by uniform spreading within the site/outside the site as directed by the Engineer.

Adequate protective measures shall be taken by the Contractor to see that the excavation for the building foundation does not affect the adjoining structure's stability and safety. Contractor will be responsible if he has not taken precaution for the safety of the people, workers property or neighbour's property caused by his negligence during the constructional operations.

Lead

Lead for disposal of excavated material inside the site and at convenient places in the surrounding areas have been specified in the respective items of work and no other extra lead is intended.

Classification

Any earthwork will be classified under any of the following categories:

All kinds of soils

These shall include all kinds containing kankar, sand, silt, moorum and/or shingle, gravel, clay, loam peat, ash, shale, etc., which can generally be excavated by spade, pick-axe and shovel and which is not classified under ordinary rock, and hard rock defined below. This shall also include excavation in macadam and tarred roads and pavements. This shall also include rock boulders up to 200 dm³. Rubble masonry to be dismantled below ground level will also be measured under this item.

Ordinary Rock

These shall include generally any rock which can be excavated by splitting with crowbars or picks and does not require blasting, wedging or similar means for excavation such as lime stone, sand stone, hard laterite, hard conglomerate and unreinforced cement concrete below ground level.

Hard Rock

This shall include rock which cannot be easily excavated with pick-axes, hammer, crow bars and wedges but has to be either heated where blasting is prohibited or has to be blasted. They shall be stacked separately for measurement as directed by the Engineer-in-charge.

Blasting in rocks

Unless otherwise stated herein, IS 4081, safety code for blasting and related drilling operations shall be followed. After removal of over burden, if any, excavation shall be continued in rock to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as may be specified by Engineer. As far as possible all blasting shall be completed prior to commencement of construction. At all stages of excavation, precautions, shall be taken to preserve the rock below and beyond the lines specified for the excavating, in the soundest possible condition. The quantity and strength of explosive used, shall be such as will neither damage nor crack the rock outside the limits of excavation. All precautions, as directed by Engineer shall be taken during the blasting operations and care shall be taken that no damage is caused to adjoining buildings or structure as a result of blasting operations. In case of damage to permanent or temporary structures, Contractor shall repair the same to the satisfaction of Engineer at his cost. As excavation approaches its final lines and levels, the depth of the charge holes and amount of explosives used shall be progressively and suitably reduced.

Specific permission of Engineer will have to be taken by Contractor for blasting rock and he shall also obtain a valid blasting licence from the authorities concerned. If permission for blasting is refused by Engineer, the rock shall be removed by wedging, pick barring, heating and quenching or other approved means. All loose/loosened rock in the sides shall be removed by barring wedging, etc. The unit rates for excavation in hard rock shall include the cost of all these operations.

Contractor shall employ a competent and experienced supervisor and licensed blaster in charge for each set of operation, who shall be held personally responsible to ensure that all safety regulations are carried out.

Before any blasting is carried out, Contractor shall intimate Engineer-in-charge and obtain his approval in writing for resorting to such operations. He shall intimate the hours of firing charges, the nature of explosive to be used and the precautions taken for ensuring safety.

Filling in plinth with selected excavated earth

Plinth shall be filled in layers 15 - 30 cm, of thickness or as specified in items specification watered and compacted with hand rammers as directed by the Engineer-in-charge, so as to avoid any settlement at later stage. For the final layer the surface shall be flooded with water and water allowed to stand for 24 hours. The finished level of the filling shall be trimmed to the level specified.

Where specified in the item description given in the Schedule of Quantities that the compaction of the plinth fill shall be carried out by means of 10/12 tonnes rollers smooth wheeled, sheep-foot or wobble wheeled rollers. As rolling proceeds water sprinkling shall be done to assist consolidation. Water shall not be sprinkled in case of sandy fill.

Filling excavated earth in ground for land development

No earthfill shall commence until surface water discharges and streams have been properly intercepted or otherwise dealt with as directed by Engineer-in-charge.

Filling shall be carried out as indicated in the drawings and as directed by Engineer-in-charge. If no compaction is called for, the fill may be deposited to the full height in one operation and levelled. If the fill has to be compacted, it shall be placed in layers not exceeding 600 mm and levelled uniformly and compacted before the next layer is deposited.

Field compaction is called for, test shall be carried out at different stages of filling and also after the fill to the entire height has been completed. This shall hold good for embankments as well. The tests for field compaction shall be specified by the Engineer and the Contractor shall arrange to carry out such tests to the satisfaction of the Engineer-in-charge.

Contractor shall protect the earthfill from being washed away by rain or damaged in any other way. Should any slip occur, Contractor shall remove the affected material and make good the slip at his own cost.

The fill shall be carried out to such dimension and levels as indicated on the drawings after the stipulated compaction. The fill shall be considered as incomplete if the desired compaction has not been obtained.

Filling in plinth and ground with earth brought from outside

Filling shall be carried out with approved material. The material and source shall be subject to prior approval of Engineer-in-charge. The approved area, from where the fill material is to be dug, shall be cleared of all bushes, roots plants, rubbish, etc., top soil containing salts, sulphate and other foreign material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer-in-charge. The Contractor shall make necessary access roads to those areas and maintain the same, if such access road does not exist, at his cost.

If any material is rejected by Engineer-in-charge, Contractor shall remove the same forthwith from the site at no extra cost to the owner. Surplus fill material shall be disposed of by uniform spreading within the site as instructed by the Engineer-in-charge.

At places backfilling shall be carried out with local sand if directed by Engineer. The sand used shall be kept flooded with water for 24 hours to ensure maximum consolidation. Any temporary work required to contain sand under flooded condition shall be to Contractor's account. The surface of the consolidated sand shall be dressed to require level or slope. Construction of floors or other structures on sand fill shall not be started until Engineer has inspected and approved the fill.

DAMP PROOF COURSE**Cement Concrete Layer**

This shall consist of cement concrete of specified proportions and thickness. The surface of brick or stone masonry work shall be levelled and prepared before laying the cement concrete. Edge of damp proof course shall be straight, even and vertical. Side shuttering shall consist of steel forms and shall be strong and properly fixed so that it does not get disturbed during compaction and the mortar does not leak through. The concrete mix shall be of workable consistency and shall be tamped thoroughly to make a dense mass. When the sides are removed, the surface should come out smooth without honeycombing.

Continuity shall be maintained while laying the cement concrete layer and laying shall be terminated only at the predetermined location where damp proof course is to be discontinued. There shall be no construction joints in the Damp Proof Course.

Curing

Damp proof course shall be cured for at least seven days, after which it shall be allowed to dry.

Application of Hot Bitumen

Where so directed, hot bitumen in specified quantity shall be applied over the dried up surface of cement concrete, properly cleaned with brushes and finally with a piece of cloth soaked in kerosene oil.

Bitumen of penetration A 90 or equivalent where used shall be heated to a temperature of $160^{\circ} \pm 5^{\circ}\text{C}$.

The hot bitumen shall be applied uniformly all over, so that no blank spaces are left anywhere. It will be paid for separately.

Water Proofing Materials

Where so specified, water proofing material of approved quality shall be added to the concrete mixture in accordance with the manufacturer's specification stating the quantity of water proofing material in liters or kg per 50 kg or cement and will be paid for separately.

Measurements

The length and breadth shall be measured correct to a cm and its area shall be calculated in square metres correct to two places of decimal. The depth shall not be less than the specified thickness at any section.

Rate

The rate is inclusive of the cost of materials and labour involved in all the operations described above except for the applications of a coat of hot bitumen and addition of water proofing materials which shall be paid for separately, unless otherwise specified.

CONCRETE AND ALLIED WORKS**Applicable Codes**

The following codes and standards are made a part of the Specifications. All standards, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

In case of discrepancy between this specification and those referred to herein, this specification shall prevail.

Materials

- 1) IS 269 : Specification for ordinary, rapid hardening and low heat portland cement
 - 2) IS 455 : Specification for Portland blast furnace slag.
 - 3) IS 1489 :Specification for Portland-pozalana cement
 - 4) IS 4031 :Methods of physical tests for hydraulic cement
 - 5) IS 650 :Specification for standard sand for testing of cement
 - 6) IS 383 :Specification for coarse and fine aggregates from natural sources for concrete
 - 7) IS 2386 (Parts I to VIII) : Methods of test for aggregates for concrete
 - 8) IS 516 : Methods of test for strength of concrete
 - 9) IS 1199 : Methods of sampling and analysis of concrete
 - 10) IS 2396 (I) IS 5640: Flakiness Index of aggregates
 - 11) IS 3025: Methods of sampling and test (physical and chemical water used in industry)
 - 12) IS 432(Part I & II): Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement
 - 13) IS 1139: Specification for hot rolled mild steel and medium tensile steel deformed bars for concrete reinforcement
 - 14) IS 1566: Specification for plain hard drawn steel wire fabric for concrete reinforcement
 - 15) IS 1785: Specification for plain hard drawn (Part I) steel wire for prestressed concrete
 - 16) IS 1786 :Specification for cold twisted steel bars for concrete reinforcement
 - 17) IS 2090 :Specification for high tensile steel bars used in prestressed concrete
 - 18) IS 4990 :Specification for plywood for concrete shuttering work
 - 19) IS 2645 :Specification for integral cement water-proofing compounds
- Equipment**
- 1) IS 1791 :Specification for batch type concrete mixers
 - 2) IS 2438 :Specification for roller pan mixer
 - 3) IS 2505 :Specification for concrete vibrators immersion type

- 4) IS 2506 :Specification for screed board concrete vibrators
- 5) IS 2514 :Specification for concrete vibrating tables
- 6) IS 3366 :Specification for pan vibrators
- 7) IS 4656 :Specification for form vibrators for concrete
- 8) IS 2722 :Specification for portable swing weigh-batchers for concrete (single and double bucket type)
- 9) IS 2750 : Specification for steel scaffoldings

Codes of Practice

- 1) IS 456 : Code of practice for plain and reinforced concrete
- 2) IS 1343 : Code of practice for prestressed concrete
- 3) IS 457: Code of practice for general construction of plain and reinforced concrete for dams and other massive structures
- 4) IS 3370 (Part I to IV): Code of practice for concrete structures for storage of liquids.
- 5) IS 3935 : Code of practice for composite construction
- 6) IS 3201 : Criteria for design and construction of precast concrete trusses
- 7) IS 2204 : Code of practice for construction of reinforced concrete shell roof
- 8) IS 2210 : Criteria for the design of RC shell structures and folded plates
- 9) IS 2751 : Code of practice for welding of mild steel bars used for reinforced concrete construction
- 10) IS 2502: Code of practice for bending and fixing of bars for concrete reinforcement
- 11) IS 3558: Code of practice for use of immersion vibrators for consolidating concrete
- 12) IS 3414: Code of practice for design and installation of joints in buildings
- 13) IS 4014 (Part I&II): Code of practice for steel tubular, scaffolding
- 14) IS 2571: Code of practice for laying insitu - cement concrete flooring

Construction Safety

- 1) IS 3696 : Safety code for scaffolds and ladders

Measurement

- 1) IS 1200 :Method of measurement of building works
IS 3385 :Code of practice for measurement of civil engineering works

General

The quality of materials, method and control of manufacture and transportation of all concrete work irrespective of mix, whether reinforced or otherwise shall conform to the applicable portions of this specification.

Materials

The ingredients to be used in the manufacture of standard concrete shall consist solely of standard type portland cement, clean sand, natural coarse aggregate, clean water and admixtures.

Cement

If the Contractor is instructed to supply cement, then the following points shall be applicable:

- a. The cement to be used shall be ordinary Portland/Portland Pozzolana cement conforming to IS: 8112-1989 & IS:1489 part I respectively for 43 Grade OPC/PPC unless otherwise mentioned. The cement procured should be of reputed brands such as Malabar Cements, ACC, L&T, Shankar Cement, etc. and as approved by the Engineer-in-Charge. As far as possible, all the cement shall be obtained from a single source throughout the contract. Cement of different types shall not be mixed together. Different brands of cements or same brand of cement from different sources shall not be used without prior approval of the Engineer-in-Charge.

The cement shall be delivered at site in original sealed bags which shall be labelled with the weight, date of manufacture, brand and type. Cement received in torn or hand-stitched bags shall not be used. For volumetric batching of concrete, cement should be mixed only by box measurement. All cement should be fresh when delivered and shall be stored in an approved manner in stores built by the Contractor at his own cost. Set cement shall not be allowed to be used for any work.

- b. A certified report attesting to the conformance of the cement to IS specifications by the cement manufacturer's chemist shall be furnished to engineer if demanded.
- c. Cement held in storage for a period of sixty (60) days or longer shall be tested. Should at any time Engineer have reasons to consider that any cement is defective, then irrespective of its origin, and/or manufacturers test certificate, such cement shall be tested immediately at contractor's cost at an approved laboratory and until the results of such tests are found satisfactory, it shall not be used in any work. Contractor shall not be entitled to any claim of any nature on this account.
- d. Contractor will have to make his own arrangements for storage of adequate quantity of cement.
- e. The site engineer shall be regularly notified when supplies of cement are made to the site store. Copies of invoices shall be made available to the site engineer and a common cement register shall be kept at his office showing the supply stock and issue on a daily basis.

If the cement is supplied by the Client

- a) Contractor will have to make his own arrangements for the storage of cement. If supplies are arranged by owner, cement will be issued in quantities to cover work requirements of one month or more, as deemed fit by Engineer and it will be the responsibility of contractor to ensure adequate and proper storage. The storage arrangements shall be such that there is no dead storage. The storage arrangement shall be approved by Engineer.

Aggregates

Aggregate in general designates both fine and coarse inert materials used in the manufacture of concrete. Fine aggregate is aggregate all of which passes through 4.75 mm IS sieve. Coarse aggregate is aggregate most of which is retained on 4.75 mm sieve. Specification mentioned against various item of work may also be followed.

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

Aggregates shall, except as noted above, consist of natural sands, crushed stone and gravel from a source known to produce satisfactory aggregate for concrete and shall be chemically inert, strong, hard, durable against weathering, of limited porosity and free from deleterious materials that may cause corrosion of the reinforcement or may impair the strength and/or durability of concrete. The grading of aggregates shall be such as to produce a dense concrete of specified strength and consistency that will work readily into position without segregation and shall be based on the mix design and preliminary tests on concrete specified later.

Sampling and testing

Samples of the aggregates for mix design and determination of suitability shall be taken under the supervision of Engineer and delivered to the laboratory, well in advance of the scheduled placing of concrete. Records of tests which have been made on proposed aggregates and on concrete made from this source of aggregates shall be furnished to Engineer in advance of the work for use in determining aggregate suitability. The costs of all such tests, sampling, etc., shall be borne by contractor.

Storage of Aggregates

All coarse and fine aggregates shall be stacked in stock separately in stock piles in the materials yard near the work site or if instructed in bins properly constructed to avoid inter mixing of different aggregates. Contamination with foreign materials and with earth during storage and while heaping the materials shall be avoided. The aggregate must be of specified quality not only at the time of receiving at site but more so at the time of loading into mixer.

Screening and Washing

- a) Sand shall be prepared for use for such screening or washing, or both, as necessary, to remove all objectionable foreign matter while separating the sand grains to the required size fractions.
- b) Natural gravel and crushed rock shall be screened and/or washed for the removal of dirt or dust coating, if so demanded by Engineer

Water

Water used for both mixing and curing shall be free from injurious amounts of deleterious materials. Potable waters are generally satisfactory for mixing and curing concrete.

In case of doubt, the suitability of water for making concrete shall be ascertained by the compressive strength and initial setting time test specified in IS-456. The sample of water taken for testing shall be typical of the water proposed to be used for concreting, due account being paid to seasonal variation. The sample shall not receive any treatment before testing other than that envisaged in the regular supply of water proposed for use in concrete. The sample shall be stored in a clean container previously rinsed out with similar water.

Brick aggregates

The brickbats shall be of new bricks well burnt, hard, durable and broken to sizes, well graded. It shall be free from dust, the size shall be of 37 mm and down. It shall be free from earth and other impurities.

Mix Design

Classification

In case of concrete works, mix design may be necessary as per IS:456 for certain items as directed by Engineer-in-charge. All concrete in the works shall be of design mix as defined in IS 456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8, 1:5:10. Whether reinforced or otherwise, all design mix concrete works to be carried out under this specification shall be divided into the following classifications. (Also refer Clause 1.2.6.3 for testing of concrete).

MINIMUM COMPRESSIVE STRENGTH OF 15 CM CUBES AT
7 AND 28 DAYS AFTER MIXING, CONDUCTED IN ACCORDANCE WITH IS 516

Class	Specified Characteristic Compressive Strength of 15cm Cube at 28 Days in	Assumed Standard Deviation as per table no.8 of IS 456	Max. size of aggregate mm
M 40	40.0	5.0	40 or 20
M 35	35.0	5.0	40 or 20
M 30	30.0	5.0	40 or 20
M 25	25.0	4.0	40 or 20
M 20	20.0	4.0	40 or 20
M 15	15.0	3.5	40 or 20

It shall be very clearly understood that whenever the class of concrete such as M20 is specified it shall be the Contractor's responsibility to ensure that minimum crushing strength stipulated for the respective class of concrete is obtained at works. The maximum total quantity of

aggregate by weight per 50 kg of cement shall not exceed 250 kg except when otherwise specifically permitted by Engineer.

To fix the grading of aggregates, water cement ratio, workability and the quantity of cement required to give preliminary and works cubes of the minimum strength specified, the proportions of the mix shall be determined by weight. Adjustment of aggregate proportions due to moisture present in the aggregate shall be made. Mix proportioning shall be carried out according to Indian Standard Specifications.

Whenever there is a change either in required strength of concrete or water cement ratio or workability or the source of aggregates and/or cement, preliminary tests shall be repeated to determine the revised proportions, of the mix to suit the altered conditions.

While fixing the value for water cement ratio for preliminary mixes, assistance may be derived from the graph (appendix IS 456) showing the relationship between the 28 day compressive strengths of concrete mixes with different water cement ratios and the 7 days compressive strength of cement tested in accordance with IS 269.

Preliminary tests

Test specimens shall be prepared with at least two different water/cement ratios for each class of concrete, consistent with workability required for the nature of the work. The materials and proportions used in making preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of these tests is to determine the proportions of cement, aggregates and water necessary to produce concrete of required consistency and to give the specified strength. It will be the Contractor's sole responsibility to carry out these tests and he shall therefore furnish to Engineer a statement of proportions proposed to be used for the various concrete mixes.

Materials shall be brought to the room temperature and all materials shall be in a dry condition. The quantities of water, cement and aggregates for each mix shall be determined by weight/volume to an accuracy of 1 part in 1000 parts.

Mixing shall be done by a mixer machine as per IS 516 in such a manner as to avoid loss of water. The cement and fine aggregate shall first be mixed dry until the mixture is uniform in colour. The coarse aggregate shall then be added, mixed and water added and mixed thoroughly for a period of not less than 3 minutes until the resulting concrete is uniform in appearance. Each mix of concrete shall be of such a quantity as to leave about 10% excess concrete after moulding the desired number of test specimens.

The consistency of each mix of concrete shall be measured immediately after mixing, by the slump test in accordance with IS 1199. If in the slump test, care is taken to ensure that no water or other materials is lost, the materials used for the slump test may be remixed with the remainder of the concrete for making the specimen test cubes. The period of remixing shall be as short as possible yet sufficient to produce a homogeneous mass.

Compression tests of concrete cubes shall be made as per IS 516 on 15 cm cubes. Each mould shall be provided with a metal base having a plane surface so as to support the mould during filling without leakage. The base plate shall be preferably attached to the mould by springs or screws. The parts of the mould when assembled shall be positively and rigidly held together. Before placing concrete the mould and base plate shall be cleaned and oiled. The dimensions and internal faces of the mould shall be accurate within the following limits:

Height and distance between the opposite faces of the mould shall be of specified size plus or minus 0.2 mm. The angle between the adjacent internal faces and between internal faces and top and bottom planes of mould shall be 90 Deg. plus or minus 5 Deg. The interior faces of the mould shall be plane surfaces with a permissible variation 0.03 mm.

Concrete test cubes shall be moulded by placing fresh concrete in the mould and compacted as specified in IS 516.

Curing shall be as specified in IS 516. The cubes shall be kept in moist air of at least 90% relative humidity at a temp. of 27 Deg. Cent. plus or minus 2 Deg. Cent. for 24 hours plus or minus half hour from the time of adding water to the dry ingredients. Thereafter they shall be removed from the moulds and kept immersed in clean, fresh water and kept at 27 Deg. Cent. plus or minus 2 Deg. Cent. temp. until required for test. Curing water shall be renewed every seven days. A record of maximum and minimum temperatures at the place of storage of the cubes shall be maintained during the period they remain in storage.

Testing of specimens

The strength shall be determined based on not less than five cubes test specimens for each age and each water cement ratio. All these laboratory test results shall be tabulated and furnished to Engineer. The test result shall be accepted by Engineer if the average compressive strengths of the specimens are tested subject to the condition that only one out of the five consecutive test may give a value less than the specified strength for that age. The Engineer may direct the Contractor to repeat the tests if the results are not satisfactory and also to make such changes as he considers necessary to meet the requirements specified. All these preliminary tests shall be conducted by the Contractor at his own cost in an approved laboratory.

Proportioning, consistency, batching and mixing of concrete

Aggregate

The proportions which shall be decided by conducting preliminary test shall be by volume. These proportions of cement, fine and coarse aggregates shall be maintained during subsequent concrete mixing. The supply of properly graded aggregate of uniform quality shall be maintained over the period of work, the grading of aggregates shall be controlled by obtaining the coarse aggregate in different sizes and blending them in the right proportions. The different sizes shall be stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as possible as determined by Engineer, to ensure maintaining of grading in accordance with the samples used in preliminary mix design. The material shall be stock piled well in advance of use.

Cement

The cement shall be measured by weight.

Water

Only such quantity of water shall be added to the cement and aggregates in the concrete mix as to ensure dense concrete, specified surface finish, satisfactory workability, consistent with the strength stipulated for each class of concrete. The water added to the mix shall be such as not to cause segregation of material or the collection of excessive free water on the surface of the concrete.

The water cement (W/C) ratio will be decided by Engineer-in-charge on weight basis and this shall be strictly followed at site.

Proportioning by Water/Cement ratio

The W/C ratio specified for use by Engineer shall be maintained. The Contractor shall determine the water content of the aggregates as frequently as directed by Engineer as the work progress and as specified in IS 2386 (Part-III) and the amount of water added at the mixer shall be adjusted as directed by Engineer so as to maintain the specified W/C ratio. To allow for the variation in volume of aggregates due to variation in their moisture content suitable adjustments in the volume of aggregates shall also be made.

Consistency and slump

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

Slumps for Various Types of Construction

Only sufficient quantity of water shall be added to concrete during the mixing to produce a mix of sufficient workability to enable it to be well consolidated, to be worked into the corners of the shuttering and around the reinforcement, to give the specified surface finish, and to have the specified surface strength. The following slumps shall be adopted for different kinds of works:

Placing Conditions	Degree of Workability	Slump (mm)
[1]	[2]	[3]
Blinding concrete: Shallow sections; Pavements using pavers	Very low	

Mass concrete:	}	Low	25-75		
Lightly reinforced sections in slabs, beams, walls, columns:					
Floors;	}	Medium	50-100 75-100		
Hand placed pavements;					
Canal lining;					
Strip footings					
Heavily reinforced sections in slabs, beams, walls, columns;	}	Medium	50-100 75-100		
Slipform work; Pumped concrete					
Trench fill;		High	100-150		
<i>In-situ pilling</i>		Very high			
<i>Tremie concrete</i>					

Sampling and testing concrete in the field

Facilities required for sampling materials and concrete in the field shall be provided by the Contractor at no extra cost. The following equipment with operator shall be made available at Engineer’s request (all must be in serviceable condition):

- a) One concrete cube testing machine suitable for 15 cm cubes of 100 tonnes capacity with proving calibration ring.
- b) Twelve cast iron cube moulds of 15 cm size
- c) One Lab. balance to weigh upto 5 kg with sensivity of 10 gm.
- d) One set of sieves for coarse and fine aggregates
- e) One set of slump cone complete with tamping rod
- f) A set of measures from 5 litre to 0.1 litre
- g) One electric oven with thermostat upto 120 Deg. Cent.
- h) One flakiness gauge
- i) One elongation index gauge
- j) One sedimentation pipette
- k) One Pyconometer
- l) Two calibrated glass jar of 1 litre capacity

Arrangement can be made by the contractor to have the cubes tested in an approved laboratory in lieu of a testing machine at site at his expense, with the prior consent of the Engineer.

At least 6 test cubes of each class of concrete shall be made for every 15.0 cu.m. of concrete or part thereof. Such samples shall be drawn on each day for each type of concrete. Of each set of 6 cubes, three shall be tested at 7 days age and three at 28 days age. The laboratory test results shall be tabulated and furnished to Engineer. Engineer will pass the concrete if average strength of the specimens tested is not less than the strength specified, subject to the condition that only one out of three consecutive tests may give a value less than the specified strength but this shall not be less than 90% of the specified strength. The cubes shall be tested on 7th and 28th day from the day of casting of the cubes.

Admixtures

Admixtures may be used in concrete only with the approval of Engineer based upon evidence that, with the passage of time, neither the compressive strength nor its durability reduced. Calcium chloride shall not be used for accelerating setting of the cement for any concrete containing reinforcement, or embedded steel parts. When calcium chloride is permitted to be used, such as in mass concrete works, it shall be dissolved in water and added to the mixing water in an amount not to exceed 1.5% of the volume of the cement in concrete. When admixtures are used, the designed concrete mix shall be corrected accordingly. Admixtures shall be used as per manufacturer's instructions and in the manner and with the control specified by Engineer-in-charge.

Air entraining agents

Where specified and approved by Engineer, neutralised vinyl resin or any other approved air-entraining agent may be used to produce the specified amount of air in the concrete mix and these agents shall conform to the requirements of ASTM standard 6260, air entraining admixtures for concrete. The recommended total air content of the concrete is 4% plus minus 1%. The method of measuring air content shall be as per IS 1199.

Water reducing admixtures

Where specified and approved by Engineer-in-charge water reducing lignosulfonate mixture shall be added in quantities specified by Engineer. The admixtures shall be added in the form of a solution.

Retarding admixtures

Where specified and approved by Engineer-in-charge retarding agents shall be added to the concrete mix in quantities specified by Engineer.

Water proofing agent

Where specified and approved by Engineer-in-charge water proofing agent conforming to IS 2645 shall be added in quantities specified by Engineer.

Optional tests

Engineer-in-charge may order tests to be carried out on cement, sand, coarse aggregate and water in accordance with the relevant Indian Standards. Tests on cement shall include (i) fineness test (ii) test for normal consistency (iii) test for setting time (iv) test for soundness (v) test for tensile strength (vi) test for compressive strength (vii) test for heat of hydration by experiment and by calculations in accordance with IS 269. Tests on sand shall include (i) sieve test (ii) test for organic impurities (iii) decantation test for determining clay and silt content

(iv) specific gravity test (v) test for unit weight and bulkage factor. Tests on coarsed aggregate shall include (i) test for sieve analysis (ii) specific gravity and unit weight of dry loose and rodded aggregate (iii) soundness and alkali aggregate reactivity (iv) petrographic examination (v) deleterious materials and organic impurities (vi) test for aggregate crushing value. Any or all these tests would normally be ordered to be carried out only if Engineer feels the materials are not in accordance with the specifications or if the specified concrete strengths are not obtained and shall be performed by contractor at site or at an approved test laboratory.

If the work cubes do not give the stipulated strengths Engineer-in-charge reserves the right to ask contractor to dismantle such portions of the work which in his opinion are unacceptable and re-do the work to the standard stipulated at contractor's cost.

Preparation prior to concrete placement

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

The various agencies shall be permitted ample time to install drainage and plumbing lines in floor and treech drains, conduits, hangers, anchors, inserts, sleeves, bolts, frames and other miscellaneous embedments to be cast in the concrete as indicated on the drawings or as is necessary for the proper execution of the work. Contractor shall cooperate fully with all such agencies and shall permit the use of scaffolding form work, etc., by other agencies at no extra cost.

All embedded parts, inserts, etc., supplied by Owner or Contractor shall be correctly positioned and securely held in the forms to prevent displacement during depositing and vibrating of concrete.

Anchor bolts shall be positioned and kept in place with the help of properly manufactured templates. The use of all such templates, fixture, etc., shall be deemed to be included in the rates.

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

Prior to concrete placement all work shall be inspected and approved by Engineer and if found unsatisfactory, concrete shall not be poured until after all defects have been corrected at Contractor's cost. Cat ladders shall be provided on the reinforcement to facilitate labour movement.

Approval by Engineer for all materials and work as required herein shall not relieve contractor from his obligation to produce finished concrete in accordance with the drawings and specifications.

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

Immediately before concrete placement begins, proposed surfaces except framework, which will come in contact with the concrete to be placed, shall be covered with a bonding mortar.

Transportation

All buckets, containers or conveyors used for transporting concrete shall be mortar tight. Irrespective of the method of transportation adopted, concrete shall be delivered with the required consistency and plasticity without segregation or loss of slump. However, chutes shall not be used for transport of concrete without the written permission of Engineer and concrete shall not be rehandled before placing.

Concrete must be placed in its final position before it becomes too stiff to work. On no account, water shall be added after the initial mixing concrete which has become stiff or has been contaminated with foreign materials shall be rejected and disposed off as directed by Engineer.

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

Procedure for placing of concrete

Before any concrete is placed, the entire placing programme, consisting of equipment, layout proposed procedures and methods shall be submitted to engineer for approval if so demanded by Engineer and no concrete shall be placed until Engineer's approval has been received. Conveyor for conveying concrete shall be of such size and design as to ensure a practically continuous flow of concrete during depositing without segregation of materials, considering the size of the job and placement location.

Concrete shall be placed in its final position before the cement shall normally be compacted in its final position within thirty minutes of leaving the mixer and once compacted it shall not be disturbed.

Concrete, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be rehandled or caused to flow in a manner which will cause segregation, loss of materials, displacement of reinforcement, shuttering or embedded inserts or impair its strength. For locations where direct placement is not possible, and in narrow forms, contractor shall provide suitable drop and elephant trunks to confine the movement of concrete. Special

care shall be taken when concrete is dropped from a height especially if reinforcement is in the way, particularly in columns and thin walls.

Except when otherwise approved by Engineer, concrete shall be placed in shovels or other approved implements and shall not be dropped from a height more than 1 M or handled in a manner which will cause segregation.

The following specification shall apply when placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of work involved. The control of placing shall begin at the mixer discharger, concrete shall be discharged by a vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to thoroughly all stages of delivery until the concrete comes to rest in its final position.

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

In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall clear the concrete already in place and the height of drop shall not exceed 1 M. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing or in any manner which results in separation of ingredients or disturbance of previously placed concrete will not be permitted.

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

Where it is necessary to use transfer chutes, specific approval of Engineer must be obtained to the type, length, slopes, baffles, vertical terminals and timing of operations, the discharge and without segregation. To allow for the loss of mortar against the sides of the chutes, the first mix shall have less coarse aggregate. During cleaning of chutes the waste water shall be kept clear of the forms. Concrete shall not be permitted to fall from the end of the chutes by more than 1 M. Chutes when approved for use shall have slopes not flatter than 1:2 chutes shall be of metal or metal lined and of rounded cross section. The slopes of all chutes sections shall be approximately the same. The discharge end of the chutes shall be maintained above the surface of the concrete in the forms.

Concrete may be conveyed and placed by mechanically operated equipment e.g. pumps or pneumatic placers only with the written permission of Engineer. The slump shall be held to the minimum, necessary for conveying concrete by this method.

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

When pneumatic placer is used, the manufacturer's advice on layout of pipeline shall be followed to avoid blockages and excessive wear. Restraint shall be provided at the discharge box to cater for the reaction at this end. Manufacturer's advice shall be followed regarding concrete quality and all other related matters when pumping or pneumatic placing equipment are used.

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

The top surface of each pour and bedding planes shall be approximately horizontal unless otherwise instructed.

Compaction

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

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

The exact manner of application and the most suitable machines for the purpose must be carefully considered and operated by experienced men. Immersion vibrators shall be inserted vertically at points not more than 450 mm apart and withdrawn when air bubbles cease to come to the surface. Immersion vibrators shall be withdrawn very slowly. In no case shall immersion vibrators be used to transport concrete inside the forms. Particular attention shall be paid to vibration at the top of a lift e.g. in a column or wall.

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

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

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

Form attached vibrators shall be used only with specific authorisation of Engineer.

The surface vibrators will not be permitted under normal conditions. However for thin slabs vibration by specially designed vibrators may be permitted upon approval of Engineer.

The formation of stone pockets or mortar bondages in corner and against faces of forms shall not be permitted. Should these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for through bonding, as directed by Engineer.

Placement interval

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

Special provision in placing

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

Placing concrete through reinforcement steel

When placing concrete through reinforced steel, care shall be taken to prevent segregation of the coarse aggregate. When the congestion of steel makes placing difficult it may be necessary to temporarily move the top steel aside to get proper placement and restore reinforcing steel to design position.

Bleeding

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

Curing, protecting, repairing and finishing

Curing

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

Certain types of finish or preparation for overlaying concrete must be done at certain stage of the curing process and special treatment may be required for specific concrete surface finish.

Curing of concrete made of high alumina cement and supersulphated cement shall be carried out as directed by Engineer.

Fresh concrete shall be kept continuously wet for a minimum period of 15 days from the date of placing of concrete following a lapse of 12 to 14 hours after laying of concrete. The curing of horizontal surfaces exposed to the drying winds shall however begin immediately the concrete has hardened. Water shall be applied uniformly to concrete surfaces within 1 hour after concrete has set. Water shall be applied to formed surfaces immediately upon removal of forms. Quantity of water applied shall be controlled so as to prevent erosion of freshly placed concrete.

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

Whenever, by the judgement of Engineer, it may be necessary to omit the continuous spray method, a covering of clean sand or other approved means such as wet gunny bags which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which would stain or damage the concrete during or after the curing period. Covering shall be kept continuously wet during the curing period.

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

Surface coating type compounds shall be used only by special permission of Engineer, curing compounds shall be liquid type white pigmented. Other curing compounds shall be used on

surfaces where future blending with concrete, water or acid proof membrane or painting is specified.

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

Protecting fresh concrete

Fresh concrete shall be protected from defacements and damage due to construction operation by leaving forms in place for an ample period as specified later in this specifications. Newly placed concrete shall be protected by approved means such as tarpaulins from rain, sun and winds. Steps as approved by Engineer shall also be taken to protect immature concrete from damage by debris, excessive loading, vibration, abrasion or contact with other materials, etc., that may impair the strength and/or durability of the concrete. Workmen shall be warned against and prevented from disturbing green concrete during its setting period. If it is necessary that workmen enter the area of freshly placed concrete, Engineer may require that bridges be placed over the area.

Repair and replacement of unsatisfactory concrete

Immediately after the shuttering is removed, the surface of concrete shall be very carefully inspected and all defective areas called to the attention of Engineer who may permit patching of the defective areas or also reject the concrete unit either partially or entirely. Rejected concrete shall be removed and replaced by contractor at no additional expense to owner. Holes left by form bolts, etc., shall be filled up and made good with mortar composed of one part of cement to one and half parts of sand passing 2.36 mm IS sieve after removing any loose stones adhering to the concrete shall be finished as described under the particular items of work.

Superficial honeycombed surfaces and rough patches shall be similarly made good immediately after removal of shuttering in the presence of Engineer and superficial water and air holes shall be filled in. The mortar shall be well worked into the surface with a wooden float. Excess water shall be avoided. Unless instructed otherwise by Engineer the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fine or other irregularities and necessary care being taken to avoid damage to the surface. Surface irregularities shall be removed by grinding.

If reinforcement is exposed or the honey combing occurs at vulnerable positions eg. ends of beams or columns it may be necessary to cut out the member completely or in part and reconstruct. The decision of Engineer shall be final in this regard. If only patching is necessary, the defective concrete shall be cut out till solid concrete is reached (or to a minimum depth of 25 mm) the edges being cut perpendicular to the affected surface or with small under cut if possible. Achors, tees or dovetail slots shall be provided whenever necessary to attach the new concrete securely in place an area extending several centimetres beyond the edges and the surfaces of the prepared voids shall be saturated with water for 24 hours immediately before the patching material is placed.

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

Small size holes having surface dimensions about equal to the depth of the hole, holes left after removal of form bottom, grout insert holes and slots cut for repair of cracks shall be repaired as follows. The hole to be patched shall be roughened and thoroughly soaked with clean water until absorption stops.

A 5 mm thick layer of grout of equal parts of cement and sand shall be well brushed into the surface to be patched, followed immediately by the patching concrete which shall be well consolidated with a wooden float. The concrete patch shall be built up in 10 mm thick layers. After an hour or more, depending upon weather conditions, it shall be worked off flush with a wooden float and smooth finish obtained by wiping with hessian, a steel trowel shall be used for this purpose. The mix for patching shall be of same materials and in the same proportions as that used in the concrete being repaired, although some reduction in the maximum size of the coarse aggregates may be necessary and the mix shall be kept as dry as possible.

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

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

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

Finishing

The type of finish for formed concrete surface shall be as follows, unless, otherwise specified by the Engineer.

For surfaces against which backfill or concrete is to be placed, no treatment is required except repairing of defective area.

For surface below grade which will receive waterproofing treatment the concrete shall be free of surface irregularities which would interfere with proper application of the waterproofing material which is specified for use.

Unless specified, surfaces which will be exposed when the structure is in service shall receive no special finish, except repairing of damage or defective concrete removal of fins and abrupt irregularities, fillings of holes let by form ties and rods and clean up of loose or adhering debris.

Surfaces which will be exposed to the weather and which would normally be level, shall be sloped for drainage. Unless the drawing specifies such as stair treads, walls shall be sloped across the width approximately 1 in 30 broader surface such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete subfloors to be covered either concrete topping, terrazzo or quarry tile and similar surfaces shall be smooth screeded and levelled to produce even surfaces. Surface irregularities shall not exceed 6 mm. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside decks, floors of galleries and sumps, parapets, gutters, sidewall floors and slabs shall be consolidated, screeded and floated. Excess water and laitance shall be removed before finishing. Floating may be done with hand or power tools and started as the screeded surface has attained a stiffness to permit finishing operation and these shall be the minimum required to produce a surface uniform in texture and free from screed marks or other imperfections. Joints edges panels and forms linings shall be of uniform size and be as large as practicable and installed with closed joints. Upon removal of forms the joint marks shall be smoothed off and all blemishes, projections etc., removed leaving the surfaces reasonably smooth and unmarked.

Integral cement concrete finish

When specified on the drawings and integral cement concrete finish of specified thickness for floors and slabs shall be applied either monolithic or bonded as specified on the drawing as per IS 2571. The surface shall be compacted and then floated with a wood float or power floating machine. The surface shall be tested with a straight edge and any high and low spots eliminated. Floating or trowelling of finish shall be permitted only after all surface water has evaporated. Dry cement or a mixture of dry cement and sand shall not be sprinkled directly on the surface of the cement finish to absorb moisture or to stiffen the mix.

Exposed Concrete finish/Rendering

A rubbed finish shall be provided only on exposed concrete surfaces as specified on the drawings. Upon removal of forms, all fins and other projections on the surfaces shall be carefully removed, off-sets levelled and voids and damaged sections be immediately saturated with water and repaired by filling with a concrete or mortar of the same composition as was used in the surface. Then surface shall be thoroughly wetted and rubbed with carborundum or other abrasive. Cement mortar may be used in the rubbing, but the finished surface shall be brush coated with either cement grout after rubbing. The finished surfaces shall present a uniform and smooth appearance.

Form Work

The formwork shall consist of shores, bracings, sides of beams and columns, bottom of slabs, etc., including ties anchors, hangers inserts, etc., complete which shall be properly designed and planned for the work. False work shall be so constructed that necessary adjustment can be made to compensate for take up and settlements. Wedge may be used at the top or bottom of

timber shores but not at both ends to facilitate vertical adjustment or dismantling of the formwork.

Design of formwork

The design of the formwork as well as its construction shall be the responsibility of Contractor. If so instructed, the drawings and/or calculation for the design for the formwork shall be submitted to Engineer for approval before proceeding with work, at no extra cost. Engineer's approval shall not however relieve Contractor of the full responsibility for the design and construction of the formwork. The design shall take into account all the load vertical and lateral that the forms will be carrying live and vibration loadings.

Type of formwork

Formwork may be of timber, plywood, metal, plastic or concrete. For special finishes the formwork may be lined with plywood, steel, sheets, oil, tempered hard board, etc. Sliding forms and slip forms may be used with the approval of Engineer.

Form work requirements

Forms shall conform to the shapes, lines, grades and dimensions including camber of the concrete as called for on the drawings. Ample studs, braces, ties, straps, etc., shall be used to hold the forms in proper position without any distortion whatsoever until the concrete is set sufficiently to permit removal of forms. Forms shall be strong enough to permit the use of immersion vibrators. In special cases form vibrators may also be used. The shuttering shall be close boarded. Timber shall be well seasoned, free from sap, shakes, loose knots, worm holes, warps or other surface defects in contact with concrete. Faces coming in contact with the concrete shall be free from adhering grout, plaster, paint, projecting nails, splits or other defects. Joints shall be sufficiently tight splits or other defects. Joints shall be sufficiently tight to prevent loss of water or any fine material from concrete.

Plywood shall be used for exposed concrete surfaces; where called for. Sawn and wrought timber may be used for unexposed surfaces. Inside faces of forms for concrete surfaces which are to be rubbed finished shall be planed to remove irregularities or unevenness in the face. Formwork with linings shall be permitted.

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

Shores supporting successive members shall be placed directly over those below or be so designed and placed that the load will be transmitted directly to them. Trussed supports shall be provided for shores that cannot be secured on adequate foundations.

Formwork, during any stage of construction showing signs of distortion or distorted to such a degree that the intended concrete work will not conform to the exact contours indicated on

the drawings, shall be repositioned and strengthened. Poured concrete affected by the faulty formwork, shall be removed completely and the formwork be corrected prior to placing of new concrete.

Excessive construction camber to compensate for shrinkage, settlement may impair the structural strength of members and shall not be permitted.

Forms shall be so designed that their removal will not damage the concrete. Face formwork shall provide true vertical and horizontal joints, conform to the architectural features of the structure as to location of joints and be as directed by engineer.

Where exposed smooth or rendered concrete finishes are required the forms shall be constructed with special care so that the resulting concrete surfaces require a minimum finish.

Formwork for Slope Surfaces

Forms for sloped surfaces shall be built so that the formwork can be placed board-by-board immediately ahead of concrete placement so as to enable ready access for placement, vibration inspection and repair of the concrete.

The formwork shall also be built so that the boards can be removed one by one from the bottom up as soon as the concrete has attained sufficient stiffness to prevent sagging. Surfaces of construction joints and finished surfaces with slopes steeper than 4 horizontal: 1 vertical shall be formed as required herein.

Formwork for Curved Surfaces

The contractor shall interpolate intermediate sections as necessary and shall construct the forms so that the curvature will be continuous between sections. Where necessary to meet requirements for curvature, the form timber shall be built up of laminated splines cut to make tight, smooth form surfaces.

After the forms have been constructed, all surface imperfections shall be corrected and all surface irregularities at matching faces of form material shall be dressed to the specified curvature.

Formwork for Exposed Concrete Surfaces

Where it is desired, directed or shown on the drawings to have original fair face finish of concrete surface without any rendering or plastering, formwork shall be carried out by using wood planks, plywood or steel plates of approved quality and as per direction of the Engineer.

The contractor shall use one type of material for all such exposed concrete faces and the forms shall be constructed so as to produce uniform and consistent texture and pattern on the face of the concrete. Patches or forms for these surfaces will not be permitted. The formwork shall be placed so that all horizontal formworks are continuous across the entire surface.

To achieve a finish which shall be free of board marks, the formwork shall be faced with plywood or equivalent material in large sheets. The sheets shall be arranged in an approved pattern. Wherever possible, joints between sheets shall be arranged to coincide with architectural features, chills, window heads or change in direction of the surface. All joints between shuttering plates or panels shall be vertical or horizontal unless otherwise directed. Suitable joints shall be provided between sheets. The joints shall be arranged and fitted so that no blemish or mark is imparted to the finished surfaces.

To achieve a finish which shall give the rough appearance of concrete cast against sawn boards, formwork boards unless otherwise stated shall be of 150 mm wide, securely jointed with tonge and grooved joints if required to prevent grout loss with tie rod positions and direction of boards carefully controlled. Sawn boards shall be set horizontally, vertically or at an inclination shown in the drawings. All bolt holes shall be accurately aligned horizontally and vertically and shall be filled with matching mortar recessed 5 mm back from the surrounding concrete face.

Forms for exposed concrete surfaces shall be constructed with grade strips (the underside of which indicated top of pour) at horizontal construction joints, unless the use of groove strips is specified on the drawings. Such forms shall be removed and reset from lift to lift, they shall not be continuous from lift to lift. Sheeting of reset forms shall be tightened against the concrete so that the forms will not be spread and permit abrupting irregularities or loss of mortar. Supplementary form ties shall be used as necessary to hold the reset forms tight against the concrete.

For fair faced concrete, the position of through bolts will be restricted and generally indicated on the drawings.

Chamfer strips shall be placed in the corners of forms for exposed exterior corners so as to produce 20 mm bevelled edges except where otherwise shown in the drawings. Interior corners and edges at formed joints shall not be bevelled unless shown on the drgs. Mouldings for grooves, drip courses and bands shall be made in the form itself.

The wood planks, plywood and steel plates used in formwork for obtaining exposed surfaces shall not be used for more than 3 times in case of wood planks, 6 times for plywood and 10 times for steel plates respectively. However, no forms will be allowed for reuse, if in the opinion of the Engineer it is doubtful to produce desired texture of exposed concrete.

In order to obtain exposed concrete work of uniform colour it shall be necessary to ensure that the sand used for all exposed concrete work shall be of approved uniform colour. Moreover the cement used in the concrete for any complete element shall be from single consignment.

No exposed concrete surface shall be rendered or painted with cement or otherwise. Plastering of defective concrete as a means of achieving the required finish shall not be permitted, except in the case of minor porosity on the surface, the Engineer may allow a surface treatment by rubbing down with cement and sand mortar of the same richness and colour as for the concrete. This treatment shall be made immediately after removing the formwork.

The contractor shall also take all precautionary measures to prevent breaking and chipping of corners and edges of completed work until the building is handed over.

Bracings struts and props

Shuttering shall be braced, strutted, propped and so supported that it shall not deform under weight and pressure of the concrete and also due to the movement of men and other materials. Bamboos shall not be used as props or cross bearers.

The shuttering for beams and slabs shall be so erected that the shuttering on the sides of the beams and under the soffit of slabs can be removed without disturbing the beam bottoms. Repropping of beams shall not be done except when props have to be reinstated to take care of construction loads anticipated to be in excess of the design load. Vertical props shall be supported on wedges or other measures shall be taken whereby the props can be generally lowered vertically while striking the shuttering. If the shuttering for a column, is erected for the full height of the column, one side shall be left open and built up in sections as placing of concrete from the sides to limit the drop of concrete to 3 M or as directed by Engineer.

Mould Oil

Care shall be taken to see that the faces of form work coming in contact with concrete are perfectly cleaned and two coats of mould oil or any other approved material applied before fixing reinforcement and placing concrete. Such coating shall be insoluble in water, non-staining and not injurious to the concrete. It shall not become flaky or be removed by rain or wash water. Reinforcement and/or other items to be cast in the concrete shall not be placed until coating of the forms is complete, adjoining concrete surface shall also be protected against contamination from the coating material.

Chamfers and fillets

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

Wall ties

Wire ties passing through the walls shall not be allowed. In their place bolts through sleeves be used.

Reuse of forms

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

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

Removal of forms

Contractor shall record on the drawings and in a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed therefrom. The Contractor shall remove the shuttering after obtaining the approval of the Engineer.

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

In normal circumstances (generally where temperatures are above 20 Deg. Cent.) forms may be removed after expiry of the following periods:

		Ordinary portland cement concrete	Rapid hardening portland cement
a)	Walls columns and vertical sides of beams	24 to 48 hrs as directed by the Engineer	24 hrs.
b)	Slabs prods left under	3 days	2 days
c)	Beam soffits prods left under	7 days	4 days
d)	Removal of props to slabs: i) Spanning upto 4.5m ii) Spanning over 4.5m.	7 days 14 days	4 days 8 days
e)	Removal of props to beams & arches i) Spanning upto 6m ii) Spanning over 6m	14 days 21 days	8 days 12 days

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

Reinforced temporary openings shall be provided as directed by Engineer to facilitate removal of formwork which otherwise may be inaccessible.

Tie rods, clamps, form bolts etc., which must be entirely removed from walls or similar structures shall be loosened not sooner than 24 hours nor later than 40 hrs. after the concrete has been deposited. Ties, except those required to hold forms in place, may be removed at the same time, Ties, withdrawn from walls and grade beams shall be pulled towards the inside face cutting ties back from the faces of walls and grade beams will not be permitted.

For liquid retaining structures no sleeves for through bolts shall be used nor shall through bolts be removed as indicated above. The bolts, in this case, shall be cut at 25mm depth from the surface and then the hole shall be made good by sand, cement mortar of the same proportions as the concrete just after striking the formwork.

Reinforcement Steel

General

Reinforcement bars, if supplies are arranged by contractor unless otherwise specified, shall be either plain round mild steel bars grade I as per IS 432 (Part I) or medium tensile steel bar as per IS 432 (Part I) or hot rolled mild steel and medium tensile steel deformed bars as per IS 1139 or cold twisted steel bars as per IS 1786, as shown and specified on the drawings. Wire mesh or fabric shall be in accordance with IS 1566. Substitution of reinforcement will not be permitted except upon written approval from Engineer.

Plain round mild steel bars grade II as per IS 432 (Part I) may be used with prior approval of Engineer in writing and with 10% increase in the reinforcement area but its use shall not be permitted in structures located in earthquake zones subjected to severe damage (as per IS 1895) and for structures subject to dynamic loading (other than wind loading), such as frames supporting rotary or reciprocating machinery, etc.

All reinforcement shall be clean, free from grease, oil, paint, loose mill scale, loose rust, dust, bituminous material or any other substances that will destroy or reduce the bond. All rods shall be thoroughly cleaned before being fabricated. Pitted and defective rods shall not be used.

All concrete in the works shall be of design mix as defined in IS 456, unless it is a nominal mix concrete such as 1:3:6, 1:4:8 or 1:5:10. Whether reinforced or otherwise, all design mix concrete works to be carried out under this specification shall be divided into the following classifications:

Providing, fabricating and placing in position reinforcement steel

The quality of the steel shall be as mentioned in the materials section. The bars shall be fabricated as per the drawings and binding with 16 gauge GI binding wire etc. Laps and splices for reinforcement shall be as shown on the drawings. Splices in adjacent bars shall be approved by Engineer. The bars shall not be lapped unless the length required exceeds the maximum available lengths of bars at site.

Bending

Reinforcing bars supplied bent or in coils, shall be straightened before they are cut to size. Straightening of bars shall be done in cold and without damaging the bars. This is considered as a part of reinforcement binding fabricating work.

All bars shall be accurately bent according to the sizes and shapes shown on the detailed working drawings/bar bending schedules. They shall be bent gradually by machine or other approved means. Reinforcing bars shall not be straightened and rebent in a manner that will injure the material, bars containing cracks or splits shall be rejected. They shall be bent cold, except bars of over 32 mm in diameter which may be bent hot if specifically approved by Engineer. Bars bent hot shall not be heated beyond cherry red colour (not exceeding 845°C) and after bending shall be allowed to cool slowly without quenching. Bars incorrectly bent shall be used only if the means used for straightening and rebending shall not injure the material. No reinforcement shall be bent when in position in the work without approval whether or not it is partially embedded in hardened concrete. Bars having kind or bends other than those required by design shall not be used.

Fixing

Reinforcement shall be accurately fixed by any approved means and maintained in the correct position shown in the drawings by the use of block, spacers and chairs as per IS 2502 to prevent displacement during placing and compaction of concrete. Bars intended to be in contact at crossing points shall be strongly bound together at all such points with two no. 16 gauge annealed soft iron wire. The vertical distance required between successive layers of bar in beams or other members shall be maintained by providing of mild steel spacer bars at such intervals that the main bars do not perceptibly sag between adjacent spacer bars.

Cover

Unless indicated otherwise on the drawings, clear concrete cover for reinforcement (exclusive of plaster or other decorative finish) shall be as follows:

- a) At each end of reinforcing bar, not less than 25 mm nor less than twice the diameter of the bar whichever is less.
- b) For a longitudinal reinforcing bar in a column, not less than 40 mm, nor less than the diameter of the bar. In case of columns of minimum dimensions of 20 cm or under, with reinforcing bars of 12 mm and less in diameter, a cover of 25 mm may be used.
- c) For longitudinal reinforcing bars in a beam 25 mm nor less than the diameter of the bar.
- d) For tensile, compressive, shear, or other reinforcement in a slab or wall not less than 12 mm nor less than the diameter of such reinforcement.
- e) For any other reinforcement not less than 12 mm nor less than the diameter of such reinforcement.
- f) For footings and other principal structural members in which the concrete is deposited directly against the ground, cover to the bottom reinforcement shall be 75 mm. If concrete is poured on a layer of lean concrete the bottom cover may be reduced to 50 mm.
- g) For concrete surfaces exposed to the weather or the ground after removal of forms, such as retaining walls, footing sides and top, etc., not less than 50 mm for bars larger than 16 mm dia and not less than 40 mm for bars 16 mm dia or smaller.
- h) Increased cover thickness shall be provided, as indicated on the drawings, for surfaces exposed to the action of harmful chemicals (or exposed to earth contaminated by such chemical, acid, alkali, saline atmosphere, sulphurous smoke, etc.

- i) For reinforced concrete members, totally or periodically immersed in sea water or subject to sea water spray, the cover of concrete shall be 50 mm more than those specified in (i) to (v) above.
- j) For liquid retaining structures the minimum cover to all steel shall be 40 mm or the diameter of the main bars, whichever is greater. In the presence of sea water and soils and waters of a corrosive character the cover shall be increased by 10 mm.
- k) Protection to reinforcement in case of concrete exposed to harmful surroundings may also be given by providing a dense impermeable concrete with approved protective coatings, as specified by the Engineer.
- l) The correct cover shall be maintained by cement mortar cover blocks. Reinforcement for footings, beams and slabs on sub-grade shall be supported on precast concrete blocks as approved by engineer. The use of pebbles or stones shall not be permitted.

Inspection

Erected and secured reinforcement shall be inspected, jointly measured and recorded and approved by Engineer prior to placement of concrete.

MASONRY WORKS

Applicable codes and specifications

- a) The following codes, standards and specifications are made a part of this specification. All standards, tentative specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revisions.

- IS:1077 - Common burnt clay building bricks
- IS:3102 - Classification of burnt clay bricks
- IS:2180 - Burnt clay building bricks, heavy duty
- IS:3495 - Method of sampling and testing clay building bricks
- IS:2691 - Burnt clay facing bricks
- IS:2221 - Code of practice for brick work
- IS:2185 - Load bearing hollow concrete blocks
- IS:5498 - Lime-cement-cinder hollow concrete blocks
- IS:3115 - Lime-cement cinder solid blocks
- IS:1597 - Code of practice for construction of stone masonry (Part I)
- IS:3620 - 1979-Specification for laterite stone block for masonry

Brick

Bricks used in works shall be bricks of specified crushing strength as described in the Schedule of Quantities. They shall have the following general properties:

They shall be sound, hard, homogenous in texture, well burnt in kiln without being verified, table moulded, deep red, cherry or copper coloured, of regular shape and size and shall have sharp and square edges and paralleled faces. The bricks shall be free from pores, chips, flaws or humps of any kind. Bricks containing unground particles and which absorb water more than 1/5th of their weight when soaked in water for twenty four hours shall be rejected. Overburnt

or under burnt bricks shall be liable to rejection. These bricks shall give a clear ringing sound when struck.

Samples of bricks shall be submitted before starting the brickwork to the Engineer for approval. Bricks supplied shall conform to these approved samples. Brick sample shall be got tested as per IS:3495 by Contractor at no extra cost. Bricks rejected by Engineer shall be removed from the site of works within 24 hours.

Mortar

Mix for cement mortar shall be as specified in the respective items of work. Gauge boxes for sand shall be of such dimensions that one complete bag of cement containing 50 kgs. of cement forms one unit. The sand shall be free from clay, shale, loam, alkali, and organic matter and of sound, hard, clean and durable practices. Sand shall be approved by the engineer. If so directed by the engineer sand shall be thoroughly washed till it is free of any contamination.

For preparing cement mortar the ingredients shall first be mixed thoroughly in dry condition. Water shall then be added and mixing continued to give a uniform mix of required consistency. Cement mortar shall preferably be machine mixed, through mixing in a thorough manner may be allowed. The mortar so mixed shall be used within 30 minutes of mixing. Mortar left unused in the specified period shall be rejected.

The Contractor shall arrange for test on mortar samples if so directed by the engineer retempering of mortar shall not be permitted.

Workmanship

All bricks shall be thoroughly soaked in clean water for at least one hour immediately before being laid. The cement mortar for brick masonry work shall be as specified in the respective item of work. Brick work 230 mm thick and over shall be laid in english bond unless otherwise specified. While laying bricks shall be pressed into the mortar and shoved into final position so as to embed the brick fully in mortar. Bricks shall be laid with frogs uppermost.

All brick work shall be plumb, square and true to dimensions. Vertical joints in alternate courses shall come directly one over the other and be in line. Horizontal courses shall be levelled. The thickness of brick courses shall be kept uniform. For walls of thickness greater than 230 mm both faces shall be kept in vertical planes. No broken bricks shall be used except as closers. Care shall be taken that the bricks forming the top corners and ends of the wall shall be properly radiated and keyed into position. Holes kept in masonry for scaffolding shall be closed before plastering. All interconnected brickwork shall be carried out at nearly one level (so that there is uniform distribution of pressure on the supporting structure) and no portion of the work shall be left more than one course lower than the adjacent work where this is not possible, the work shall be raked back accordingly to bond (and not saw toothed) at an angle not exceeding 45°.

Bricks shall be so laid that all joints are well filled with mortar. The thickness of joints shall not be less than 6 mm and not more than 10 mm. The face joint shall be raked to a minimum

depth of 12 mm by raking tools daily during the progress of work when the mortar is still green so as to provide a proper key for the plaster or pointing to be done. Where plastering or pointing is not required to be done the joints shall be uniform in thickness and be struck flush and finished at the time of laying. The face of brickwork shall be cleaned daily and all mortar droppings removed. The surface of each course shall be thoroughly cleaned of all dirt before another course is laid on top. If the mortar in the lower course has begun to set the joints shall be raked out to depth of 12 mm before another course is laid.

All brick work shall be built tightly against columns, floor slabs or other structural member.

Where drawings indicate that structural steel columns are to be fireproofed with brick work the brick shall be built closely against all flanges and webs with all spaces between the steel and bricks works filled solid with mortar. Steel members partly embedded in brickwork and not indicated to be fireproofed with concrete shall be covered with not less than 12 mm thick mortar unless directed otherwise by engineer.

The work shall be cured for 15 days.

Miscellaneous inserts in masonry e.g. sleeves, wall ties, anchors, conduits, structural sheet, steel lintels, etc., shall be installed by the Contractor. Furnishing fixing of any of these inserts by the Contractor will be paid for separately under steel work. Openings, arches, etc., shall be provided as shown on the drawings, chasses, pockets, etc., shall be provided as shown on the drawings to receive rain water pipes, etc. Wall ties and flashings shall be built into the brickwork in accordance with the drawings and specifications.

CONCRETE BLOCK

Concrete block, hollow (open or closed cavity) or solid shall be referred to by its nominal dimensions. The term nominal means that the dimension includes the thickness of the mortar joint. Actual dimensions (length and depth only) shall be 10 mm short of the nominal dimensions.

The nominal dimensions of concrete block as specified in specification

MATERIALS

Cement

Cement complying with any of the following Indian Standards may be used:

The cement to be used shall be ordinary Portland/Portland Pozolana cement conforming to IS: 8112-1989 & IS:1489 part I respectively for 43 Grade OPC/PPC unless otherwise mentioned. The cement procured should be of reputed approved by the Engineer-in-Charge. As far as possible, all the cement shall be obtained from a single source throughout the contract. Cement of different types shall not be mixed together. Different brands of cements or same brand of cement from different sources shall not be used without prior approval of the Engineer-in-Charge.

Aggregates

The aggregates used in the manufacture of blocks at the mixer or the mixing platform shall be clean and free from deleterious matter and shall conform to the requirements of IS 383.

The grading of the combined aggregates shall conform as near as possible to the requirements indicated in IS 383.

Fly ash

Conforming to IS 3812 (Part 2) may be used for part replacement of fine aggregate upto a limit of 20 percent (see *also* 6.1.1 of IS 2185 (Part 1) :2005).

Water

The water used in the manufacture of concrete masonry units shall be free from matter harmful to concrete or reinforcement, or matter likely to cause efflorescence in the units and shall conform to the requirements of IS 456.

Additives or Admixtures

Additives or admixtures may be added either as additives to the cement during manufacture, or as admixtures to the concrete mix. Additives or admixtures used in the manufacture of concrete masonry units may be:

Where accelerating, water reducing, air-entraining and super plasticizer conforming to IS 9103, Waterproofing agents conforming to IS 2645, and Colouring pigments no Indian Standards apply; the additives or admixtures shall be shown by test or experience, to be not detrimental to the durability of the concrete.

MANUFACTURE**Mix**

The concrete mix used for blocks shall not be richer than one part by volume of cement to 6 parts by volume of combined aggregates before mixing.

In machine-moulded blocks, the web markings on the units as they come from the machine give a good indication as to whether the proper consistency of concrete has been used. In addition to the grading of the aggregate and the quantity of the cement, the amount of water required for mix will depend to an extent on the type of machine on which blocks are produced. The amount of water required for mix should be electronically measured and controlled in the mixing drum.

Mixing

Batching of the ingredients should be done accurately and concrete mixing shall be done in a mixer to achieve homogeneous mix.

Mixing shall be continued until there is a uniform distribution of the materials, and the mass is uniform in colour and consistency.

Placing and Compaction

The block should be compacted by vibro-compaction and finished to proper size -without broken edges.

After ejection demoulding, the "blocks shall be handled carefully to avoid damage. The blocks shall be protected until they are sufficiently hardened before starting curing.

Curing

The blocks hardened in accordance with the specification shall then be cured as per IS 456 or by mist curing .So as to deliver the specified strength of block.

The blocks hardened in accordance with the IS standards may alternatively be cured by steam.

Drying

After curing the blocks in accordance with IS standards they shall be dried for a period of 4 weeks before being used on the work.

Surface Texture and Finish

Concrete masonry units can be given a variety of surface textures ranging from a very fine close texture to a coarse open texture by the proper selection. grading, and proportioning of aggregates at the time

IS 2185 (Part 1): 2005 of manufacture. Textures may also be developed by treating the face of the units while still-green by wire brushing or combing, slightly eroding the surface by playing a fine spray of water upon it, and by splitting (split block). Colour maybe introduced by incorporating non-fading mineral pigments in the facing concrete, or by applying a coloured cement grout or paint to the face of the units soon atler they are removed from the moulds. Selected coloured aggregates may also be used in the facing and exposed by washing with water or dilute hydrochloric acid followed by thorough washing with water to ensure no traces of acid are left on the surface. 8.-2 Well made concrete masonry may not require plaster in case of.unimportant buildings in low rainfall areas; two or three coats of a cement paint being sufficient to render it resistant to rain water. If, however, it is intended to plaster concrete

masonry, the block shall have a sufficiently rough surface to afford a good key to the plaster. Water proofing admixtures may be used for preparing the plaster.

Physical Requirements

General

All units shall be sound and free of cracks or other defects which interfere with the proper placing of the unit or impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection.

Where units are to be used in exposed wall construction, the face or faces that are to be exposed shall be free of chips, cracks, or other imperfections, except that if not more than 5 percent of a consignment contains slight cracks or small chippings not larger than 25 mm, this shall not be deemed grounds for rejection.

Dimensions

The overall dimensions of the units shall be as per specification

Compressive Strength

The minimum compressive strength at 28 days being the average of eight units, and the minimum compressive strength at 28 days of individual units, when tested in the manner described in Annex D - IS2185 (Part I):2005 or shall be as specified in BOQ and as directed by the Engineer in Charge

Water Absorption

The water absorption, being the average of three units, when determined in the manner prescribed in Annex E- IS2185 (Part I):2005 shall not be more than 10 percent by mass.

Drying Shrinkage

The drying shrinkage of the units when unrestrained being the average of three units, shall be determined in the manner described in Annex F - IS2185 (Part I):2005 and shall not exceed 0.06 percent.

Moisture Movement

The moisture movement of the dried blocks on immersion in water, being the average of three units, when determined in the manner described in Annex G – IS 2185 (Part I):2005, shall not exceed 0.09 percent.

Tests

Tests as described in Annex B to Annex G of IS 2185 shall be conducted on samples of units selected according to the sampling procedure, to ensure conformity with the physical requirements.

Sampling

A sample of 20 blocks shall be taken from every lot/consignment of 5000 blocks or part thereof from the same grade, size and same batch of manufacture.

The required number of blocks shall be taken at regular intervals during the loading of the vehicle or the unloading of the vehicle depending on whether sample is to be taken before delivery or after delivery. When this is not practicable, the sample shall be taken from the stack in which case the required number of blocks shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks by opening trenches from the top.

The sample of blocks shall be marked for future identification of the consignment it represents. The blocks shall be kept under cover and protected from extreme conditions of temperature, relative humidity and wind until they are required for test. The tests shall be undertaken as soon as practicable after the sample has been taken.

Number of Tests

All the 20 blocks shall be checked for dimensions and inspected for visual

Out of the 20 blocks, 3 blocks shall be subjected to the test for block density, 8 blocks to the test for compressive strength, 3 blocks to the test for water absorption and 3 blocks to the test for drying shrinkage and later to the test for moisture movement. The remaining 3 blocks shall be reserved for retest for drying shrinkage and moisture movement, if a need arises.

Manufacturer's Certificate

The manufacturer shall satisfy himself that the masonry units conform to the requirements of this standard and, if requested, shall supply a certificate to this effect to the purchaser or his representative.

Independent Tests

If the purchaser or his representative requires independent tests, the samples shall be taken before or immediately after delivery, at the option of the purchaser or his representative and the tests shall be carried out in accordance with this standard.

The manufacturer shall supply free of charge the units required for testing.

Cost of Testing

Unless otherwise specified in the enquiry or order, the cost of the tests shall be borne as follows:

By the manufacturer in the event of the results showing that the blocks do not conform to this specification, or By the purchaser in the event of the results showing that the blocks conform to this specification.

Marking

Concrete masonry units manufactured in accordance with this specification shall be marked permanently with the following information:

Identification of the manufacturer;

Grade of the unit and Year of manufacture, if required by the purchaser.

Laterite stone block masonry

IS: 3620 - 1979

SCOPE

This standard lays down the requirements for dimensions, physical properties, and workmanship of rectangular blocks made from laterite stone, used in the construction of walls and partitions.

GENERAL REQUIREMENTS

The stone blocks shall be without any soft veins, cracks, cavities, flaws and similar imperfections.

The blocks shall be exposed preferably for a period of three months before being used in the construction of masonry to ensure adequate stabilization However, exposure to rains should be avoided.

DIMENSIONS AND TOLERANCES

The standard size of laterite stone blocks shall be as specified in Table 1.

TABLE 1 SIZE OF LATERITE STONE BLOCKS

(All dimensions in millimetrcs)

LEGTH	BREADTH	THICKNESS
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(1)	(2)	(3)
390	190	190
490	190	190
590	290	290

Sizes other than those mentioned in Table 1, may be supplied if agreed to between the purchaser and the supplier.

A tolerance of f5 mm shall be allowed on dimensions specified in Table 1.

PHYSICAL PROPERTIES

The physical properties of the laterite stone blocks shall conform to the requirements given in co1 3 of Table 2 when tested in accordance with the provision of the respective Indian Standard given in co1 4 in Table. 2.

Sl.No (1)	Characteristic (2)	Requirement (3)	METHOD OF TEST – REF 1'O (4)
i.	Water absorption	Not more than 12 percent by mass	IS : 1124-1974
ii.	Specific gravity	Not less than 2.5	IS : 1124-1974
iii.	Compressive strength	Not less than 3.5 N/mm	IS : 1121 (Part I)-1974

NOTE - The compressive strength is for saturated dry samples.

*Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones (First revision).

Method of tests for determination of strength properties of natural building stones:

Part I Compressive strength (First revision).

WORKMANSHIP

The blocks shall be of uniform shape with straight edges at right angle.

The edges of the block shall be rough and chisel dressed as prescribed in IS : 1129-1972*.

MARKING

The blocks may be marked **in a** suitable manner with the manufacturer's identification mark or initials.

SAMPLING AND CRITERIA OF CONFORMITY

Lot - I n any consignment all the blocks from the same quarry shall be grouped together to constitute a lot.

Samples shall be selected and tested separately for each lot for determining its conformity or otherwise to the requirements of the specification.

The number of blocks to be selected SOR the sample shall depend upon the size of the lot and shall be in accordance with Table 3.

***Specification for dressing of natural building stones (first revision).**

TABLE 3 SAMPLE SIZE AND CRITERIA FOR CONFORMITY

(Clause 7.2)

No. of Blocks	No. of Blocks to be selected in the sample	Permissible no. of defectiveness	Subsample size no.
1	2	3	4
Upto 100	5	0	3
101 to 300	8	0	3
301 to 500	13	0	6
01 and above	20	1	6

The blocks in the sample shall be selected at random and in order to ensure the randomness of selection, random number table may be used (see IS : 4905-1968*).

All the blocks selected as given in co1 2 of Table 3 shall be examined for general requirements (see 2), dimensions (see 3), workmanship (see 5).

Any block failing in any one or more of the above requirements shall be considered to be defective. A lot shall be considered as conforming to these requirements if the number of defectives obtained is not more than the permissible number of defectives given in co1 3 of Table 3.

The lot having been found satisfactory with respect to general requirements, dimension and workmanship, shall be tested for physical properties. For this purpose a sub-sample of size as given in co1 4 of Table 3 shall be selected at random. These blocks shall be first tested for compressive strength and then for water absorption and specific gravity. A lot shall be considered to have satisfied the requirement of physical properties if none of the blocks tested for these requirements fails in any of these tests.

Rubble Masonry

Stones for this work shall be hard, durable rock, close or fine grained and uniform in colour free from veins, flaws and other defects and shall conform to IS:1597 (Part I). The stones shall be laid in mortar proportions specified for the particular item of work. Stones shall be got approved.

For all work below ground level the masonry shall be random rubble uncoursed with ordinary quarry dressed stones or hearting and faced with selected quarry dressed stones. For all work above ground level the masonry shall be random rubble faced with hammer dressed stones with squared quoins at joints and corners.

No stones shall tail into the wall, either with a point or to length less than $1\frac{1}{2}$ times its height. The thickness of the joints shall not exceed 12 mm.

Spauls and pinnings shall not be allowed to show on the face of the wall. Two bond stones each of minimum area of 500 sq.cm for every 1.0 sq.m. of each wall face shall be provided. These shall be through stones in walls 600 mm thick and under, in walls thicker than 600 mm the length of bond stones shall be $\frac{2}{3}$ times the thickness of walls. The stones for hearting of the wall shall not be less than 150 mm in any direction. Chips and spauls shall be wedged in to avoid thick mortar beds and joints. The wall faces, corners and joints or openings shall be truly vertical the quoins shall be of selected stones, neatly dressed with chiesel to form the required angle and laid header and stretcher alternatively.

The exposed face of the work shall be carefully and neatly pointed with mortar in all joints on the other side the joints shall be neatly struck with trowel while the mortar is fresh.

The mortar for the work shall be as specified in the respective item of work. Curing of masonry shall continue for a minimum of ten days.

Glass

Sheet glass or plate glass shall be of Indian make as specified in the Schedule of Quantities/as directed. It shall be free from waves and bubbles and all defects. The thickness of the glass shall be as follows:

- 2 mm thick glass for panes upto 900 sq.cm. area
- 3 mm thick glass for panes from 900 - 5500 sq.cm. area
- 4 mm thick glass for panes 5500 - 8400 sq.c.m. area
- 5.5 mm thick glass or plate glass for panes above 8400 sq.cm.

It should be clearly understood that glass which does not have uniform refractive index or which is wavy, will be rejected. The glazing shall be fixed with teak wood beading and putty.

It shall conform to IS:1761. The putty shall be made up of one part of white lead, 3 parts of finely powdered chalk and adding boiled linseed oil to make a stiff elastic paste. No voids shall be left in the putty. Woodwork shall not be painted, oiled or otherwise treated before it has been approved by the engineer.

The window frame shall be provided with 2 nos. MS 230x30x3 mm flat split hold fasts on each side, respectively. These hold fasts shall be embedded in masonry or concrete work with concrete block of mix 1:2:4 and size 230x300x250 mm.

The type of windows shall be as specified. Each leaf of the shutter shall have one pair of hinges for a width of less than or equal to 2 feet, for width more than 2 feet extra nos. of hinges shall be provided as directed by the Engineer at no extra cost. The glazed windows shall be provided with glass of thickness as specified in the item description. Architraves shall be provided as per drawing.

FINISHING WORKS

Applicable Codes

- 1) IS:2394- Code of practice for application of lime plaster finish
- 2) IS:1477- Code of practice for painting of ferrous metals in buildings and allied finishes (Part I & II)
- 3) IS: 427 - Distemper, dry colour as required
- 4) IS:2395 - Code of practice for painting concrete, masonry and plaster surfaces
- 5) IS: 428 - Distemper, oil emulsion, colour as required

Plastering

The surface to be plastered shall be washed with fresh clean water free from all dirt, loose material grease, etc., and thoroughly wetted for 6 hours before plastering work is commenced. Concrete surfaces to be plastered will however be kept dry. The wall should not be too wet but only damp at the time of plastering. The damping shall be uniform to get uniform bond

between the plaster and the wall. The junction between the brick work and RCC should be fixed with chicken wire mesh/PVC strip as directed before plaster.

The proportion of the mortar shall be as specified under the respective items of work. Cement shall be mixed thoroughly in dry condition and then just enough water added to obtain a workable consistency. The quality of water, sand and cement shall be as mentioned in the Specifications for Concrete & allied works. The mortar thus mixed shall be used immediately and in no case shall the mortar be allowed to stand for more than 30 minutes after mixing with water. The plaster shall be laid in a single coat. The mortar shall be splashed on the prepared surface with a trowel and finished smooth by trowelling. The plastered surface shall be rubbed with iron plate till the surface shows cement paste. The work shall be in line and level. Curing of plaster shall be started as soon as the applied plaster has hardened enough so as not to be damaged. Curing shall be done by continuously applying water in a fine spray and shall be carried out for at least 7 days.

The plaster shall be carried out on jambs, lintel and sill faces top and undersides, etc., as shown in the drawing or as directed by the engineer.

Providing & Applying Cement paint

This may be "SNOWCEM" or of equivalent make. The surface shall be prepared as specified in the specification for white wash. This shall be applied with brush on the plastered wall. The strokes shall be even and it shall be cured atleast for 7 days. No patch or brush stroke shall be seen. Three coats shall be applied.

FLOORING

Applicable codes

- 1) IS: 1443- Code of practice for laying and finishing of cement concrete flooring tiles.
- 2) IS: 2114 -Code of practice for laying in situ terrazzo floor finish
- 3) IS: 777 - Glazed earthenware tiles

Ceramic tiles in flooring, skirting and dado

The ceramic tiles in flooring and dado shall be of first class quality as specified in the item specification and shall be approved by the Engineer. The tiles shall be of standard size without warp and with straight edges, true and even in shape and size and of uniform colour. The tiles surface shall be of fine grained texture, dense and homogeneous. The thickness of the tile shall be as per the item specification. The tiles shall be submerged in water till the bubbles cease.

They should be laid on a base of 12 mm thick mortar bed (cement or lime 1:3 sand) and cement (3 kg/sq.m) paste. They shall be laid truly vertical on walls and truly horizontal on floors or to slopes as directed. The joint shall be very thin, uniform and perfectly straight. The tiles in dado shall be finished in such a way that, only the tile thickness projects over the finished plaster or as specified otherwise. Where full tiles are not possible, the same should be cut or sawn to the required size and their edge rubbed to ensure straight and true joints. After the tiles are laid

extra cement grout shall be removed. The joints shall be cleaned with wire brush and then the joint shall be floated with white or gray cement as approved by the Engineer. The tiles shall be cleaned after the work is complete.

Vitrified Tile Flooring

The vitrified tiles shall be of approved quality, size and uniform thickness and shall be hard, sound, dense and homogeneous in texture. It shall be uniform in shade free from stains, cracks and defects.

The Dimensional variations, surface quality, physical properties and chemical properties of tiles shall be as per internationally accepted relevant standards.

The edges are straight, with square edges and free from chippings. Tiles should be laid on a bed of cement mortar as specified in item specifications. Thickness of mortar bedding shall be specified in the item specifications and a neat cement shall be spread over the mortar bed. The tiles shall be placed one by one, keeping in check the level and line of the flooring. Tiles are wetted before placing. The tiles are then gently tapped with wooden mallet till it is firmly and properly bedded. There should be no voids left. The joint should be finished with tile joint filler of approved make and shade. The pattern of the flooring shall be as per the architectural drawings or as directed by Engineer-in-charge.

The base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, batted and mopped. the minimum thickness of bed mortar shall not be less than 12mm. Any undulation in the base concrete or RCC slab shall be corrected by cement mortar without any extra cost and any additional leveling required beyond max. mortar thickness to be carried out with cement concrete.

The flooring shall be cured for a minimum period of 7 days. The surface of the flooring shall be laid to levels and slopes as directed by Engineer-in-charge.

The tiles which are fixed in the floor adjoining the wall shall enter not less than 12mm under the skirting or dado. The junction between the wall plaster and the floor shall be finished neatly and without waviness.

The free edges shall be cut as per the pattern and shall be polished to match with flooring.

Engineer-in-charge has liberty to ask for any tests with respect to physical and chemical properties, etc. and the contractor shall arrange the same without any extra cost.

STEEL WORK

Providing and fixing steel doors/windows/ventilators

The steel doors, windows, ventilators shall conform to IS:7452 and 1036. All steel doors, windows, ventilators, louveres, etc. shall be of sizes as specified and conform to the description in the respective items of work. Whether or not specifically mentioned, all fixtures and fittings necessary for the satisfactory operation of the doors and windows shall be provided. Doors,

windows and ventilators shall be obtained from an approved manufacturer. Specific approval for such purchase shall be obtained before hand. Sample shall also be got approved before further manufacture starts, unless this is waived in writing by the ENGINEER. All steel door shall be of pressed steel (18 gauge) flush type with or without removable transoms. All doors shall be provided with a three way bolting device and locking arrangement with duplicate keys and handles on both sides and operable from either side. The CONTRACTOR shall obtain windows with friction hinges in place of windows with pegstays if so directed by the ENGINEER. For centre hung and top hung ventilators suitable spring catch/pulley and chord arrangement shall be provided for facility of opening. Whenever fly mesh over windows have been called for, they shall be fixed on the window and suitable lever type or rototype arrangement shall be provided for opening or closing of the glazed panels from inside. Prior approval of Engineer shall be taken before order is placed with the manufacturer.

Where specified, steel door supplied shall be airtight. For this purpose, the CONTRACTOR shall provide necessary padding material such as rubber, felt or any other approved material.

The rate quoted shall be inclusive of glazing with 4mm thick glass free from all blemishes. The workmanship shall conform to IS:1081. The rate quoted shall also be inclusive of fixing doors, windows, ventilators, louvres, etc. in brick work, steel framing, etc. by making holes/drilling holes in steel work where required complete.

The rate shall also include cost of painting two coats of approved enamel paint over two coat of approved zinc chromate primer.

Providing and fixing inserts in concrete works

Inserts are required to be fixed/embedded as indicated in construction drawings and/or as directed by Engineer-in-charge in foundations, columns and other miscellaneous concrete works. These inserts comprise plates, angles, pipe sleeves, anchor bolt assemblies, etc.

The rate quoted by the Tenderer shall hold good for accurately fixing the inserts at the correct levels/alignment and shall include for the cost of any temporary or permanent supports/anchors such as bars including cutting, bending, welding, etc. as required.

Steel templates shall be used by Contractor to locate and very accurately position bolts, group of bolts, inserts, embedded parts, etc. at his cost. Such templates shall be previously approved by the Engineer. Templates shall invariably be supported such that the same is not disturbed due to vibration, movement of labourers, materials, shuttering work, reinforcement, etc. while concreting. The Contractor will have to suitably bend, cut or otherwise adjust the reinforcement in concrete at the locations of inserts as directed by the Engineer at no extra cost to OWNER. If the Engineer so directs, the inserts will have to be welded to reinforcement to keep them in place. Contractor shall be responsible for the accuracy of dimensions, levels, alignments and centre lines of the inserts in accordance with the drawings and for maintenance of the same until the erection of equipment/structure or final acceptance by Owner.

Contractor shall ensure proper protection of all bolts, inserts, etc. from weather and other damages by greasing or other approved means such as applying white lead putty and wrapping them with gunny bags or canvas or by other means as directed by Engineer to avoid damage

due to movement of his labourers, material, equipment, etc. No extra claim from the Contractor on this account shall be entertained. Contractor shall be solely responsible for all the damages caused to bolts, inserts, etc. due to his negligence and in case damages do occur, they shall be rectified to the satisfaction of Engineer at the Contractor's cost.

Providing and fixing in position grill, railing, steel ladder, etc.

This work shall be carried out as per the detailed drawings. The MS sections shall be of approved quality. The welding shall be perfect and the junctions shall be ground properly. The frames shall be provided with hold fasts and the same shall be grouted with CC blocks in brick work. It shall be painted with two coats of zinc chromate primer and two coats of synthetic enamel paint of approved make and colour.

Providing & Fixing MS holding down bolts

The MS holding down bolts of specified dia, length and shape shall be provided as per the drawings in line & level. These shall be fixed to RCC work or brick work by grouting it with concrete. The bolt shall be provided with nuts and washers. The grease shall be applied to the threaded portion with the help of templates. If the bolts need some adjustment it shall be provided with a wooden piece 75x75 mm or 50 mm dia GI pipe around bolt shall be provided at the time of concreting and shall be removed after initial set.

TUBULAR / HOLLOW SECTION TRUSSES

Structural Steel Tube

These shall be of:

1. Hot finished welded (HFW) type, or
2. Hot finished seamless (HFS) type, or
3. Electric resistance or induction butt welded (ERW), having carbon content less than 0.03percent, yield stress of 21.5 kg/mm² (YST 210) type.

Conforming to the requirement of IS 1161. The steel tubes when analysed in accordance with the method specified in IS 228 shall show not more than 0.06 percent sulphur, and not more than 0.06 per cent phosphorous. Tubes shall be designated by their nominal bore. These shall be light, medium or heavy as specified depending upon the wall thickness. Hollow sections shall be as per IS 4923. Tubes shall be clean finished and reasonably free from scale. They shall be free from cracks, surface flaws, laminations and other defects. The ends shall be cut clean and square with axis of tube, unless otherwise specified.

Minimum Thickness of Metals

Wall thickness of tubes used for construction exposed to weather shall be not less than 4 mm and for construction not exposed to weather it shall be not less than 3.2 mm where structures are not readily accessible for maintenance, the minimum thickness shall be 5 mm.

Fabrication

The component parts of the structure shall be assembled in such a manner that they are neither twisted nor otherwise damaged and be so prepared that the specified cambers, if any, are, maintained. The tubular steel work shall be painted with one coat of approved steel primer after fabrication. All fabrication and welding is to be done in an approved workshop. The joint details shall be generally as per S.P-38 of B.I.S publication.

Straightening : All material before being assembled shall be straightened, if necessary, unless required to be of curvilinear form and shall be free from twist.

Bolting : Washers shall be specially shaped where necessary, or other means, used to give the nuts and the heads of bolts a satisfactory bearing.

In all cases, where the full area of the bolts is to be developed, the threaded portion of the bolt shall not be within the thickness of the parts bolted together and washers of appropriate thickness shall be provided to allow the nuts to be completely tightened.

Welding : Where welding is adopted, it shall be as per IS 816.

Caps and Bases for Columns : The ends of all the tubes, for columns transmitting loads through the ends, should be true and square to the axis of the tubes and should be provided with a cap or base accurately fitted to the end of the tube and screwed, welded or shrunk on. The cap or base plate should be true and square to the axis of the column.

Sealing of Tubes : When the end of a tube is not automatically sealed by virtue of its connection by welding to another member the end shall be properly and completely sealed. Before sealing, the inside of the tubes should be dry and free from loose scale

Flattened Ends : In tubular construction the ends of tubes may be flattened or otherwise formed to provide for welded. Riveted or bolted connections provide that the methods adopted for such flattening do not injure the material. The change of sections shall be gradual.

Hoisting and Erection

Tubular trusses shall be hoisted and erected in position carefully, without damage to themselves, other structure, equipment and injury to workman. The method of hoisting and erection proposed to be adopted shall be got approved from the Engineer-in-charge. The contractor shall however be fully responsible, for the work being carried out in a safe and proper manner without unduly stressing the various members. Proper equipment such as derricks, lifting tackles, winches, ropes etc. shall be used.

Measurements

The work as fixed in place shall be measured in running metres correct to a centimeter on their weights calculated on the basis of standard tables correct to the nearest kilogram unless otherwise specified. Weight of cleats, brackets, packing pieces bolts nuts, washers distance

pieces separators diaphragm gussets (taking overall square dimensions) fish plates, etc. shall be added to the weight of respective items unless otherwise specified. No deduction shall be made for skew cuts.

Rate: The rate shall include the cost of labour and materials involved in all the operations described above including application of painting.

ALUMINIUM WORK

Sl. No. IS Code Subject

1. IS 733 : Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes) -Specification
2. IS 737: Wrought Aluminium and Aluminium alloy sheet and strip for general engineering purposes -Specification
3. IS 1285: Wrought Aluminium and Aluminium Alloy, Extruded Round Tube and Hollow sections (For General Engineering Purposes) - Specification
4. IS 1868: Anodic coating on Aluminium and its Alloys-Specification
5. IS 1948: Specification for Aluminium Doors, Windows and Ventilators
6. IS 3908: Specification for Aluminium equal leg angles
7. IS 3909: Specification for Aluminium unequal leg angles
8. IS 3965: Dimensions for wrought Aluminium and Aluminium Alloys bars, rods and sections.
9. IS 5523: Method of testing anodic coating on aluminium and its alloys.
10. IS 6012: Measurement of coating thickness by Eddy Current Method
11. IS 6315: Floor springs (Hydraulically regulated) for heavy doors- Specifications
12. IS 6477: Dimensions of extruded hollow section and tolerances
13. IS 12823:Wood products- Pre-laminated particle board –Specifications.
14. IS 14900:Transparent Float glass- Specifications

Anodized Aluminium

Aluminium with an anodic coating, produced by an electrolytic oxidation process, in which the surface of the aluminium is covered with a coating, generally an oxide, to give protective and decorative properties.

Pre-laminated Particle Board

A particle board laminated on both surface by synthetic impregnated base papers under the influence of heat and pressure with finished foil under the pressure or pressure and heat depending on type of binder used.

ALUMINIUM

Aluminium Sections

Aluminium sections used for fixed/openable windows, ventilators, partitions, frame work & doors etc. shall be suitable for use to meet architectural designs to relevant works and shall be subject to approval of the Engineer-in-Charge for technical, structural, functional and visual considerations. The aluminium extruded sections shall conform to IS 733 and IS 1285 for chemical composition and mechanical properties. The stainless steel screws shall be of grade AISI 304.

The permissible dimensional tolerances of the extruded sections shall be as per IS 6477 and shall be such as not to impair the proper and smooth functioning/operation and appearance of door and windows.

Aluminium glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings. The details shown in the drawings may be varied slightly to suit the standards adopted by the manufacturers of the aluminium work, with the approval of Engineer-in-Charge. Before proceeding with any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawings for each type of glazing doors, windows, ventilators and partition etc. for the approval of the Engineer-in-Charge. If the sections are varied, the contractor shall obtain prior approval of Engineer-in-Charge and nothing extra shall be paid on this account.

Anodising

Standard aluminium extrusion sections are manufactured in various sizes and shapes in wide range of solid and hollow profiles with different functional shapes for architectural, structural glazing, curtain walls, doors, window & ventilators and various other purposes. The anodizing of these products is required to be done before the fabrication work by anodizing/electro coating plants which ensures uniform coating in uniform colour and shades. The extrusions are anodized up to 30 micron in different colours. The anodized extrusions are tested regularly under strict quality control adhering to Indian Standard.

Powder Coating

Material: The powder used for powder coating shall be Epoxy/polyester powder of make approved by the Engineer-in-Charge. The contractor shall give detailed programme for powder coating in advance, to facilitate the inspection by Engineer-in-Charge or his authorized representative.

Pre-treatment: Each aluminium alloy extrusion or performed section shall be thoroughly cleaned by alkaline or acidic solutions under the conditions specified by chemical conversion coating supplier and then rinsed. A chemical conversion coating shall be applied by treatment

with a solution containing essentially chromate ions or chromate and phosphate ions as the active components as applicable. The amount of the conversion coating deposited depends on the type used by the conversion coating chemical supplier. The conversion coating shall be thoroughly rinsed either with the solution specified by the conversion coating chemical supplier or with de-mineralized water and then dried at the temperature for the time specified by the conversion coating chemical supplier. The contractor shall submit the detail specifications and application procedure for application of conversion coating for approval of Engineer-in-Charge. The metal surface after the conversion coating pretreatment and prior to the application of the coating shall be free from dust or powdery deposits

Process: The polyester powder shall be applied by electrostatic powder spray method. Before start of powder coating the contractor shall submit detail specification for application of polyester powder from manufacturer of the polyester powder for approval of Engineer-in-Charge. The powder coating shall be applied as per the specification approved by Engineer-in-Charge.

Thickness: The thickness of the finished polyester powder coating measured by micron meter shall not be less than 50 micron nor more than 120 micron at any point.

Performance Requirements for the Finish

Surface appearance: The finish on significant surfaces shall show no scratches when illuminated and is examined at an oblique angle, no blisters, craters; pinholes or scratches shall be visible from a distance of about 1 m. There shall not be any visible variation in the colour of finished surfaces of different sections and between the colours of different surfaces of same section.

Adhesion: When a coated test piece is tested using a spacing of 2 mm between each of the six parallel cuts (the cut is made through the full depth of powder coating so that metal surface is visible) and a piece of adhesive tape, approximately 25 mm x 150 mm approved by the Engineer-in-Charge is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test area, no pieces of the finish other than debris from the cutting operation shall be removed from the surface of the finish.

Protection of Powder Coated / Anodizing Finish: It is mandatory that all aluminium members shall be wrapped with self adhesive non-staining PVC tape, approved by Engineer-in-Charge.

Measurement: All the aluminium sections including snap beading fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment. (Weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts.

Rate: The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

PANELING MATERIAL

Pre-laminated Particle Board

A particles board laminated on both surfaces by synthetic resin impregnated base papers under heat and pressure. Pre-laminated particle boards shall be of two grades, namely, Grade I and II corresponding to IS 3087 & 12823. Synthetic resin bonded flat pressed three layers, multilayer and graded particle board defined in IS 3087 having superfine surface shall be used for production of prelaminated particle board. For ECO Marks the particle board shall also conform to the requirements of ECO Mark specified in IS 3087

Float Glass

The glass shall be clear float glass and should be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to the IS 14900.

Thickness : The thickness of float glass shall depend on the size of panel. The tolerance in thickness shall be as under:

TABLE

Nominal Thickness (in mm)	Tolerance (in mm)
4.0 ± 0.3	
5.0 ± 0.3	
6.0 ± 0.3	
8.0 ± 0.6	

EPDM- GASKETS

The EPDM Gaskets shall be of size and profile as shown in drawings and as called for, to render the glazing, doors, windows, ventilators etc. air and water tight. Samples of gaskets shall be submitted for approval and the EPDM gasket approved by Engineer-in-Charge shall only be used. The contractor shall submit documentary proof of using the above material in the work to the entire satisfaction of Engineer-in-Charge.

SEALANT

The sealants of approved grade and colour shall only be used. The silicone for perimeter joints (between Aluminium section and RCC/Stone masonry) shall be of make approved by the Engineer in Charge.

Method of Application

Surface Preparation : Clean all joints and glazing pockets by removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt, old sealants or glazing compounds and protective coatings.

Masking

Areas adjacent to joints shall be masked to ensure neat sealant lines. Masking tape shall not be allowed to touch clean surfaces to which the silicone sealant is to adhere. Tooling shall be completed in one continuous stroke immediately after sealant application and before a skin forms and masking shall be removed immediately after tooling.

Application

Install backer rod of appropriate size and apply silicone sealant in a continuous operation using a positive pressure adequate to properly fill and seal the joint. The silicone sealant shall be tooled with light pressure to spread the sealant against backing material and the joint surfaces before a skin forms. A tool with convex profile shall be used to keep the sealant within the joint. Soap or water shall not be used as a tooling aid. Remove masking tape as soon as silicone joint is tooled.

Tolerance: A tolerance of + 3 mm shall be allowed in the width of silicone joints. The depth of the joints at throat shall not be less than 6 mm.

DOOR, WINDOW, VENTILATOR AND PARTITION FRAMES**Frame Work**

First of all the shop drawings for each type of doors/windows/ventilators etc. shall be prepared by using suitable sections based on architectural drawings, adequate to meet the requirement/specifications and by taking into consideration varying profiles of aluminium sections being extruded by approved manufacturers. The shop drawings shall show full size sections of glazed doors, windows, ventilators etc. The shop drawings shall also show the details of fittings and joints. Before start of the work, all the shop drawings shall be got approved from the Engineer-in-Charge. Actual measurement of openings left at site for different type of door/window etc. shall be taken. The fabrication of the individual door/windows/ventilators etc. shall be done as per the actual sizes of the opening left at site. The frames shall be truly rectangular and flat with regular shape corners fabricated to true right angles. The frames shall be fabricated out of section which have been cut to length, mitered and jointed mechanically using appropriate machines. Mitered joints shall be corner crimped or fixed with self tapping stainless steel screws using extruded aluminium cleats of required length and profile. All aluminium work shall provide for replacing damaged/broken glass panes without having to remove or damage any member of exterior finishing material.

Fixing of Frames

The holes in concrete/masonry/wood/any other members for fixing anchor bolts/ fasteners/ screws shall be drilled with an appropriate electric drill. Windows/ doors/ ventilators etc. shall be placed in correct final position in the opening and fixed to Sal wood backing using stainless steel screws of star headed, counter sunk and matching size groove. of required size at spacing not more than 250 mm c/c or dash fastener. All joints shall be sealed with approved silicone sealants.

In the case of composite windows and doors, the different units are to be assembled first. The assembled composite units shall be checked for line, level and plumb before final fixing is done. Engineer-in-Charge in his sole discretion may allow the units to be assembled in their final location if the situation so warrants. Snap beadings and EPDM gasket shall be fixed as per the detail shown in the shop drawings.

Where aluminium comes into contact with stone masonry, brick work, concrete, plaster or dissimilar metal, it shall be coated with an approved insulation lacquer, paint or plastic tape to ensure that electrochemical corrosion is avoided. Insulation material shall be trimmed off to a clean flush line on completion.

The contractor shall be responsible for the doors, windows etc. being set straight, plumb, level and for their satisfactory operation after fixing is complete.

Measurements

All the aluminium sections including snap beadings fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment (weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts.

Rate

The rate shall include the cost of all the materials, labour involved in all the operations as described in nomenclature of item and particular specification.

DOOR, WINDOWS AND VENTILATOR SHUTTERS

Material, fabrication and dimensions of aluminium doors, windows and ventilators manufactured from extruded aluminium alloy sections of standard sizes and designs complete with fittings, ready for being fixed into the building shall be as per IS 1948.

Tolerances

The sizes for doors, windows and ventilators frames shall not vary by more than ± 1.5 mm.

Material

Aluminium alloy extruded sections used in the manufacture of extruded window sections shall conform to IS 733. Hollow aluminium alloy sections used shall conform to IS 1285

Glass Panes

Glass panes shall weigh at least 7.5 kg/m² and shall be free from flaws, specks or bubbles. All panes shall have properly squared corners and straight edges.

Screws

Screws threads of machine screws used in the fabrication of aluminium doors, windows and ventilators shall conform to IS 1362.

Fabrication

Frames: Frames shall be square and flat, the corners of the frame being fabricated to a true right angle. Both the fixed and opening frames shall be constructed of sections which have been cut to length, mitered and welded at the corners. Where hollow sections are used with welded joints, argon-arc welding or flash butt welding shall be employed (gas welding or brazing not to be done). Subdividing bars of units shall be tenoned and riveted into the frame.

Side-hung Shutters

For fixing aluminium alloy hinges, slots shall be cut in the fixed frame and the hinges inserted inside and may be riveted to the frame. The hinges shall normally be of the projecting type 67 mm wide. The aluminium alloy for cast hinges shall conform to IS Designation A-5-M of IS 617. Specification for Aluminium and Aluminium Alloy Ingots and Castings for General Engineering Purpose and for extruded section of hinges to IS Designation HE10-WP or HE30-WP of IS 733. The pins for hinges shall be of stainless steel of non-magnetic type or aluminium alloy HR30. Irrespective of hinges being anodized or not, the aluminium alloy pins shall be anodized to a minimum film thickness of 0.025 mm shall be sealed with oil, wax or lanolin. Non- projecting types of hinges may also be used where ever required. Frictions hinges may be provided for side-hung shutter windows, in which case peg stay may not be required. The handle for side-hung shutters shall be of cast aluminium conforming to IS Designation A-5-M of IS 617 and mounted on a handle plate welded or riveted to the opening frame in such a way that it could be fixed before the shutter is glazed. The handle should have anodized finish with minimum anodic film thickness of 0.015 mm. The handle shall have a two points nose which shall engage with an aluminium striking plate on the fixed frame in a slightly open position as well as in a fast position . The height of the handles in each type of side-hung shutters shall be fixed in approximate position . The peg stay shall be either of cast aluminium conforming to IS 617 or folded from IS Designation NS4 aluminium alloy sheet conforming to IS:737 specification for wrought aluminium and aluminium alloys, Sheet and strip. It shall be 300 mm long, The stay shall have holes for keeping the shutter open in three different positions. The peg and locking bracket shall be riveted or welded to the fixed frame. Alternatively, and if specifically required

by the purchaser, side-hung shutters may be fitted with an internal removable fly screen of 0.375 mm wire and equivalent to IS Sieve 100 in a 0.900 mm aluminium alloy sheet conforming to IS Designation NS3-1/2H of IS 737 applied to the outer frame of the shutter by case or extruded aluminium alloy turn-buckle at the jambs and by aluminium or plated bronze shoes at the sill to allow of the screen being readily removed, and with a rotor operator at the sill to permit the operation of the shutter through an angle of 90°. On fly-screened shutters the peg stay is omitted and the normal handle shall be replaced by a locking handle to hold the shutter in the fast position.

Top-Hung Ventilators

The aluminium hinges for top-hung ventilators shall be either cast or fabricated out of extruded sections and shall be riveted to the fixed rail after cutting a slot in it. The aluminium alloy for cast hinges shall conform to IS Designation A-5-M of IS 617 and the extruded section of hinge to IS Designation HE10-WP or HE30_WP of IS 733. The pegs stay shall be 300 mm long as in side-hung shutter. The locking bracket shall be fixed to the fixed frame.

Cement Plaster

The cement plaster shall be 12 mm, 15 mm or 20 mm thick as specified in the item.

Scaffolding

For all exposed brick work or tile work double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed. For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

Note : In case of special type of brick work, scaffolding shall be got approved from Engineer-in-charge in advance.

Preparation of Surface

The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced. In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface.

Mortar

The mortar of the specified mix using the type of sand described in the item shall be used. It shall be as specified. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.

Application of Plaster

Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15 × 15 cm shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and sideways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided.

All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, provision of grooves at junctions etc. where required shall be done without any extra payment. Such rounding, chamfering or grooving shall be carried out with proper templates or battens to the sizes required.

When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped cleaned and wetted with cement slurry before plaster is applied to the adjacent areas, to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arrises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakages. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar. No portion of the surface shall be left out initially to be patched up later on. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

Thickness

Where the thickness required as per description of the item is 20 mm the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case of brick work, the minimum thickness over any portion of the surface shall be not less

than 15 mm while in case of stone work the minimum thickness over the bushings shall be not less than 12 mm.

Curing

Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the Engineer-in-Charge may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

Finish

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

Precaution

Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer-in-Charge.

(i) When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method with the wall while the plaster is green.

(ii) To prevent surface cracks appearing between junctions of column/beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be made separately.

Measurements

Length and breadth shall be measured correct to a cm and its area shall be calculated in square metres correct to two places of decimal.

Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves, or open joints in brick work.

The measurement of wall plaster shall be taken between the walls or partitions (the dimensions before the plaster shall be taken) for the length and from the top of the floor or skirting to the ceiling for the height. Depth of coves or cornices if any shall be deducted.

The following shall be measured separately from wall plaster.

- (a) Plaster bands 30 cm wide and under
- (b) Cornice beadings and architraves or architraves moulded wholly in plaster.
- (c) Circular work not exceeding 6 m in radius.

Plaster over masonry pilasters will be measured and paid for as plaster only.

A coefficient of 1.63 shall be adopted for the measurement of one side plastering on honey comb work having 6 x 10 cm. opening.

Moulded cornices and coves.

- (a) Length shall be measured at the centre of the girth.
- (b) Moulded cornices and coves shall be given in square metres the area being arrived at by multiplying length by the girth.
- (c) Flat or weathered top to cornices when exceeding 15 cm in width shall not be included in the girth but measured with the general plaster work.
- (d) Cornices which are curved in their length shall be measured separately.

Exterior plastering at a height greater than 10 m from average ground level shall be measured separately in each storey height. Patch plastering (in repairs) shall be measured as plastering new work, where the patch exceed 2.5 sqm. extra payment being made for preparing old wall, such as dismantling old plaster, raking out the joints and cleaning the surface. Where the patch does not exceed 2.5 sqm in area it shall be measured under the appropriate item under sub head 'Repairs to Buildings.'

Deductions in measurements, for opening etc. will be regulated as follows:

- (a) No deduction will be made for openings or ends of joists, beams, posts, girders, steps etc. upto 0.5 sqm in area and no additions shall be made either, for the jambs, soffits and sills of such openings. The above procedure will apply to both faces of wall.
- (b) Deduction for opening exceeding 0.5 sqm but not exceeding 3 sqm each shall be made for reveals, jambs, soffits sills, sills, etc. of these openings.
 - (i) When both faces of walls are plastered with same plaster, deductions shall be made for one face only.
 - (ii) When two faces of walls are plastered with different types of plaster or if one face is plastered and other is pointed or one face is plastered and other is unplastered, deduction shall be made from the plaster or pointing on the side of the frame for

the doors, windows etc. on which width of reveals is less than that on the other side but no deduction shall be made on the other side.

Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.

(iii) For opening having door frame equal to or projecting beyond thickness of wall, full deduction for opening shall be made from each plastered face of wall.

(c) For opening exceeding 3 sqm in area, deduction will be made in the measurements for the full opening of the wall treatment on both faces, while at the same time, jambs, sills and soffits will be measured for payment. In measuring jambs, sills and soffits, deduction shall not be made for the area in contact with the frame of doors, windows etc.

Rate

The rate shall include the cost of all labour and materials involved in all the operations described

Cement Plaster with a Floating Coat of Neat Cement

When the plaster has been brought to a true surface with the wooden straight edge it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement coating. The quantity of cement applied for floating coat shall be 1 kg per sqm. Smooth finishing shall be completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix. The rest of the specifications described and shall apply.

6mm Cement Plaster on Cement Concrete and Reinforced Cement

Concrete Work

Scaffolding

Stage scaffolding shall be provided for the work. This shall be independent of the walls.

Preparation of Surface

Projecting burrs of mortar formed due to the gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brushes. In addition concrete surfaces to be plastered shall be pock marked with a pointed tool, at spacing of not more than 5 cm. Centres, the pock being made not less than 3 mm deep. This is to ensure a proper key for the plaster. The mortar shall be washed off and surface, cleaned off all oil, grease etc. and well wetted before the plaster is applied.

Mortars

Mortar of the specified mix using the types of sand described in the item shall be used. It shall be as specified.

Application

To ensure even thickness and a true surface, gauges of plaster 15 x 15 cm. shall be first applied at not more than 1.5 m intervals in both directions to serve as guides for the plastering. Surface of these gauged areas shall be truly in the plane of the finished plaster surface. The plaster shall be then applied in a uniform surface to a thickness slightly more than the specified thickness and shall then be brought to true and even surface by working a wooden straight edge reaching across the gauges. Finally the surface shall be finished true with a trowel or with wooden float to give a smooth or sandy granular texture as required. Excess troweling or over working of the floats shall be avoided. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar. Plastering of ceiling shall not be commenced until the slab above has been finished and centering has been removed. In the case of ceiling of roof slabs, plaster shall not be commenced until the terrace work has been completed. These precautions are necessary in order that the ceiling plaster is not disturbed by the vibrations set up in the above operations.

Finish

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

Thickness

The average thickness of plaster shall not be less than 6 mm. The minimum thickness over any portion of the surface shall not be less than 5 mm.

Curing

The specifications shall be as detailed

Precautions

The specifications shall be as detailed

Measurements

Length and breadth shall be measured correct a cm. and its area shall be calculated in sqm. correct to two places of decimal. Dimensions before plastering shall be taken.

Thickness of plaster shall be exclusive of the thickness of the key i.e. depth or rock marks and hacking.

Plastering on ceiling at height greater than 5 m above the corresponding floor level shall be so described and shall be measured separately stating the height in stages of 1 m or part thereof.

Plastering on the sides and soffits of the projected beams of ceiling at a height greater than 5 m above the corresponding floor level shall be measured and added to the quantity measured. Plastering on spherical and groined ceiling and circular work not exceeding 6 m in radius, shall be measured and paid for separately.

Flowing soffits (*viz.* portion under spiral stair case etc.) shall be measured and paid for separately.

Ribs and mouldings on ceiling shall be measured as for cornices, deductions being made from the plastering on ceiling in case the width of the moulding exceed 15 cm.

Deduction shall not be made for openings or for ends of columns, or columns caps of 0.5 sqm each in area and under. No additions will be made either for the plastering of the sides of such openings. For openings etc. of areas exceeding 0.5 sqm deduction will be made for the full opening but the sides of such openings shall be measured for payment.

Rate

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

Cement Water Proofing Compound

It shall be used for cement mortar for plastering or concrete work.

Water Proofing Compound

Integral cement water proofing compound conforming to IS 2645 and of approved brand and manufacture, enlisted by the Engineer-in-Charge from time to time shall be used.

The contractor shall bring the materials to the site in their original packing. The containers will be opened and the material mixed with dry cement in the proportion by weight, recommended by the manufacturers or as specifically described in the description of the item. Care shall be taken in mixing, to see that the water proofing material gets well and integrally mixed with the cement and does not run out separately when water is added.

It shall be measured by weight.

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

CEMENT PRIMER COAT

Cement primer coat is used as a base coat on wall finish of cement, lime or lime cement plaster or on non-asbestos cement surfaces before oil emulsion distemper Paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalies present in the cement, lime or lime cement in wall finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper Paints. Primer coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surfaces. New plaster patches in old work should also be treated with cement primer before applying oil emulsion Paints etc.

Preparation of the Surface

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.

Application

The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion Paint is applied.

CEMENT PAINT**Material**

The cement Paint shall be (conforming to IS 5410) of approved brand and manufacture. The cement Paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the Contractor and the Engineer-in-Charge. The empty containers shall not be removed from the site of work till the relevant item of the work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For New Work, the surface shall be thoroughly cleaned of all mortar dropping, dirt dust, algae, grease and other foreign matter by brushing and washing. Pitting in plaster shall be made good and a coat of water proof cement Paint shall be applied over patches after wetting them thoroughly.

Preparation of Mix

Cement Paint shall be mixed in such quantities as can be used up within an hour of its mixing as otherwise the mixture will set and thicken, affecting flow and finish. Cement Paint shall be mixed with water in two stages. The first stage shall comprise of 2 parts of cement Paint and one part of water stirred thoroughly and allowed to stand for 5 minutes. Care shall be taken to add the cement Paint gradually to the water and not *vice versa*. The second stage shall comprise of adding further one part of water to the mix and stirring thoroughly to obtain a liquid of workable and uniform consistency. In all cases the manufacturer's instructions shall be followed meticulously. The lids of cement Paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement Paint rapidly becomes air set due to its hygroscopic qualities. In case of cement Paint brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in an airtight container to avoid its exposure to atmosphere.

Application

The solution shall be applied on the clean and wetted surface with brushes or spraying machine. The solution shall be kept well stirred during the period of application. It shall be applied on the surface which is on the shady side of the building so that the direct heat of the sun on the surface is avoided. The method of application of cement Paint shall be as per manufacturer's specification. The completed surface shall be watered after the day's work.

The second coat shall be applied after the first coat has been set for at least 24 hours. Before application of the second or subsequent coats, the surface of the previous coat shall not be wetted.

For new work, the surface shall be treated with three or more coats of water proof cement Paint as found necessary to get a uniform shade.

For old work, the treatment shall be with one or more coats as found necessary to get a uniform shade.

Precaution

Water proof cement Paint shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound, varnishes, Paints etc. It shall not be applied on gypsums, wood and metal surfaces. If water proofing cement is required to be applied on existing surface, previously treated with white wash, colour wash etc., the surface shall be thoroughly cleaned by scrapping off all the white wash, colour wash etc. completely. Thereafter, a coat of cement primer shall be applied followed by two or more coat of water proof cement.

Exterior Painting on Wall**Material**

The paint shall be (Textured exterior paint/Acrylic smooth exterior paint/premium acrylic smooth exterior paint) of approved brand and manufacture. This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

Preparation of Surface

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting is commenced.

Application

Base coat of water proofing cement paint

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions & directions of the Engineer-in-charge shall be followed meticulously. The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.

Paint shall be applied with a brush on the cleaned and smooth surface. Horizontal strokes shall be given, First and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.

SANITARY AND WATER SUPPLY

Applicable Codes:

1. IS:77-1984 Flushing Cisterns for water closets and urinals
2. IS:775/1970 Cast iron brackets and supports for wash basins and sinks

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| 3. | IS:1300/1994 | Phenolic moulding materials |
| 4. | IS:1795/1982 | Pillar taps for water supply purposes |
| 5. | IS:2326/1987 | Automatic flushing cisterns for urinals |
| 6. | IS:2548/1983 | Plastic seats and covers for water closets (Part-I & II) |
| 7. | IS:2556/1994 | Specification for vitreous sanitary appliances |
| 8. | IS:2963/1979 | Copper alloy waste fittings for wash basins and sinks |
| 9. | IS:3076/1985 | Low density polyethylene pipes for potable water supplies |
| 10. | IS:3489/1985 | Specification for enameled steel bath tubs |
| 11. | IS:4984/1987 | High density polyethylene pipes for potable water supplies, sewage and industrial effluents |
| 12. | IS:4985/1988 | Specification for unplasticised PVC pipes for potable water supplies |
| 13. | IS:6411/1985 | Specification for gel-coated-glass fibre reinforced polyester resin bath tub |
| 14. | IS:7231/1984 | Plastic flushing cisterns |
| 15. | IS:13983/1994 | Stainless steel sinks for domestic purposes |
| 16. | IS:13592 | Code of practise for PVC pipes for sanitary applications |
| 17. | IS:14735 | PVC pipe fittings |
| 18. | IS:5382 | Rubber rings |

Scope of Work

Scope of work shall cover the following

1. Supplying, laying, jointing and testing PVC SWR pipe (type B), with specials such as tees, bend, door bend, coupling, Y with door, unions, rubber ring, etc. cutting, earth work excavation, back filling, making good the walls, testing the line, etc.
2. Supplying and fixing gully traps with gully chamber, ventilation cowl, floor trap, etc.
3. Commissioning the Sanitary Piping System
4. Maintaining the commissioned line for a defect liability period of 60 months.

Drawings

Checked and approved drawings showing location of sanitary and water supply fixtures will be furnished to the Contractor and all drawing so furnished shall form a part of this specification. The Contractor shall refer these drawings for all information contained thereon which pertains to and required for this work.

All connected works will be measured and paid under respective items of work unless specifically mentioned otherwise.

Providing & Laying concealed PVC rain water line

The strength of the pipe shall be 4kg/sqcm. It shall be of approved make. It shall be provided with all necessary specials. It shall be jointed with adhesive as per the manufacturer's specifications.

Specification for laying and jointing sanitary pipes**Jointing**

1. Make sure the spigot end and inside of socket is clean and the sealing ring is placed evenly in the socket
2. During cutting of pipes, make sure that they are cut square. Chamfer the end cut to angle of 15° with a medium file.
3. A correct depth of entry of the spigot into the socket is required to allow thermal movement. To achieve this, push spigot fully into the socket (remove sealing ring at this time) and make a mark on the spigot. Withdraw the spigot by 10mm and mark the spigot with a bold line. This bold mark indicates the correct depth of entry to allow the necessary expansion gap.
4. Apply rubber lubricant evenly on the chamfered spigot and the sealing ring. Then insert the spigot into socket and pull out the pipe to allow 10mm expansion gap.

Precautions

1. Avoid over tightening of door caps. Proper placement of rubber ring should be confirmed before tightening
2. Avoid misalignment of vertical Pipe stacks and incorrect spacing of Pipe clips.
3. Cutting of pipes should be straight, as diagonal cutting leads to leakages.
4. All entry to main stacks should be protected with water seal trap, wherever there is mixing of Soil & Waste lines.
5. Keep a gap of 10mm between all Pipes and Fittings to accommodate thermal expansion and contraction of pipes for longer life of the system.
6. Horizontal lines within bathrooms should be cement encased and tested before compacting of sunken floor to avoid any accidental damages.

Installation in walls/concrete

The wall/concrete slots should allow for a stress-free installation.

Testing Non-pressure Installation above ground.

The PVC drainage system can be put to use immediately after installation, as no waiting time required for joints to be set and dried. The water level shall then be raised to a height of not less than three meters above the highest point of the section being tested as directed by the Engineer-in-charge. Every joint shall be carefully examined for leaks

Providing & Laying PVC line for Sanitary application.

The strength of the pipe shall be to withstand 4kg/cm² pressure rating. It shall be of approved make. It shall be provided with all necessary specials. It shall be jointed with manufacturer's specifications.

PVC PIPNG**A. Transportation and Stacking**

Because of the lightweight, there may be a tendency for the PVC pipes to be thrown much more than their metal counterparts. This should be discouraged and reasonable care should be taken in handling and storage to prevent damage to the pipes. On no account should pipes be dragged along the ground. Pipes should be given adequate support at all times. These pipes should not be stacked in large piles, specially under warm temperature conditions, as the bottom pipes may be distorted thus giving rise to difficulty in pipe alignment and jointing. For temporary storage in the field, where racks are not provided, care should be taken that the ground is level, and free from loose stones. Pipes stored thus should not exceed three layers and should be so stacked as to prevent movement. It is also recommended not to store one pipe inside another. It is advisable to follow the practices mentioned as per IS 7634 - Part I.

Laying and Jointing procedure

B. Trench Preparation

The trench bed must be free from any rock projections. The trench bottom where it is rocky and uneven a layer of sand or alluvial earth equal to 1/3 dia of pipe or 100mm whichever is less should be provided under the pipes.

The trench bottom should be carefully examined for the presence of hard objects such as flints, rock, projections or tree roots. In uniform, relatively soft fine grained soils found to be free of such objects and where the trench bottom can readily be brought to an even finish providing a uniform support for the pipes over their lengths, the pipes may normally be laid directly on the trench bottom. In other cases, the trench should be cut correspondingly deeper and the pipes laid on a prepared under-bedding, which may be drawn from the excavated material if suitable.

C. Laying and Jointing

As a rule, trenching should not be carried out too far ahead of pipe laying. The trench should be as narrow as practicable. This may be kept from 0.30m over the outside diameter of pipe and depth may be kept at 1.0 to 1.2m depending upon traffic conditions. Pipe lengths are placed end to end along the trench. The glued spigot an socket jointing technique as mentioned later is adopted. The jointed lengths are then lowered in the trench and when sufficient length has been laid, the trench is filled.

If trucks, lorries, or other heavy traffic will pass across the pipeline, concrete tiles 600 x 600mm of suitable thickness and reinforcement should be laid about 2m above the pipe to distribute the load. If the pipeline crosses a river, the pipe should be buried at least 2m below bed level to protect the pipe.

For bending, the cleaned pipe is filled with sand and compacted by trapping with wooden stick and pipe ends plugged. The pipe section is heated with flame and the portion bent as required. The bend is then cooled with water, the plug removed, the sand poured out and the pipe (bend) cooled again. Heating in hot air over hot oil bath, hot gas or other heating devices with solvent cement. Threaded joints are also feasible but are not recommended. Jointing of PVC pipes can be made in following ways:

- i) Solvent cement
- ii) Rubber ring joint
- iii) Flanged joint
- iv) Threaded joint

For further details on laying & jointing of PVC pipes, reference can be made to IS 4985-1998, IS 7634 - Part 1-3.

Socket and spigot joint is usually preferred for all PVC pipes upto 150mm in dia. The socket length should at least be one and half times the outer dia for sizes upto 100mm dia and equal to the outer dia for larger sizes.

For pipe installation, solvent gluing is preferable to welding. The glued spigot socket connection has greater strength than can ever be achieved by welding. The surfaces to be glued are thoroughly scoured with dry cloth and preferably chamfered to 30°. If the pipes have become heavily contaminated by grease or oil, methylene cement is applied with a brush evenly to the outside surface of the spigot on one pipe and to the inside of the socket on the other. The spigot is then inserted immediately in the socket upto the shoulder and thereafter a quarter (90°) turn is given to evenly distribute the cement over the treated surface. The excess cement which is pushed out of the socket must be removed at once with a clean cloth. Jointing must be carried out in minimum possible time, time of making complete joint not being more than one minute. Joints should not be disturbed for at least 5 minutes. Half strength is attained in 30 minutes and full in 24 hours. Gluing should be avoided in rainy or foggy weather, as the colour of glue will turn cloudy and milky as a result of water contamination.

D. Pre-fabricated Connections

In laying, long lengths of pipe, prefabricated double socketed connections are frequently used to join successive pipe lengths of either the same or one size different. The socket in this case must be formed over a steel mandrel. A short length of pipe is flared at both ends and used as the socket connection. The mandrel used is sized such that the internal dia of the flared socket matches the outer dia of the spigot to be connected. By proper sizing of the two ends of a connector, it is possible to achieve reduction (or expansion) of pipe size across the connector.

E. Standard Threaded Connections

Normally PVC pipes should not be threaded. For the connections of PVC pipes to metal pipes, a piece of a special thick wall PVC connecting tube threaded at one end is used. The other end is connected to the normal PVC pipe by means of a glued spigot and

socket joint. Before installation, the condition of the threads should be carefully examined for cracks and impurities.

Glue can be used for making joints leak proof. Yarn and other materials generally used with metal pipe and fittings should not be used. Generally, it is advisable to use PVC as the spigot portion of the joint.

F. Pressure Testing

The method which is commonly in use is filling the pipe with water, taking care to evacuate any entrapped air and slowly raising the system to appropriate test pressure. The field test pressure to be imposed should be not less than the maximum of the following:

- a. 1 1/2 times the maximum sustained operating pressure
- b. 1 1/2 times the maximum pipeline static pressure
- c. Sum of the maximum sustained operating pressure and the maximum surge pressure.
- d. Sum of the maximum pipeline static pressure and maximum surge pressure, subject to a maximum equal to the work test pressure for any pipe fitting incorporated.

After the specified test time has elapsed, usually one hour, a measured quantity of water is pumped into the line to bring it to the original test pressure, if there has been loss of pressure during the test. The pipe shall be judged to have passed the test satisfactorily if the quantity of water required to restore the test pressure of 30m for 24 hours does not exceed 1.5 litres per 10mm of nominal bore for a length of 1 Km.

Testing

Water test and air test shall be conducted as stipulated in IS:5329.

Providing & constructing manholes

Manholes of different types and sizes as specified shall be constructed in the sewer line at such places and to such levels and dimensions as shown in the drawings or as directed by the engineer. The size indicate the inside dimensions of the manhole.

Excavation and back filling shall be as per respective specifications.

Manhole shall be built on a bed of brickbat cement concrete 1:4:8 (1 cement : 4 sand : 8 brickbats of 40mm nominal size). The thickness of the bed concrete shall be 150mm unless otherwise specified.

Brick work shall be in cement mortar 1:6 (1 cement : 6 sand). The external joints of the brick masonry shall be finished smooth. The joints of the pipes with the masonry shall be made perfectly leak-proof with cement concrete 1:2:4.

The brick walls of the manholes shall be plastered inside with 12mm thick cement plaster 1:4 (1 cement : 4 sand) finished smooth with a floating coat of neat cement.

Channels and benching shall be in cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate).

All manholes deeper than 1.0m shall be provided with CI foot rest. These shall be embedded 20 cm deep with 20x20x10 cm blocks of cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate). The block with CI foot rest placed in its centre shall be cast-in-situ along with the masonry and the surface finished with 12mm thick cement plaster 1:4 (1 cement : 4 sand) finished smooth. Foot rests shall be fixed 30cm apart vertically and staggered the wall. The top foot rest shall be 45 cm below the manhole cover. Foot rests shall be painted with coal tar, the portion embedded in cement concrete block painted with thick cement slurry before fixing.

The depth of channels and benching shall be as indicated in the table given below.

Size of drain (mm)	Top of channel at the centre above bed concrete (cm)	Depth of benching at side walls above bed concrete (cm)
100	15	20
150	20	30
200	25	35
250	30	40
300	35	45
350	40	50
400	45	55
450	50	60

CI manhole covers and frames shall conform to IS:1726. The covers and frames shall be cleanly cast and they shall be free from air and sand holes and from cold struts. They shall be neatly dressed and carefully trimmed. All casting shall be free from voids whether due to shrinkage, gas inclusion or other causes. Cover shall have a raised chequered design on the top surfaces to provide an adequate non slip grip. The cover shall be capable of easy opening and closing. It shall be fitted in the frame in workmanship like manner. The cover shall be gas tight and water tight. Covers and frames shall be coated with a black bituminous paint. It shall not flow when exposed to a temperature of 63 Deg. Cent. and shall not be brittle as to chip off at temperature of 0 Deg.Cent.

Manhole cover and frame shall conform to medium duty 500 mm internal diameter and shall weigh not less than 75kg unless otherwise mentioned in the item description. (Weight of cover 58kg and weight of frame 58kg).

Manholes shall be measured in numbers. The depth of the manhole shall be reckoned from top level of CI cover to the invert levels of channel. The depth shall be measured correct to centimeters.

Sewers of unequal sectional area shall not be jointed at the same invert level in a manhole. The invert of the smaller sewer at its junction with main shall be, at a height at least $\frac{2}{3}$ the diameter of the main, above the invert of the main. The branch sewer should deliver sewage in the manhole in the direction of main flow and the junction must be made with care so that flow in the main is not impeded. No drains from house fittings eg. GT, soil pipe etc. exceeding a length of 6m shall be connected unless it is inevitable.

The frame of the manhole cover shall be firmly embedded to correct alignment and levels in plain cement concrete 100mm thick 1:2:4 (1 cement :2 sand :4 graded stone aggregate) on top of the brick masonry. After completion of the work manhole covers shall be smeared by means of thick grease.

Providing & Constructing Soak pit

The earth excavation shall be carrying out to the exact dimensions as shown in the drawing. The soak pit shall be constructed of honey-comb dry brick work of 250 mm thick in cement mortar 1:6, RCC 1:2:4 precast or cast-in-situ slabs 150 mm thick for top cover with reinforcement, CI manhole cover 500 mm dia of 80 kg weight, 150 mm dia SW tee, outlet vent, 75 mm dia CI pipe 2 m high fixed on masonry pedestal with cowl and bituministic painting, refilling, watering, consolidating etc., all complete.

Providing & Constructing Drop connection

In cases where branch sewer enters the manholes of main pipe sewer at a higher level than the main sewer, a drop connection should be provided. Pipes and specials conforming to IS:1729 shall be of the same size as the branch pipe sewer.

For 150 mm and 250 mm main line if the difference in level between the water line (peak flow level and the invert level) of branch line is less than 60 cm a drop connection may be provided within the manhole by giving a suitable ramp. If the difference in level is more than 60 cm the drop should be provided externally.

The excavation shall be done for the drop connection at the place where the branch line meets the manhole. The excavation shall be carried up to the bed concrete of the manhole and to the full width of the branch line excavation and backfilling shall be done as per respective specifications.

At the end of branch sewer line SCI tee shall be fixed to the line which shall be extended through the wall of manhole by a horizontal piece of SCI pipe to form an inspection of cleaning eye. The open end shall be provided with chain and lid. The SCI drop pipe shall be connected to the tee at the top and to the SCI bend at the bottom. The bend shall be extended through the wall of the manhole by a piece of pipe which shall discharge into the channel. Necessary channel shall be made with cement concrete of grade M-150 and finished smooth to connect the main channel. The joint between CI pipe and fittings shall be lead caulked. The joint between SCI tee and SW branch line shall be made with cement mortar 1:1 (1 cement : 1 fine sand) as for emased around with minimum 15 cm thick concrete 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate 40 mm nominal size) and cured. For encasing the concrete around the drop connection the necessary centering and shuttering shall be provided the holes

made in the walls of the manhole shall be made good with brick work in cement mortar 1:5 (1 cement : 5 coarse sand) and plastered with cement mortar 1:3 (1 cement : 3 fine sand) on the inside of the manhole wall. The excavated earth shall be back filled in the trench in level with the original ground level.

TESTING AND ACCEPTANCE

Inspection before Installation

All pipes, fittings and fixtures shall be inspected before delivery at the site to see whether they confirm to accept standards. The pipes shall again be inspected before laying by sounding to disclose cracks. All defective items shall be clearly marked and removed from the site.

Testing and Commissioning

The manholes raised above the subsoil water, water level expected in the monsoon shall similarly be tested for water tightness as for the pipelines.

Testing and Commissioning of all completed work shall be done in accordance with the provisions of the I.S. codes mentioned in the beginning of these specifications

SPECIFICATIONS FOR FITTINGS AND FIXTURES

SCOPE OF WORK:

The work covered under these specifications consist of supplying different types of fittings and fixtures required for doors, windows, ventilators etc. The supply shall be in accordance with the specification, drawings / approved samples. Samples of various fittings and fixtures proposed to be incorporated in the work shall be submitted by the contractor for approval of the Engineer-in-charge before order for bulk supply is placed.

General:

All fittings and fixtures shall conform to relevant IS code and made of brass, anodised aluminium, iron oxidised (M.S.) or as specified. These shall be well made reasonably smooth and free from sharp edges, corners, flaws and other defects. Screw holes shall be counter sunk to suit the heads of the specified screws. All hinges pins shall be of steel for brass hinges and aluminium alloy NR-6 or steel pins for aluminium hinges with nylon washers or as specified. All riveted heads pertaining to hinge pins shall be well formed. Screws supplied for fittings shall be of the same metal and finish as the fittings. However brass cadmium plated/chromium plated screws shall be supplied with aluminium fittings. Samples of each fixture/ fitting shall be furnished by the contractor for approval of the Engineer-in-Charge. Order for procurement of fittings and fixtures in bulk shall be placed only after approval by the Engineer-in-Charge.

The fittings and fixtures to be incorporated in the work shall be strictly according to the approved sample. Fittings shall be fixed in proper position as shown in the drawing and as directed by the Engineer-in-Charge. These shall be truly vertical or horizontal as the case may be. Screws shall be driven home with a screwdriver and not hammered in. Recess shall be cut to the exact size and depth for the counter sinking of hinges. The fittings and fixtures shall be

fixed in a workman like manner and any damages done either to fittings and fixtures or to the shutter frames etc. should be rectified by the contractor at his own cost.

Fittings shall be of Mild steel, Stainless steel, aluminium, brass or as specified. The fittings shall be well made, smooth, and free from sharp edges and corners, flaws and other defects.

Mild steel fittings shall be bright satin finish black stone enameled or copper oxidized (black finish), nickel chromium plated or as specified.

Brass fittings shall be finished bright satin finish or nickel chromium plated or copper oxidized or as specified.

Aluminium fittings shall be anodised to natural matt finish or dyed anodic coating less than grade AC 10 of IS: 1868

Stainless steel fittings shall be non-magnetic, rust & moisture proof, strong & sturdy. Pin of hinges shall also be of stainless steel.

Butt Hinges:

Brass and aluminium hinges shall be manufactured from the extruded sections and shall be free from cracks and other defects. M.S. butt hinges shall be cranked and manufactured from M.S. sheets. All butt hinges shall conform to latest I.S. specifications butt hinges shall generally conform to relevant I.S viz IS 1341 (M.S.) IS : 205 (Cast brass & aluminium, IS : 362 (Parliament hinges); IS : 453 sprig hinges, IS : 3818 (Piano hinges) etc. The size of butt hinges shall be taken as the length of the hinge. Width of the hinge shall be measured from the centre line of hinge pin to end of flange.

Parliamentary Hinges:

These shall be manufactured from extruded section for brass and aluminium and from M.S. sheets for iron oxidised and shall be free from cracks and other defects. The size of the parliamentary hinges shall be taken as the width between open flanges, while the depth shall be as specified.

Piano Hinges:

These shall be generally conformed to I.S. 3818 and shall be made of either brass oxidized, aluminium anodized, iron oxidized (M.S.) or as specified. Piano hinges shall be fixed in the entire length of the cupboard shutters in a single piece. No joints shall be allowed.

Tower Bolts:

These shall generally conform to IS 204 (Part II & I). They shall be well made and shall be free from defects.

The tower bolts shall be of the following types:

- i) MS semi barrel tower bolt with ms sheet pressed barrel and G.I. bolt or with ms barrel and ms Sheet bolt.
- ii) Oxidised brass barrel tower bolt with brass sheet barrel and rolled or drawn brass bolt.
- iii) Anodised aluminium tower bolt with barrel and bolt of extruded sections of aluminium alloy.

In case of M.S. tower bolt plates and straps after assembly shall be firmly riveted or spot welded properly.

The knobs of brass tower bolts shall be cast and the bolt fixed into the knob firmly as per I.S. specifications. The tower bolt shall be finished to correct shape and pattern so as to have a smooth action. Wherever specified, aluminium barrel tower bolts shall be manufactured from extruded sections of barrel & bolts.

Knobs shall be properly screwed to the bolt and riveted at the back. The size of the tower bolt shall be taken as the length of barrel without top socket.

Door Latch:

This shall be of MS, cast brass or as specified shall have smooth sliding action. MS Latch shall be copper oxidised (black finish) or as specified. Brass Latch shall be finished bright, CP or oxidised or as specified.

Aldrops:

These shall be oxidized brass or anodized aluminium, iron oxidized or as specified and shall be capable of smooth sliding action and shall be as per relevant I.S. Brass sliding door bolt (aldrop) shall be made from rolled brass generally confirming to IS : 2681. M.S. sliding door bolt shall generally conform to I.S.281.

The hasp shall be of cast brass and screwed to the bolt in a workman like manner. Alternatively the hasp and the bolt may be in one piece. Bolts shall be finished to shape and threaded with worth standard and provided with round brass washers and nuts of square or hexagonal shape. All components shall be smooth and polished. The leading dimensions of aldrop shall be as the length of the bolt and specified diameter.

Door Handles- Bow/Plate Handles:

These should generally conform to IS : 208. Unless otherwise specified door handles shall be of 100 mm size & windows handles of 75 mm size. These shall be of cast brass of specified size, shape and pattern as approved by the Engineer-in-charge. All edges and corners shall be finished smooth and correct to shape and dimensions.

Brass handles shall be finished bright, chromium plated or oxidized as specified. Anodized aluminium or iron oxidized (m.s.) handles shall be of specified size, shape and pattern. The size

of the handle is taken as the inside grip of the handle. In case of iron oxidized handles, the same shall be manufactured from m.s. sheet pressed into oval section as per I.S.

Mortise Lock & Latch:

This should generally conform to I.S. 2209. Handles shall conform to IS 4992.

Mortise lock with latches and a pair of level handles shall be 6 levers, with zinc alloy pressure die cast/brass or as specified body of approved quality, and shall be right or left handed as specified. The pair of handles shall be either brass chromium plated or anodized aluminium of approved shape and pattern or as specified. It shall be of the best Indian make of approved quality. The size of the lock shall be determined by its length. The lock for single leaf door shall have plain face and that for double leaf door a rebated face. Level handles with springs shall be mounted on plates and shall be of approved quality, anodized aluminium or as specified.

Hydraulic Door Closer:

This shall be generally conform to IS : 3564. Hydraulic door closer shall be of approved quality and make. The operation of the Hydraulic door closer shall be very smooth.

This should be of H.D.-66 for external/main doors and elegant - 63 for all internal doors.

The overall height should not be more than 170 mm. for H.D.-66 and 160 mm. for elegant - 63, base shall be 110 x 60 mm. for H.D.-66 and 100 x 55 mm. for elegant - 63 weighing not less than 4.5 kg. for H.D.-66 and 4 Kg. for elegant - 63. Speed of the Hydraulic door closer shall be adjustable and latch closing also shall be adjustable type. Suspension and lubrication of door closer shall be in perfect line and level.

The contractor shall provide for all the incidentals required for fixing these fixtures and fittings such as cadmium plated screws etc. Fittings and fixtures shall be fixed securely in a workman like manner as directed by the Engineer-in-charge. Any of the fixtures damaged during the fixing shall be removed and new one fixed in their place and the surface of joinery made good where affected, at his own expense. Mortise plates shall be used over holes where the bolts enter in the wood work. Metal sockets shall be provided to all bolts where the shoot enter brick, stone, concrete etc. The incidental Fixtures like mortise plates, metal sockets, screws etc. shall not be paid for separately.

Mortice Night Latch:

This is a mortice lock having a single spring bolt withdrawn from the outside by using the key and from inside by turning the knob and with an arrangement whereby the lock can be prevented from being opened by its key from outside while the night latch is used from inside the room.

This should generally conform to IS: 3847. It shall be cast or sheet brass, cast or sheet aluminium alloy or mild steel as specified and of approved make. These shall be bright finished or copper oxidized (black) finish as specified. Normal size of the latch shall be denoted by the length of the face over the body in millimeters.

Floor Door Stopper:

The floor door stopper shall conform to IS: 1823. This shall be made of cast brass of overall size as specified and shall have rubber cushion. The shape and pattern of stopper shall be approved by the Engineer-in-Charge. It shall be of brass finished bright, chromium plated or oxidized or as specified. The size of door stopper shall be determined by the length of its plate. The body of the door stopper shall be cast in one piece. All parts of the door stopper shall be of good workmanship and finish and free from surface and casting defects. Aluminium stopper shall have anodic coating of not less than grade AC-10 of IS 1868.

Mode of measurement:

All the fittings with all the necessary accessories shall be measured in numbers and the rate shall include the cost of all materials including taxes, excise duty, if any, loading, unloading, transporting, cost of screws, bolts and other accessories complete, if the same are not to be paid for separately as per schedule of quantities.

TECHNICAL SPECIFICATION- ROAD WORKS

1.0 GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

PART-I: GENERAL TECHNICAL SPECIFICATIONS

The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (FIFTH REVISION, 2013) issued by the Ministry of MORTH, Government of India, published by The Indian Roads Congress with up to date amendments, if any. (NOT INCLUDED CONTRACTORS TO OBTAIN COPY BY OTHER MEANS)

PART-II: SUPPLEMENTARY TECHNICAL SPECIFICATIONS

The Supplementary Technical Specifications shall comprise of various Amendments / Modifications/ Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to in PART-I above.

- 1.1.1 A particular clause or a part thereof in "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (FIFTH REVISION, 2013) referred in PART-I above, where Amended/Modified/Added upon, and incorporated in PART-II, referred to above, such Amendment/Modification/ Addition supersedes the relevant Clause or part of the Clause.
- 1.1.2 When an Amended/ Modified/ Added Clause supersedes a Clause or part thereof in the said specifications, then any reference to the superseded clause shall be deemed to refer to the Amended/Modified/ Added Clause or part thereof.
- 1.1.3 In so far as Amended/Modified/Added Clause may come in conflict or be inconsistent with any of the provisions of the said Specifications under reference, the Amended/Modified/Added Clause shall always prevail.
- 1.1.4 The following Clauses in the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (FIFTH REVISION, 2013) have been amended/modified/added upon.

102, 110, 120, 121, 301, 305, 306, 401, 406, 408, 409, 502, 503, 505, 1007, 1014, 1502, 1503, 1703, 2504, 2706.
- 1.1.5 In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of IRC and BIS in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practice as approved by the Engineer and in case of any dispute arising out of the interpretation of the above, the decision of the Engineer shall be final and binding on the Contractor.

PART-II
SUPPLEMENTARY SPECIFICATIONS
AMENDMENTS / MODIFICATIONS / ADDITIONS TO EXISTING CLAUSES OF
GENERAL TECHNICAL SPECIFICATIONS

Clause 102 **DEFINITIONS**

The following abbreviations shall be added in this Clause:
"KSIDC" - Kerala State Industrial Development Corporation

Clause 110 **PUBLIC UTILITIES**

Clause 110.7 This clause shall be read as under

The Contractor shall arrange removal/shifting of structures/utilities/service lines causing hindrance to work on specific instruction from the Engineer and shall do necessary liaison/ follow-up with the authorities concerned. Any statutory payment required for such removal/ shifting will be borne by the Owner.

Clause 120.0 **FIELD LABORATORY**

Clause 120.2 **DESCRIPTION**

This clause shall be read as under

The Contractor shall arrange to provide fully furnished and adequately equipped field laboratory of adequate size. The field laboratory shall be located adjacent to the site office of the Engineer and provided with amenities like water supply, electric supply etc. as for the site office of the Engineer.

The floor space requirement for the field laboratory shall be as required for accommodating the staff and equipments. Contractor shall furnish drawing for the laboratory. It shall include office space for the Materials Engineers, one from the Contractor's side and another from the Engineer's side and a store for the storage of samples. The remaining space shall be provided for the installation of equipment, laboratory tables and cupboards, working space for carrying out various laboratory tests, besides a wash basin, toilet facility and a curing tank for the curing of samples, around 4m x 2m x 1m in size and a fume chamber. The furnishing in each of two offices of the Materials Engineers shall be as provided for the Site Engineer. Wooden/concrete working table with a working platform area of about 1m x 10m shall be provided against the walls, also providing wooden cupboards above and below the working tables to store accessories such as sample moulds etc. The Contractor shall furnish the

proposal for laboratory, including drawings, along with the offer.

Table 100.2 **LIST OF LABORATORY EQUIPMENT**

This clause shall be read as under

The following items of laboratory equipment shall be provided on the field laboratory.

A. GENERAL

(i) Weigh Balance

- | | |
|--|----------|
| (a) 5 kg. To 20 kg. Capacity semi-self indicating type –
Accuracy 1 gram - Electronic | : 01 No. |
| (b) 500 gm capacity semi self-indicating type-
Accuracy 0.01 gram - Electronic | : 01 No. |
| (c) Electronic balance 5 kg. Capacity - Accuracy 0.5 gram | : 01 No. |
| (d) Platform scale - 300 kg. Capacity | : 01 No. |

(ii) Ovens

Electrically operated, thermostatically controlled, from 0°C to 220°C, Sensitivity 1°C	: 01 No.
---	----------

(iii) Sieves (as per I.S. 460-1962)

- | | |
|--|---------------|
| (a) I.S. Sieves 450mm internal diameter of sieve sets
as per ISI of required sieve sizes complete with lid
and pan | : 01 No. |
| (b) I. S. Sieve 200 mm internal diameter (brass frame and
steel or brass wire cloth mesh) consisting of sieve sets
of required Sieve sizes complete with lid and pan | : 01 No. |
| (iv) Sieve shaker capable of taking 200 mm and 450 mm dia
sieves electrically operated with time switch assembly
(as per I. S.) | : 01 No. |
| (v) 200 tonnes compression testing machine | : 01 No. |
| (vi) Stop watches 1/5 seconds accuracy | : 01 No. |
| (vii) Glassware comprising of Beakers, Pipettes, dishes,
measuring cylinders (100 to 1000 cc capacity) glass rods
and funnels, glass thermometers range 0°C to 100°C
and metallic thermometers. Range up to 300°C | : 2 No. Each. |
| (viii) Hot plates 200mm diameter (1500 watt) | : 01 No. |
| (ix) Enamel trays | |
| (a) 600 mm x 450 mm x 50 mm | : 02 No. |
| (b) 450 mm x 300 mm x 40 mm | : 02 No. |

- (c) 300 mm x 250 mm x 40 mm : 02 No.
 (d) Circular plates of 250 mm diameter : 02 No.

B. FOR SOILS

- (i) Water still : -----
- (ii) Liquid limit device with Casagrande and A.S.T.M. grooving Tools as per ISI 2720 : 01 No.
- (iii) Sampling pipettes fitted with pressure and suction inlets, Capacity 10 ml. : 01 Set
- (iv) Compaction apparatus (Proctor) as per ISI 2720 (Part 8) complete with collar, base plate and hammer : 01 No.
- (v) Compaction Test Equipments (Standard Proctor and Modified Proctor test) with 2.5 and 4.5 Kg rammers as per IS : 01 No.
- (vi) Sand pouring cylinder with conical funnel and tap and complete as per I. S. 2720 (Part 28) 1974 including modified equipment (small and big size) : 02 No.
- (vii) Sampling tins with lids 100 mm diameter x 75 mm height, 1/2kg capacity and miscellaneous items like moisture, tins with lid (50 grams) etc. : 12 No.
- (viii) Lab C.B.R. testing equipment for conducting CBR testing, load frame with 5 Tonne capacity, electrically operated with speed control as per I.S. 2720 (Part 16), and consisting of the following : 01 Set
- (a) CBR moulds 150 mm diameter x 175 mm height complete with collar, base plate etc. (at least 2 sets) : 6 Nos.
- (b) Tripod stands for holding dial gauge holder : 6 nos.
- (c) CBR plunger with settlement dial gauge holder : 01 No.
- (d) Surcharge weight 147 mm diameter x 2.5 kg. weight with central hole. : 6 Nos.
- (e) Spacer disc 148 mm diameter x 47.7 mm height with handle. : 01 No.
- (f) Perforated plate (Brass) : 6 Nos.
- (g) Soaking tank for accommodating 6 CBR moulds. : 1 No.
- (h) Proving rings of 1000 kg, 2500 kg and 5000 kg capacity : 01 No. each
- (i) Dial gauges, 25mm travel- 0.01 mm/division : 01 No.
- (ix) Standard penetration test equipment : 01 No.
- (x) Nuclear gauge for density testing : 01 No.
- (xi) Speedy moisture meter complete with chemicals : 01 No.

(C) FOR BITUMEN AND BITUMINOUS MIXES

- (i) Constant temperature bath for accommodating bitumen test specimen, electricity operated and thermostatically controlled : 1 No.
- (ii) Penetrometer automatic type, adjustable weight arrangement and needles as per IS 1203 - 1958 : 1 No.
- (iii) Soxhlet extraction or centrifuge type apparatus complete Electrically operating with extraction thimbles with solvent and filter paper. : 1 No
- (iv) Laboratory mixer including required accessories about 0.02 capacity electrically operated fitted with heating jacket : 1 No
- (v) Marshal compaction apparatus automatically operated as per ASTM 1559-62 T and complete with electrically operated loading unit compaction pedestal heating head assembly, dial micrometer and bracket for flow measurement, load transfer bar, specimen mould 100 mm dia. (4 in) with base plate, collars, specimen extractor, compaction hammer 4,53 kg (10 lb) x 457 mm (18 in) fall. : 1 set.
- (vi) Distant reading thermometer (Laser thermometer) : 1 No.
- (vii) Furol viscometer : 1 No.
- (viii) Softening point apparatus : 1 set
- (ix) Vacuum pump : As required
- (x) Thermometers : As required

(D) FOR CEMENT, CEMENT CONCRETE AND MATERIALS

- (i) Vicat needle apparatus for setting time with plungers, as per IS 269-1967 : 1 No.
- (ii) Moulds
 a. 150mm x 300mm ht cylinder with capping component : As reqd.
 b. Cubicles 150mm, 100mm (each size) : As reqd
- (iii) Flakiness and elongation guage :1 set
 each
- (viii) Aggregate impact test apparatus as per IS 2386 (part 4) 1963 : 1 No
- (ix) Los Angeles abrasion apparatus as per IS 2386 (Part 4 1963. : 1 No
- (x) Equipment for slump test : 1 No
- (xi) Equipment for determination of specific gravity for fine and Coarse aggregate as per IS 2386 (Part 3) 1963 : 1 No
- (xii) Core cutting machine with 10 cm diameter diamond cutting Edge : 1 No
- (xiii) 0.5cft, left cylinder for checking bulk density of

aggregate with tamping rod. : As reqd

E. FOR CONTROL OF PROFILE AND SURFACE EVENNESS

- (i) Precision automatic level with micrometer attachment : 1 Set
- (ii) Distomat or equivalent : 1 Set
- (iii) Total station : 1 Set
- (iv) Precision staff : 1 Set
- (v) 3 meter straight edge and measuring wedge : 1 Set

- (vi) Camber templates 2 lane
 - (a) Crown type cross-section : 1 Set
 - (b) Straight run cross-section : 1 Set

- (vii) Steel tape
 - (a) 5 meter long :02 Sets
 - (b) 10 meter long :02 Sets
 - (c) 20 meter long :02 Sets
 - (d) 30 meter long :02 Sets

F. MISCELLANEOUS

- (i) First Aid Box (2 sets, 1 for lab and 1 for Office)
- (ii.) Fire Extinguisher (2 sets, 1 for Lab and 1 for Office)
- (iii) Sand Bucket with stand (2 sets, 1 for Lab and 1 for Office)
- (iv) Conveyance for carrying samples and emergency (for laboratory) on a full time basis.

Clause 301.9 RATES

Clause 301.9.2 This clause shall read as under:

“The contract unit rate for loosening and re-compacting at subgrade level shall include full compensation for loosening to the specified depth, removing the loosened soil outside the roadway excavation, rolling the surface below, breaking the clods, spreading the excavated soil in layers, watering where necessary and compacting to the requirements.

Clause 305 EMBANKMENT CONSTRUCTION**Clause 305.2 MATERIAL AND GENERAL REQUIREMENTS****Clause 305.2.1 Physical requirements**

Clause 305.2.1.1 The materials used in embankments, subgrades, earthen shoulders and miscellaneous, backfills shall be soil, moorum gravel, sand, a mixture of these or any other material approved by the Engineer.

Clause 305.2.1.2 This clause shall read as under:

Highly expansive soils exhibiting marked swell and shrinkage properties (free swelling index' exceeding 50 percent when tested as per IS:2720 – Part 40) shall not be used in construction of sub-grade and embankment.

Clause 305.2.1.4 Delete second sentence of Clause 305.2.1.4

The materials satisfying the density requirements given in Table 300-1 shall be employed for construction of the embankment and subgrade.

Table 300-1
DENSITY, COHESION, ANGLE OF INTERNAL FRICTION AND CALIFORNIA BEARING RATIO
REQUIREMENTS OF EMANKMENT AND
SUBGRADE MATERIALS

SL. No.	Type of work	Max. dry density (gm/cc)	Cohesion (kg/Sq cm)	Angle of internal friction (Degree)	California bearing ratio (CBR) (%)
1.	Embankment upto 3 m height, not subject to extensive flooding	Not less than 1.52	-	-	-
2.	Embankments exceeding 3 m height and up to 6 m height	Not less than 1.60	-	-	-
3.	Subgrade and earthen shoulders/verge/backfill	Not less than 1.75	-	-	10

Clause 305.2.2.2 Borrow materials

The clause shall be read as under

“No borrow area shall be made available by the employer for this work. The arrangement for the source of supply of the material for embankment as well obtaining necessary permission and approvals of revenue departments and other statutory bodies, compliance to the different environment requirements in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environmental and Forest, Government of Indian and the local bodies, as applicable shall be the sole responsibility of the Contractor”.

The Table 300-2 shall read as under:

Table 300-2
COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE

Sl. No.	Type of work / Material	Relative compaction as % of maximum laboratory dry density as per IS:2720 (Part 8)
1.	Subgrade shoulders and earthen	Not less than 97
2.	Embankment	Not less than 95
3.	Expansive clays	Not allowed
	a) Subgrade and 500mm portion just below the Subgrade	
	b) Remaining portion of embankment	Not allowed

The paragraph given below Table 300-2 shall read as under:

“The contractor shall atleast 7 working days before commencement of compaction, submit the following to the Engineer for approval:

- i) The values of maximum dry density and optimum moisture content obtained in accordance with IS:2720 (Part 8) for each fill material he intends to use.
- ii) The graphs showing values of density against moisture content from which each of the values in (i) above of the maximum dry density and optimum moisture content were determined.
- iii) The dry density-moisture content –CBR relationship for each of the fill materials he intends to use in the subgrade.

Clause 305.3 CONSTRUCTION OPERATIONS

Clause 305.3.4 Compacting ground supporting embankments/ subgrade

Add the following sentence at the end of Para 2.

“Where necessary to facilitate compaction of the ground/subgrade to 97% relative compaction as stated above, a further depth of maximum of 0.25 meter thickness shall be loosened, watered and compacted in accordance with Clause 305.3.5 and

305.3.6 to not less than 97% if maximum dry density, determined in accordance with IS:2720 (Part 8)

Clause 306 **SOIL EROSION AND SEDIMENTATION CONTROL**

Clause 306.4 MEASUREMENT FOR PAYMENT

Substitute Clause 306.4 as follows:

“All temporary sedimentation and pollution control works shall be deemed as incidental to the earthwork and other items of work and as such no separate payment shall be made for the same”.

Clause 306.5 RATE

This clause shall be deleted.

Clause 401 **GRANULAR SUB – BASE**

Clause 401.2 MATERIALS

Clause 401.2.1 The material to be used for the work shall be natural sand, crushed stone or combination thereof depending on the grading required. The material shall be free from organic or deleterious constituents and shall conform to the Grading I given in table 400-1 and physical requirements given in table 400.2

Clause 406 **WET MIX MACADAM SUB-BASE / BASE COURSE**

Clause 406.2.1.1 Delete the second sentence “if crushed gravel fractured faces”

Clause 406.3.4 Spreading of Mix

Substitute para 2 of clause 406.3.4 as under.

“The mix shall be spread by a motor grader”.

Clause 406.3.5 Compaction

Delete second sentence of para 1 of clause 406.3.5

Clause 408 **SHOULDERS, ISLAND AND MEDIAN**

Clause 408.6 Measurements for Payment

This clause shall read as under:

“Construction shall be measured as finished work in position as below:

- (a) Shoulders (Earthen / Hard/ Paved)
 - i) For excavation in cum
 - ii) For earth work/granular fill in cum.
 - ii) For sub-base, base, surfacing courses in units of respective items.
- (b) Island and Medians
 - i) For earth work in cum
 - ii) For kerb in running metres

Clause 409 CEMENT CONCRETE KERB AND KERB WITH CHANNEL

Clause 409.3 Type of Construction: Delete and substitute as follows:

These shall be prefabricated construction with suitable kerb casting moulds, hydraulically compacted in all situations.

Clause 409.4 Equipment:

Delete and substitute as follows:

Kerbs shall be preferably factory made and steam/water cured.

Clause 502 PRIME COAT

Clause 502.2.1 The prime coat shall be bitumen emulsion SS-I grade conforming to IS8887

Clause 503 TACK COAT

Clause 503.2 MATERIALS

This clause shall read as under

The binder used for tack coat shall be bituminous emulsion RS-1 conforming to IS 8887

Clause 505 DENSE BITUMINOUS MACADAM

Clause 505.2 MATERIALS

Clause 505.2.2 Coarse Aggregates

Coarse aggregate shall be crushed rock.

Delete para 2 of Clause 505.2.2

Clause 1007 COARSE AGGREGATES

Add the following at the end of the Clause:

“Primary and secondary stone crusher should be employed for getting proper size and grading of coarse aggregates.”

Clause 1014 STORAGE OF MATERIALS

Clause 1014.3 AGGREGATES

The following shall be added to this clause:

“Aggregates shall be stored or stockpiled in such a manner that segregation of fine and coarse sizes will be avoided and also that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials.”

Clause 1502 MATERIALS

“All materials shall comply with the requirements of IRC-87. Material and components used for formwork shall be examined for damage or excessive deterioration before use/reuse and shall be used if found suitable after necessary repair.

Only steel formwork shall be used. The steel used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm”.

Clause 1503 DESIGN OF FORMWORK

Clause 1503.2 The following shall be added in this Clause

“For distribution of load transfer to the ground through staging, an appropriately designed base plate must be provided which shall rest on firm sub-stratum”.

Clause 1703 GRADES OF CONCRETE

Clause 1703.2 The minimum grades of concrete and corresponding minimum cement content and maximum water/cement ratio shall be as below:

Mix of concrete	Min. Cement content kg/cum	Max. water cement ratio
M 15	310	0.50
M25	400	0.45
M35	428	0.45

Clause 2504 PITCHING/REVTMENT OF SLOPES

The heading of this Clause shall read as under:

“Pitching / Revetment on slopes and filter media”

Clause 2504.2.2 Filter media

Para. 1 of this Clause shall read as under:

The material for the filter shall consist of sand, gravel, stone or coarse sand. To prevent escape of embankment material through the voids of stone pitching/weep holes in abutments as well as to allow free movement of water without creating any uplift head on pitching, one or more layers of graded materials, commonly known as filter medium, shall be provided in between the wall and soil of retaining wall. The material for filter media behind abutment shall conform to general guidelines given in appendix – 6 of IRC: 78 (Standard Specifications & Code of Practice for Road bridges section II)

Clause 2706 WEEP HOLE

This Clause shall read as under:

“Weep holes shall be provided in solid plain concrete/reinforced concrete brick or abutments, wing walls, return walls as shown in the drawing or as directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100

mm dia PVC pipe and shall extend through the full width with slope of about 1 vertical: 20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1 m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer”.

LIST OF APPROVED MAKE

1	Cement	Ultratech / Zuari / ACC / Ramco / Malabar cement/ Coramandal/Bharathi/Chettinad or equivalent. Cement from mini cement plants shall not be allowed.
2	Steel (TMT)	TISCON, SAIL, RINL, JSW or equivalent.
3	Structural Steel	TISCON, SAIL, RINL, JSW or equivalent.
4	Hard Wood	Best Quality treated jack, Sal Wood, Irul, Anjili, Thambakom, Cherutheku
5	Cement Concrete floor tiles	Eurocon Tiles, Excello or equivalent as approved
6	Water proofing compound	Roffe, Fosroc, Sika, Pidilite, Structural Waterproofing Co. Pvt Ltd or equivalent as approved
7	Paint & Primer, Distemper	ICI (Akzonobel), Berger, Asian, Jotun or equivalent as approved
8	Water Proof Cement paint	Super Snowcem, Supercem or equivalent as approved
9	Sealers	ICI (Akzonobel), Berger, Asian or equivalent as approved
10	Primer	Altek, Berger, Asian, ICI, Jotun or equivalent as approved
11	Sanitary fittings	Hindware, Cera, Parryware, Toto, Roca or equivalent as approved
12	Plumbing Fixtures	Nova, Essco, Gem, Jaquar, Kohler or equivalent as approved
13	Polyethylene Storage tank	Sintex, Hycount or equivalent as approved
14	Door handles	Ozone, Godrej, Dorset or equivalent as approved
15	Door Hinges (Heavy Duty brass oxidized)	Godrej, Ozone or equivalent as approved
16	Auto Closer Hinges	Blum, Hafele, Ozone or equivalent as approved
17	Door closer, Floor Spring	Everite, Dyna, Ozone, Door King or equivalent as approved
18	RCC Hume Pipe	Thuluvilanickal/ Thirunelveli Spun Pipe, Amaravathi spun pipes, Michel & Michel or equivalent as approved
19	Manhole cover	Neco, Areco or equivalent as approved
20	MS/GI Pipe & specials	Tata, Zenith, Jindal or equivalent as approved
21	PVC, CPVC, PPR Pipe specials	Supreme, Hycount, Saroplast or equivalent as approved
22	CI Pipe & specials	Electro steel, SAIL or equivalent
23	HDPE Pipe & specials	Hasthi, Manikya, Kodoor or equivalent as approved
24	Stainless steel sink	Diamond or equivalent as approved
25	Laminate	Formica, Greenlam, National, Century, Decolam, or equivalent as approved
26	Plain float glass & Mirror	Saint Gobain, Asahi, Modiguard, Athul or equivalent as approved
27	Marine Plywood & Veneer	Century, Tata Consowood, Kitply, Anchor, Green ply, Apple ply or equivalent as approved

28	Mortice locks, locks, latch	Godrej, Door set, Magnum, Ozone or equivalent as approved
29	MP Tiles	Comtrust, Lafarge, Monier or equivalent as approved
30	Epoxy	Forsroc, STP Ltd, Cera –chem, Don Chemicals or equivalent as approved
31	Particle board	Novapan (Exterior Grade) Jacksons (Exterior grade) or equivalent as approved
32	Welding rode	ESAB, Adwani or equivalent as approved
33	Admixtures	FOSROC, Pidilite, Polygon, STP, BASF, CERACHEM, Don Chemicals or equivalent as approved
34	Anti-Termite Paint	Wood care, Wood Guard or equivalent as approved.
35	Admixtures	FOSROC, Pidilite, Polygon, STP, BASF, CERACHEM, Don Chemicals,Sika or equivalent as approved
36	Plumbing Fittings	Kohler, Jaquar, Toto, Grohe , Nova, Essco, Gem or equivalent as approved
37	Concealed flush	Geberit, Grohe, Jaquar, Kohler, Queo or equivalent as approved
38	Toilet accessories	Bobrick, Euronics, Simex, Jaquar, Best Practice Wash Room Pvt. Ltd or equivalent as approved