



NAME OF WORK: CONSTRUCTION OF KPS MODEL MOULANA AZAD SCHOOL (SCHOOL BUILDING AT G+3 FLOORS AND OTHER INFRASTRUCTURE WORKS) FOR MINORITY DEPARTMENT AT DEVARAHATTI, DAVANAGERE TALUK, DAVANAGERE DISTRICT (NEW WORK) (Fixed Price No Variation) – Package – 3B

VOLUME – I

TECHNICAL BID

MAY - 2025

**Office of the General Manager (S D), RGHCL,
9th Floor E & F Block
Cauvery Bhavan KG Road Bangalore 560009**

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

GOVERNMENT OF KARNATAKA

Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

(E-PROCUREMENT PORTAL ONLY)

TENDER DOCUMENT	SECTIONS-1 TO 8 AND 10 (EXCLUDING BILL OF QUANTITIES)
INVITATION FOR TENDER REFERENCE:	As per e-portal
PERIOD OF SALE OF TENDER DOCUMENT :	As per e-portal
TIME AND DATE FOR PREBID CONFERENCE:	As per e-portal
LAST DATE AND TIME FOR RECEIPT OF TENDERS:	As per e-portal
TIME AND DATE OF OPENING OF COVER ONE OF TENDER:	As per e-portal
PLACE OF OPENING OF COVER ONE OF TENDERS:	Office of the General Manager (S D) RGHCL 9th Floor E & F Block Cauvery Bhavan KG Road Bangalore 560009
TIME AND DATE OF OPENING OF COVER TWO OF TENDERS:	Will be intimated to the Qualified Tenderers
PLACE OF OPENING OF COVER TWO OF TENDERS:	Office of the General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan KG Road Bangalore 560009 Email: rgrhclgmtech@gmail.com
ADDRESS FOR COMMUNICATION :	As Above

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

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SECTION 1:

Rajiv Ghandi Housing Corporation Limited, Bangalore.

INVITATION FOR TENDERS (IFT) - TWO COVER SYSTEM

(THROUGH e-PROCUREMENT PORTAL)

(SHORT TERM TENDER NOTIFICATION)

No: As per Portal

1. The General Manager (S D), RGHCL Bangalore invites sealed tenders for construction of school / colleges from eligible tenderers for the construction of works detailed in the table below on the behalf of Minority welfare department GoK. The " **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B** conforming to NBC of India and relevant Indian Standards on **Build & Transfer (BT)** basis.
2. Two Cover Tender procedure as per Rule 28 of the KTPP Act shall be followed. The Tenderers are required to submit two separate sealed covers, one containing the Earnest Money Deposit and the details of their capability to undertake the tender (as detailed in Clause 3 and 6 of instructions to Tenderers), which will be opened first and the second cover containing the price Tender will be opened only if the Tenderer is found to be qualified to execute the tendered works. The Tenderers are advised to note the minimum qualification criteria specified in Clause 3 to qualify for award of the contract.

The work comprises **Construction of Moulana Azad Model schools** as detailed below:

Sl. No.	Type of SBD	Name of the Works	Approximate value of work [Excluding GST] (Rs. in Lakhs)	EMD Amount (Rs. in Lakhs)	Period of completion (Including Monsoon)
1	KW-4	" Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B	502.16	7.53	Eleven Calendar Months

***GST shall be paid separately.**

1. The tenderer should be Class I Contractors (registered with PWD, CPWD, NHAI, Railways and National Highways), Individual Firms, Partnership Firms, Companies, Public Sector Undertakings having suitable Technical, Financial and Managerial Capabilities satisfying the Minimum Eligibility Criteria may participate in the tenders for " **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B on the behalf of Minority Welfare Department GoK.** As published in Notification.

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

If they have not registered, they must get themselves registered in e-portal (e-procurement, Government of Karnataka).

2. Tender Document may be downloaded from the Government of Karnataka e – Procurement Website **www.eproc.karnataka.gov.in** under login for Contractors. After login to Contractors, please scroll down to the right-side bottom to see List of Tenders, please click there to find the Details of Notice Inviting Tender and download copy of the Tender Document. The Tender can be downloaded from the Portal as per the prescribed Date and Time published in the Portal. Only interested Tenderers who wish to participate shall remit online Transaction Fee for the Tender Document after registering in the Portal. The Transaction Fee is non-refundable.

For this tender a non – refundable Transaction fee of Rs. 1.00 Lakh [Rupees one Lakh only] in the form of Demand Draft drawn in favour of Managing Director, RGHCL, Bengaluru is to be handed over to RGHCL office. A copy of this Demand Draft is to be uploaded while submitting the tender in the e-procurement portal.

3. Tenders must be accompanied by earnest money deposit specified for the work in the Table. Earnest Money Deposit will have to be in any one of the forms as specified in the Tender document and shall have to be valid for 45 days beyond the validity of tender (180 days).
4. Tenders must be electronically submitted (online through Internet) within the Date and Time published in e – Procurement Portal. First [stage] Cover of the Tenders will be opened at the Prescribed Time and Date as mentioned in the e – Procurement Portal in the presence of the Tenderers who wish to attend **at The General Manager (S D) RGHCL Bangalore-560009**. If the office happens to be closed on the date of receipt of the tenders as specified, the tenders will be opened on the next working day at the same time and venue. Other details are available in the tender documents.
5. A Pre-tender meeting will be held on As per e-portal (**on the date mentioned in e-portal**) at the office of **The General Manager (S D), RGHCL, Bangalore** to clarify issues if any, and to answer queries on any matter that may be sought by post/ e-mail or raised at that stage as stated in Clause 8.2 of "Instructions to Tenderers" of the tender documents.
6. **GST shall be paid to the tendered amount separately.**
7. Eligibility Criteria and other details can be seen in the documents.

Calendar of Events for Tender Process are as follows: -

1	Period for which Tender Document is available	As per e-portal
2	Time and Date for Pre Bid Conference	As per e-portal
3	Last Date and Time for receipt of Tender Documents	As per e-portal
4	Time and Date of Opening of Tender (Qualification Information “First Cover” only)	As per e-portal

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

5	Place of Opening of Tender Documents	Office of the General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan, KG Road Bangalore 560009 Email: rgrhclgmtech@gmail.com
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8. The terms & Conditions laid down in Karnataka Transparency in Public Procurements Act 1999 and Rules 2000 with subsequent amendments are applicable.
9. The General Manager (S D) RGHCL Bangalore at any time during the bid process, at his discretion and without assigning any reason thereof reserves the right of.
 - i. Annulling the bid process in full or part.
 - ii. Rejecting any/or all bids.
10. Conditional tenders will be rejected.
11. Joint ventures are not eligible to participate in this tender.
12. Deduction of Royalty as per the prevailing rates established under the Karnataka Mines and Mineral Concession rules will be made.
13. Collection of CESS at the rate of 1% of the cost of the construction incurred by the builder/employer etc, under the building and other construction workers welfare CESS Act-1996 (as per prevailing orders) will be deducted.

Further information can be had from the office of The General Manager (S D) RGHCL Bangalore.

Your's faithfully
Sd/-
General Manager (S D)
RGHCL Bangalore

Copy submitted for kind information to:

- (a) The Managing Director, RGHCL, Bangalore
- (b) The Director General, Directorate General of Commercial Intelligence & statistics, # 565, Anandpur, Ward No.108, Sector 1, Plot No.22, ECADP, KOLKATA- 700107 for publication in the Indian Trade Journal.
- (c) The Deputy Commissioner, Davanagere District.
- (d) The Director, Minority Welfare Department, Bangalore.

General Manager (S D)
RGHCL, Bangalore

SECTION 2: INSTRUCTIONS TO TENDERERS (ITT)

Table of Clauses

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 - 3. Qualification of the Tenderer
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 - 6. Site Visit
- B. Tender Documents**
 - 7. Content of Tender documents
 - 8. Clarification of Tender Document
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 - 11. Tender prices
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 - 14. Format and signing of Tender
- D. Submission of Tenders**
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Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

A. General

1. Scope of Tender

- 1.1. **The General Manager (S D), RGHCL Bangalore** invites sealed tenders for construction of school / colleges from eligible tenderers for the construction of works detailed in the table below on behalf of Minority welfare department GoK. **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B** conforming to NBC of India and relevant Indian Standards on **Build & Transfer (BT)** basis.
- 1.2. The General Manager (S D) RGHCL Bangalore invites "Tenders" from reputed Agencies willing to build & transfer basis these houses work. Each building would have a **Built-up area of 2352.14 Sqm** the details of the same are furnished in the Scope of work and drawings of this tender document.
- 1.3. The General Manager (S D) RGHCL Bangalore invites tenders through two Cover tender procedures from eligible Tenderers, for the construction for the houses, (as defined in this document and referred to as "the Works") as detailed out in the table given in the Invitation for Tenders (IFT). The Tenderers may submit tenders for the works detailed in the table given in IFT.

2. Eligible Tenderers

- 2.1. The tenderer should be Class I Contractors (registered with PWD, CPWD, NHAI, Railways and National Highways), Individual Firms, Partnership Firms, Companies, Public Sector Undertakings having suitable Technical, Financial and Managerial Capabilities satisfying the Minimum Eligibility Criteria may participate in the tenders for **"Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B** as published in Notification.
- 2.2. Tenderers shall not be under a declaration of ineligibility for corrupt and fraudulent practices issued by the Government of Karnataka or any other states / GoI / Boards / Corporations.
- 2.3. **Tenders from Joint Ventures.** Joint Venture not allowed.

3. Qualification of the Tenderer:

- 3.1. All Tenderers shall provide the requested information accurately and in sufficient detail in Section 3: Qualification information.
- 3.2. To Qualify for award of this contract, each Tenderer in its name should have in the last five years i.e., (2020-21, 2021-22, 2022-23, 2023-24 and 2024-25)
- a. Achieved in at least two financial years a minimum financial turnover (in all classes of civil engineering construction works only) of **Rs. 1185.10 Lakhs** (2020-21, 2021-22, 2022-23, 2023-24 and 2024-25) (The Tenderer shall have to submit the Audited Balance sheet for the following Financial Years 2020-21, 2021-22, 2022-23, 2023-24 and 2024-25)
- b. Satisfactorily completed [not less than 50% of the estimated value of contract vide G.O.No FD 480 Exp-12/2014 dated 19.07.2014]) as prime contractor, at least one similar work such as Construction of buildings (other than industrial buildings) with necessary infrastructures like External Electrification, Water Supply, UGD, Drains, Roads, Culverts executed by the

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tenderer earlier (in any of the last five years in India) of value not less than value of work put to tender of respective work i.e. **Rs.296.27 Lakhs.**

- c. Executed in any one of the last five years, the following minimum quantities of work: (usually, 80% of the peak annual rate of construction)

Executed in any one year, the following minimum quantities of work:

1) Earth work Excavation:	Cum	535
2) Providing & laying Cement concrete (PCC & RCC) work:	Cum	913
3) Providing & Fabricating Reinforcement Steel work:	MT	83
4) Providing & Constructing Brick / Solid Block work	Sqm	3126
5) Providing Plastering to walls	Sqm	6684
6) Providing and laying Flooring & dadoing Tiles	Sqm	2445
7) Shuttering work	Sqm	2900

- d. The Tenderer or his identified sub-contractor should possess required valid electrical license for executing building electrification works and should have executed similar electrical works totaling **Rs.21.85 Lakhs** in any one year.
- e. The Tenderer or his identified sub-contractor should possess valid license for executing water supply/sanitary engineering works and should have executed similar water supply/sanitary engineering works totaling **Rs.16.78 Lakhs** in any one year.

3.3. Each Tenderer should further demonstrate:

- a. Availability by owning at least 50% of the required/specified key and critical equipments for this work and
- b. The remaining 50% can be deployed on lease / hire basis for all works provided, the relevant documents (commitment agreements etc.,) for availability for this work are furnished.

(1) Concrete mixer with hopper/Transit concrete Mixer(Ajax)	2 No's (1 No. Owning, 1 No. owning/hire/lease)
(2) Water Tanker -	2 No's (1 No. Owning, 1 No. owning/hire/lease)
(3) JCB	2 No's (1 No. Owning, 1 No. owning/hire/lease)
(4) Tippers	4 No's (2 No. Owning, 2 No. owning/hire/lease)
(5) Pin Vibrators	2 No's (Owning)
(6) Plate vibrators	2 No's (owning)
(7) Shuttering material	2500 Sqm (1250 Sqm Own, 1250 Sqm own/hire/lease)
(8) 10 HP Power Generator	1 No's (owning/hire/lease)

- c. Liquid assets and/ or availability of credit facilities of not less than **Rs.150.65 Lakhs** as mentioned below against this work (Credit lines/ letter of credit certificates from banks for meeting the fund requirement etc., The Liquid Assets should not be less than 30% of value of Tender. For: **Rs. 150.65 Lakhs - to be submitted in prescribed format.**

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- 3.4. To qualify for a package of contracts made up of this and other contracts for which tenders are invited in this IFT, the Tenderer must demonstrate experience and resources to meet the aggregate of the qualifying criteria for the individual contracts.
- 3.5. Sub-Contractors experience and resources shall not be taken into account in determining the Tenderer's compliance with the qualifying criteria.

3.5.1. The Audited Balance Sheets:

The Tenderer shall have to submit the Audited Balance sheet for the following Financial Years

2020-21, 2021-22, 2022-23, 2023-24 and 2024-25

- 3.6. Tenderers who meet the above specified minimum qualifying criteria will only be qualified if their available tender capacity is more than the total tender value. The available tender capacity will be calculated as under:

$$\text{Assessed available tender capacity} = (A * N * 1.5 - B)$$

Where

A = Maximum value of civil engineering works executed in any one year during the last five years (*updated to 2024-25 price level*) taking into account the completed as well as works in progress.

(All work done certificates of last 5 years to be submitted)

N = Number of years prescribed for completion of the works for which tenders are invited.

B = Value, at 2024-25 price level of existing commitments and on-going works to be completed during the next **One year**

Note: The statements showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Employer in charge, not below the rank of an Executive Engineer or equivalent.

- 3.7. Even though the Tenderers meet the above criteria, they are subject to be disqualified if they have:
- made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
 - record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
 - Participated in the previous Tender for the same work and had quoted unreasonably high tender prices and could not furnish rational justification.

4. One Tender per Tenderer:

- 4.1. Each tenderer shall submit only one tender for one work. A tenderer who submits or participates in more than one Tender (other than as a sub-contractor or in cases of alternatives that have been permitted or requested) will cause all the proposals with the Tenderer's participation to be disqualified.

5. Cost of Tendering:

- 5.1. The tenderer shall bear all costs associated with the preparation and submission of his tender, and the Employer will in no case be responsible and liable for those costs.

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6. Site visit:

- 6.1. The Tenderer at his own responsibility and risk is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Tender and entering into a contract for construction of the Works. The cost of visiting the Site shall be at the Tenderer's own expense.

B. Tender documents

7. Content of Tender documents

- 7.1. The set of tender documents shall have all the Sections given in Contents of the Tender Document.
- 7.2. Both the sets should be completed and returned with the tender.

8. Clarification of Tender Documents

- 8.1. A prospective Tenderer requiring any clarification of the tender documents may notify the Employer in writing or by cable (hereinafter "cable" includes telex and facsimile - internet) at the Employer's address indicated in the invitation to tender. The Employer will respond to any request for clarification which he receives earlier than 15 days prior to the deadline for submission of tenders. Copies of the Employer's response will be forwarded to all purchasers of the tender documents, including a description of the enquiry but without identifying its source.

8.2. Pre-tender meeting:

- 8.2.1. The tenderer or his authorized representative is invited to attend a pre-tender meeting which will take place at Employer's office on date and time indicated in the IFT.
- 8.2.2. The purpose of the meeting will be to clarify issues and to answer questions on any matter that may be raised at that stage
- 8.2.3. The tenderer is requested to submit any questions in writing or by cable to reach the Employer not later than the date of pre-bid meeting.
- 8.2.4. Minutes of the meeting, including the text of the questions raised (without identifying the source of enquiry) and the responses given will be transmitted without delay to all purchasers of the tender documents. Any modification of the tender documents listed in Sub-Clause 7.1 which may become necessary as a result of the pre-tender meeting shall be made by the Employer exclusively through the issue of an Addendum pursuant to Clause 9 and not through the minutes of the pre-tender meeting.
- 8.2.5. Non-attendance at the pre-tender meeting will not be a cause for disqualification of a tenderer.
- 8.2.6. Any difference/discrepancy in any part or whole of the bid document the decision of the General Manager (S D) RGHCL Bangalore will be final and binding.

9. Amendment of Tender documents

- 9.1. Before the deadline for submission of tenders, the Employer may modify the tender documents by issuing addenda.
- 9.2. Any addendum thus issued shall be part of the tender documents and shall be published online in e-procurement portal
- 9.3. To give prospective Tenderers reasonable time in which to take an addendum into account in preparing

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their tenders, the Employer shall extend as necessary the deadline for submission of tenders, in accordance with Sub-Clause 16.2 below.

C. Preparation of Tenders

10. Documents comprising the Tender

10.1. The tender submitted by the Tenderer shall be in two covers and shall contain the documents as follows::

10.1.1. First Cover :

- a. Earnest Money Deposit and tender processing fee: online payment through e-procurement platform
- b. Qualification Information as per formats given in Section 3 and Tender Document Volume-I; to comply the task created in the e-procurement portal, under general terms and conditions and technical parameters and documents required from Tenderer.
- c. Methodology & proposed Construction Program for completing the works within the stipulated time

10.1.2. Second Cover:

- a. The Tender (in the format indicated in Section 4)
- b. Priced Bill of Quantities (Section 9); online through e-procurement portal, no hardcopy of commercials should be attached or disclosed.

and any other materials required to be completed and submitted by Tenderers in accordance with these instructions. The documents listed under Sections 3, 4, 6 and 9 shall be filled in without exception.

10.2. Tenderers submitting tenders together with other contracts stated in the IFT to form a package will so indicate in the tender together with any discounts offered for the award of more than one contract.

11. Tender prices

11.1. The contract shall be for the whole works as described in Sub-Clause 1.1, based on the priced Bill of Quantities submitted by the Tenderer.

11.2. The Tenderer shall fill in rates and prices and line item total (both in figures and words) for all items of the Works described in the Bill of Quantities along with total tender price (both in figures and words). **Items for which no rate or price is entered by the Tenderer will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities.** Corrections, if any, shall be made by crossing out, initialing, dating and rewriting.

11.3. **The quoted rate shall be inclusive all duties, taxes, and other levies shall be paid by the contractor Except GST.**

11.4. The Rates and prices quoted by the tenderer shall be subjected to adjustment during the performance of the contract in accordance with the provisions of Clause of the Conditions of Contract. – **NOT OPERATED**

12. Tender validity

12.1. Tenders shall remain valid for a period not less than **90 days** after the deadline date for tender submission specified in Clause 16. A tender valid for a **shorter period shall be rejected by the Employer as non-responsive.**

12.2. In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the Tenderers may extend the period of validity for a specified additional period. The request and the Tenderers' responses shall be made in writing or by cable. A Tenderer may refuse the request without

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forfeiting his earnest money deposit. A Tenderer agreeing to the request will not be required or

Permitted to modify his tender, but will be required to extend the validity of his earnest money deposit for a period of the extension, and in compliance with Clause 13 in all respects.

13. Earnest money deposit

- 13.1 The Tenderer shall furnish, as part of his tender, **Earnest Money Deposit (EMD) in the amount as shown in column 5 of the Table of IFT for this particular package.** This earnest money deposit shall be in favour of Managing Director, Rajiv Gandhi Housing Corporation Limited, Bengaluru as mentioned below:

Rs. 7.53 Lakhs [Rupees Seven Lakhs Fifty-Three Thousand only)

shall be paid online through e – Procurement Portal using any of the following Payment Modes

- Credit Card,
- Direct Debit,
- National Electronic Fund Transfer (NEFT),
- Over the Counter (OTC)

13.2 NEFT Payment Procedure

If a Tenderer chooses to make a payment of EMD/Tender Processing fee using Reserve Bank of India's (RBI) National Electronic Fund Transfer (NEFT) system, the tenderer will need to log into e-Procurement system access the Tender for which bid is being created and then select the NEFT option under the payment section and print the challan shown in the section. The printed challan will have the Unique bid reference number, account details of Government of Karnataka and the amount to be remitted. The Tenderer shall submit the printed challan to its bank branch (NEFT enabled) and request for an account-to-account transfer. Wherein the money will get transferred from the Tenderer bank account to GOK's Bank Account. The tenderer shall ensure that NEFT Transfer instructions are executed and the funds are wired to the Government of Karnataka's Principal Account before the Last Date for Bid submission and preferably 24 hours before the last date for Bid submission. If the tenderer/submits money after the last date for Bid submission the Tenderers bid will be liable for rejection. Upon executing the transfer, the tenderer's bank will provide reference number generated by NEFT Software as Confirmation of Transfer, which has to be input by the Tendere in the payment section of its bid as payment confirmation before the bid is submitted i.e as a pre requisite for bid submission, the account number from which the Funds were transferred shall be input in the e-Procurement system as part of its Bid also.

13.3 OTC Payment Procedure

If a tenderer choose to make payment of EMD / Tender Processing Fee over the counter OTC in the any of the designated Axis Bank Branches listed in the e-Procurement website (www.eproc.karnatak.gov.in), the tenderer will need to log into e-Procurement system, access the Tender for which bid is being created and then select the OTC option under the payment section and print the challan shown in the section. The printed challen will have the Unique bid Reference and the amount to be remitted along with the challan. The Tenderer can choose to make the payment either in the form of cash share or in the form of Demand Draft. Cheque payment will not be accepted. The Tenderer is requested to specifically inform the Bank Officer to input the unique bid reference Number printed in the challan in the bank software. Upon successful receipt of the payment, the bank will provide a Digit Reference Number acknowledging the Receipt of payment. This 16 digits reference number has to be input by the Tenderer in the payment section as payment Confirmation before the bid is submitted i.e as pre requisite for bid submission.

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- 13.4** Instruments having fixed validity issued as earnest money deposit for the tender shall be valid for 45 days **beyond** the validity of the tender. The Tenderer's Bid will be evaluated only on Confirmation of Receipt of the Payment of EMD as indicated in Sub Clause 14.1 in the Government of Karnataka's Central Pooling Account held at Axis Bank.
- 13.5** Any Tender not accompanied by an acceptable earnest money deposit [EMD] and not secured as indicated in Sub Clauses 13.4 and 13.4 above shall be **rejected by the Employer as non-responsive.**
- 13.6** The earnest money deposit of the unsuccessful Tenderers will be returned within 30 days of the end of the Tender Validity Period as specified in Sub Clause 12.1
- 13.7** The Earnest Money Deposit of the Successful Tenderer will be discharged when the Tenderer has signed the Agreement and furnished the required Performance Security.
- 13.8 The Earnest Money Deposit may be forfeited**
- (a) If the Tenderer withdraws the Tender after Tender Opening during the Period of Tender Validity;
 - (b) If the Tenderer does not accept the Correction of the Tender Price, pursuant to Clause 24; or
 - (c) In the case of a successful Tenderer, if the Tenderer fails within the specified time limit to
 - (i) Sign the Agreement; or
 - (ii) Furnish the required Security Deposit.

14. Format and Signing of Tender

- 14.1** The Tenderer shall prepare one original and a copy of the documents comprising tender as described in Clause 10 of these Instructions to Tenderers and clearly marked "Original" and "Copy" as appropriate. In the event of the discrepancy between them the original shall prevail. The Electronic Tendering System for the Construction Work comprises of two Stages (i) Technical Bid (ii) Financial Bid. The Tenderers are required to submit the Tender Documents in two stages **electronically**.
- 14.2** The Tender shall contain no Alterations or Additions, except those to comply with instructions issued by the Employer or as necessary to correct errors made by the Tenderer in which case such corrections shall be initialed by the person signing the Tender.
- 14.3** Signing of Tender is deemed as signed in e – Procurement System.

D. Submission of Tenders

15. Sealing and Marking of Tenders

- 15.1.** The Tenderer shall access Tender Documents, fill them and submit the Completed Tender Document as stated in Clause 10 through Website of e – Procurement itself (www.eproc.karnataka.gov.in). The Scanned Copy of all the Documents as stated in Clause 10 shall be attached to the e – Tender Document, failing which the Bid will not be considered. It is the Responsibility of the Tenderer to submit all the Documents pertaining to Eligibility Criteria / Qualification Information with due diligence.

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15.2 The inner and outer envelopes shall

(a) Be addressed to the Employer at the address mentioned above and

(b) Bear the following identification

Tender for

Tender Reference No.

DO NOT OPEN BEFORE

Deleted

15.3. **Deleted,** In addition to the identification required in Sub-Clause the inner envelop shall indicate the name and address of the Tenderer to enable the tender to be returned unopened in case it is declared late, pursuant to Clause.

15.4. If the Outer envelope is not sealed and marked as above, the Employer will assume no responsibility for the misplacement or premature opening of the Tender.

Deleted

16. Deadline for Submission of the Tenders

16.1 Tenders must submit online in the e-procurement portal by the Employer before the notified date and time.

16.2 The Employer may extend the Deadline for Submission of Tenders by issuing an Amendment in accordance with Clause 9, in which case all Rights and Obligations of the Employer and the Tenderers previously subject to the Original Deadline will then be subject to the New Deadline.

17. Late Tenders

17.1 In online e procurement system, tenderer shall not be able to submit the bid after the bid submission time and date as the icon or the task in the procurement portal will not be available

18. Modification and Withdrawal of Tenders

18.1 Tender has all the time to modify and correct or upload any relevant document in the portal till Bid submission date and time, as published in the procurement portal.

18.2 The Tenderer may withdraw his tender before the notified last date and time of tender submission.

18.3 No Tender may be modified and withdrawn after the Deadline for Submission of Tenders.

18.4 Withdrawal or Modification of a Tender between the Deadline for Submission of Tenders and the Expiration of the Original Period of Tender Validity specified in earlier Clause above or as extended pursuant to Clause above may result in the Forfeiture of the Earnest Money Deposit pursuant to clause 13.8.

18.5 Tenderers may only offer Discounts to, or otherwise modify the Prices of their Tenders by submitting Tender Modifications in accordance with this Clause, or include in the Original Tender Submission.

E. Tender Opening and Evaluation

19 Opening of First Cover of all Tenders and Evaluation to determine Qualified Tenderers

- 19.1 The Employer will open the First Covers of all the Tenders received through e-portal only in the presence of the Tenderers or their Representatives who choose to attend at **the time and date specified in e-portal** at Office of **The General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan, KG Road Bangalore 560009**. In the event of the Specified

Date of Tender Opening, being declared a Holiday for the Employer, the Tenders will be opened at the Appointed Time and Location on the Next Working Day.

- 19.2 Envelopes marked – WITHDRAWAL shall be opened and read out first. The First cover of Tenders for which an acceptable notice of withdrawal has been submitted pursuant to Clause – 16 shall not be opened.

Deleted.

- 19.3 The Tenderers' Names, the Presence or Absence of Earnest Money Deposit (Amount, Format and Validity), the Submission of Qualification Information and such other Information as the Employer may consider Appropriate will be announced by the Employer at the Opening. Late and Withdrawn Tenders will be returned Unopened to the Tenderers.

Deleted.

- 19.4 The Employer shall prepare Minutes of the Tender Opening, including the Information Disclosed to those present in accordance with bid document..

- 19.5 The Second Cover of all the Tenderers including modifications for second cover shall be placed in a large cover and securely sealed in the presence of the Tenderers or their representatives, who are present and also get the same signed by all those tenderers or their representatives. The large cover shall be kept in safe custody by the Employer.

Deleted.

- 19.6 The Employer will evaluate and determine whether each Tender (a) meets the Eligibility Criteria defined in IFT or NIT Clause 2 and 3; (b) is accompanied by the Required Earnest Money Deposit as per stipulations in IFT or NIT Clause and (c) meets the Minimum Qualification Criteria stipulated in IFT or NIT Clause 2 and 3. The Employer will draw out a List of Qualified Tenderers.

20. Opening of Second Cover of Qualified Tenderers and Evaluation

- 20.1 The Employer will inform all the Qualified Tenderers the Time, Date and Venue fixed for the Opening of the Second Cover containing the Priced Financial Bid. The Employer will open the Second Covers of Qualified Tenderers at the Appointed Time and Date in the presence of the Tenderers or their Representatives who choose to attend. In the event of the Specified Date of Second Cover opening being declared a Holiday for the Employer, the Second Covers will be opened at the Appointed Time and Location on the Next Working Day.

- 20..2 Envelopes marked “**MODIFICATION FOR SECOND COVER**” shall be opened and the submissions there-in read out in appropriate detail.

Deleted.

- 20.3 The Tenderers' Names, the Tender Prices, the Total Amount of each Tender, any Discounts, and such other Details as the Employer may consider Appropriate, will be announced by the Employer at the opening. No Tender shall be rejected at Tender Opening.

- 20.4 The Employer shall prepare Minutes of the Second Cover Tender Opening, including the

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Information disclosed to those present in accordance with the bid document.

21 Process to be Confidential

- 21.1 Information relating to the Examination, Clarification, Evaluation, and Comparison of Tenders and Recommendations for the Award of a Contract shall not be disclosed to Tenderers or any other persons not officially concerned with such Process until the Award to the Successful Tenderer has been announced. Any effort by a Tenderer to influence the Employer's Processing of Tenders or Award Decisions may result in the Rejection of his Tender.

22 Clarification of Tenders

- 22.1 To assist in the Examination, Evaluation and Comparison of Tenders, the Employer may, at his discretion, ask any Tenderer for Clarification of his Tender, including Breakdowns of Unit Rates. The Request for Clarification and the Response shall be in Writing or by Cable, but no change in the Price or Substance of the Tender shall be sought, offered, or permitted except as required to confirm the Correction of Arithmetic Errors discovered by the Employer in the evaluation of the Tenders in accordance with Clause 25..
- 22.2 Subject to Sub Clause 21, no Tenderer shall contact the Employer on any Matter relating to its Tender from the time of the Tender Opening to the Time the Contract is awarded. If the Tenderer wishes to bring Additional Information to the Notice of the Employer, it should do so in Writing.
- 22.3 Any effort by the Tenderer to influence the Employer in the Employer's Tender Evaluation, Tender Comparison or Contract Award Decisions may result in the rejection of the Tenderers' Tender.

23 Examination of Tenders and Determination of Responsiveness

- 23.1 Prior to the Detailed Evaluation of Tenders, the Employer will determine whether each Tender
- A. has been properly signed and
 - B. is substantially Responsive to the Requirements of the Tender Documents.
- 23.2 A Substantially Responsive Tender is one which conforms to all the Terms, Conditions and Specifications of the Tender Documents, without Material Deviation or Reservation. A Material Deviation or Reservation is one (a) which affects in any Substantial Way the Scope, Quality or Performance of the Works; (b) which limits in any Substantial Way, inconsistent with the Tender Documents, the Employer's Rights or the Tenderer's Obligations under the Contract; or (c) whose Rectification would affect Unfairly the Competitive Position of other Tenderers presenting Substantially Responsive Tenders.
- 23.3 If a Tender is not Substantially Responsive, it will be rejected by the Employer, and may not subsequently be made responsive by Correction or Withdrawal of the Non Conforming Deviation or Reservation.

24 Correction of Errors

- 24.1 Tenders determined to be Substantially Responsive will be checked by the Employer for any Arithmetic Errors. Errors will be corrected by the Employer as follows.

(a) Where there is a Discrepancy between the Rates in Figures and in Words, the lower of

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the two will govern; and

- 24.2 The Amount stated in the Tender will be adjusted by the Employer in accordance with the above Procedure for the Correction of Errors and, with the Concurrence of the Tenderer, shall be considered as binding upon the Tenderer. If the Tenderer does not accept the Corrected Amount the Tender will be rejected, and the Earnest Money Deposit may be forfeited in accordance with Sub Clause 13.8.

25 Evaluation and Comparison of Tenders

- 25.1 The Employer will evaluate and compare only the Tenders determined to be Substantially Responsive in accordance with Clause 23.
- 25.2 In evaluating the Tenders, the Employer will determine for each Tender the evaluated Tender Price by adjusting the Tender Price as follows:
- (a) Making any Correction for Errors pursuant to Clause 24 and
 - (b) Making Appropriate Adjustments to reflect Discounts or other Price Modifications offered in accordance with Sub Clause 18
- 25.3 The Employer reserves the right to accept or reject any Variation, Deviation or Alternative Offer. Variations, Deviations and Alternative Offers and other Factors, which are in excess of the requirements of the Tender Documents or otherwise result in Unsolicited Benefits for the Employer, shall not be taken into account in Tender Evaluation.
- 25.4 The Estimated effect of the price adjustment conditions under Clause 40 of the conditions of Contract during the implementation of the Contract will not be taken into account in tender Evaluation.
- Deleted.**
- 25.5 If the Tender of the Successful Tenderer is seriously Unbalanced in relation to the Employer's Estimate of the Work to be performed under the Contract, the Employer may require the Tenderer to produce Detailed Price Analysis for any or all Items of the Financial Bid, to demonstrate the Internal Consistency of those Prices with the Construction Methods and Schedule Proposed. After Evaluation of the Price Analysis, the Employer may require that the Amount of the Performance Security set forth in Clause 29 be increased at the expense of the Successful Tenderer to a level sufficient to protect the Employer against Financial Loss in the event of Default of the Successful Tenderer under the Contract.

F. Award of Contract

26 Award Criteria

Subject to Clause 27, the Employer will award the Contract to the Tenderer whose Tender has been determined to be Substantially Responsive to the Tender Documents and who has offered the Lowest Evaluated Tender Price provided that such Tenderer has been determined to be (a) Eligible in accordance with the Provisions of Clause 2, and (b) Qualified in accordance with the Provisions of Clause 3.

27 Employer's Right to accept any Tender and to reject any or All Tenders

Notwithstanding Clause 26, the Employer reserves the right to accept or reject any Tender, and to cancel the Tender Process and reject all Tenders, at any time Prior to the Award of Contract, without thereby incurring any Liability to the Affected Tenderer or Tenderers or any Obligation to inform the Affected Tenderer or Tenderers of the Grounds for the Employer's

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Action.

28 Notification of Award and Signing of Agreement

- 28.1 The Tenderer whose Tender has been accepted will be notified of the Award by the Employer prior to Expiration of the Tender Validity Period by Cable, Telex, e – mail or Facsimile confirmed by Registered Letter. This Letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the Sum that the Employer will pay the Contractor in consideration of the Execution, Completion of the Works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").
- 28.2 The Notification of Award will constitute the Formation of the Contract, subject only to the furnishing of Security Deposit in accordance with the provisions of Clause 29.
- 28.3 The Agreement will incorporate all Agreements between the Employer and the Successful Tenderer. It will be kept ready for Signature of the Successful Tenderer in the Office of Employer within 30 days following the notification of award along with the Letter of Acceptance. Within 20 days of Receipt, the Successful Tenderer will sign the Agreement and deliver it to the Employer. Failing which Action as stated in the document will be taken.
- 28.4 Upon the furnishing by the Successful Tenderer of the Performance Security, the Employer will promptly notify the other Tenderers that their Tenders have been unsuccessful.

29 Security Deposit

- 29.1 Within **20 days** of receipt of the Letter of Acceptance, the Successful Tenderer shall deliver to the Employer a Security Deposit in any of the forms given below for an Amount equivalent to 5% of the Contract Price plus Additional Security for Unbalanced Tenders in accordance with Sub Clause 25.5 of ITT and Clause 43 of the Conditions of Contract.
- Bank Guarantee in the Form given in Section 10.
- 29.2 If the Security Deposit is provided by the Successful Tenderer in the form of a Bank Guarantee, it shall be issued either by a **Nationalized / Scheduled Bank**.
- 29.3 The Security Deposit if furnished in Demand Draft can, if requested, be converted to Interest Bearing Securities at the Cost of the Contractor.
- 29.4 Failure of the Successful Tenderer to comply with the requirements of Sub Clause 29.1 shall constitute Sufficient Grounds for Cancellation of the Award and Forfeiture of the Earnest Money Deposit.
- 29.5 The Security Deposit will be discharged only after the Completion of Defect Liability Period as specified in Section 7 Contract Data.

30 Advance Payment and Security:

The Employer will provide an advance payment on the contract price as stipulated in the conditions of the contract, subject to the maximum amount as stated in contract data. Refer Special Conditions.

31 Corrupt or Fraudulent Practices

- 31.1 The Employer requires that the Tenderers / Suppliers / Contractors, observe the highest standard of ethics during the Procurement and Execution of such Contracts. In pursuance of this Policy, Employer

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- Will reject a Proposal for Award if it determines that the Tenderer recommended for Award has engaged in Corrupt or Fraudulent Practices in competing for the Contract in Question.
 - will declare a Firm Ineligible, either Indefinitely or for a Stated Period of Time, to be awarded an Employer's Contract if it at any time determines that the Firm has engaged in Corrupt or Fraudulent Practices in competing for, or in executing, a GOK contract.
- 31.2 Furthermore, Tenderers shall be aware of the Provision stated in Sub Clause 50.2 of the Conditions of Contract.

ANNEXURE-1-GUIDELINESS OF PROJECT DETAILS & SPECIFICATIONS

Name of Work:" Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

1. Location:

The proposed location of construction of the School / College Building is at

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Scope of Work:

- 1.1 The proposed Construction of Moulana Azad Model Schools at Devarahatti, Davanagere Taluk & District (New work)", column beams Framed Structure and using solid block Walls & Block masonry , Red Sal frame with flush shutters Doors, UPVC windows and ventilators, Including Internal & external Water supply, Sanitary & Electrical Works., details of these are as below;**

2.

Sl. No.	Details	Total Area of buildings
1.	Built up Area of Mams Model School Building.	2352.14 Sqm

Work to be executed as Construction of Moulana Azad Model Schools at Devarahatti, Davanagere Taluk & District (New work)", Columns beams Framed Structure and using solid block walls & Block masonry, Red Sal frame with flush shutters Doors, UPVC windows and ventilators, Including Internal & external Water supply, Sanitary & Electrical Works

All the Design and Good for Construction Drawings for the whole project shall be provided by RGHCL.

- a. Design of the buildings is as per the approved technology in conformity with NBC of India and relevant Indian Standards / Standard practices and obtaining necessary approvals. Following are noted while finalizing the design of the building structure and its components.
- b. Concrete for all structures (sub structure or super structure) shall be minimum of M 25 Grade and rebar / caging shall be minimum of Grade TMT FE 550 / 550D.
- c. Structural designs shall be in accordance with provisions in the latest versions of Indian Standards IS: 456, IS: 875, IS: 1893 and IS: 1904 and other all relevant IS codes.
- d. Structures shall be designed for dead, live, wind, seismic and temperature loads due to solar radiation at the proposed site confirming to relevant standards. Seismic designs and design wind loads shall be as per relevant Indian Standards.

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- e. All water supply lines, sanitary and electrical installations shall be in accordance with the provisions in the latest version of the NBC.
- f. Construction of the buildings as per approved design and technology with detailed estimates with specifications materials proposed to be adopted.
- g. The plinth of the building shall be at least average 60cm higher than the surrounding formation level and higher plinth may be required if site warrants.
- h. The building is to be provided with internal electricity, water supply and sanitary connections with all fixtures as per the approved drawings.
- i. All approved design, construction drawings, layout plans and all GFC drawings in Three sets of hard copy shall be provided by RGHCL.
- j. Attending to defects noticed in the constructed houses and developed utilities during the defect liability period.
- k. Overhead tanks and necessary pumping units with all accessories are to be provided for all the buildings.
- l. Proper treatment to roof to improve waterproofing and prevent seepage.

2.1.1 The minimum specifications to be adopted while executing the project is detailed are as below. If any alternative item is proposed and is required for the technology proposed the same has to be got approved by the Employer.

2.1.1.2 Building: (Lump Sum - No Variation)

Each School / College Building Specification

Room dimensions	:	As per uploaded drawing
Stairs Riser	:	Not more than 150 mm
Stairs Tread	:	300 mm as per Drawing
Width of Corridor	:	As per uploaded drawing

- a. **EARTH LOWERING & LEVELING :** Earth work in surface excavation by mechanical means for lowering & leveling the ground for all works other than foundation in all kinds of soils & up to depth not exceeding 300mm as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter including dressing of excavated surfaces, disposing off or levelling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m and lift up to 1.5 m including cost of labour, tools, usage of machinery & other appurtenances required to complete the work
- b. **EXCAVATION:** Earth work excavation for Foundation by mechanical means for all works & depth upto 3 m, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, including dressing of excavated surfaces, disposing off or levelling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools, usage of machinery & other appurtenances required to complete the work In all kinds of soils Depth upto 3 m
- c. **PCC 1:3:6:** Providing and laying in position plain cement concrete of mix 1:3:6 with OPC, The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine

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mixed, laid in layers not exceeding 150 mm thickness, well compacted using plate vibrators in foundation and below Flooring, flagging concrete shall be done alround the building as per standard practice.

d. SUB STRUCTURE WORKS: -

FOUNDATION: The foundation design with minimum Excavation depth of 1.50 mtrs from the NGL and Foundation footings thickness, Bases for Columns, Plinth Beams along the reinforcement shall be as per the uploaded drawing.

FOOTINGS: Providing and laying in position Reinforced cement concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications, M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.

COLUMNS & PLINTH BEAMS: Providing and laying in position Reinforced cement concrete for all Sub structures of building & other parallel works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers, laid in layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials of quality, confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications, M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.

FLAGGING CONCRETE: Providing and laying in position Cement Concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machineries, curing, and all the other appurtenances required to complete the work as per technical specifications, Mix 1:2:4 (M15) Using 20 mm nominal size graded crushed coarse aggregates.

CURTAIN WALL: Providing and laying in position Reinforced cement concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications, M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. FOR SUB STRUCTURE

- e. **ANTI-TERMITE TREATMENT:** Providing and injecting chemical emulsion for Pre-constructional Anti-Termite Treatment, creating continuous chemical barrier under and around the column pits, walls, trenches, basement excavation, top surface of the plinth filling, junction of wall and floor, along the external perimeter of building, expansion joints, over the top surface of consolidated earth on which apron is to be laid, surrounding of pipes and conduits with Chlorpyrifos 20% E.C. / Lindane 20% E.C. @ 3.19 l/m² including cost of chemical, diluting in water to one percent concentration, labour, usage charges of machinery, complete as per specifications
- f. **FILL & BACK-FILLING:** Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations and other similar works etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead and lift.

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g. CENTRING SHUTTERING:

FOOTING & BASES OF COLUMNS: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for foundations, footings, bases of columns for mass concrete including cost of all materials, labour complete as per specifications.

PLINTH & CILLS: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for vertical surface such as walls at any thickness, including attached pilasters, buttresses, plinth cills and string courses cost of all materials, labour complete as per specifications.

COLUMNS: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for columns, pillars, post and struts, square / rectangular/ polygon in plan including cost of all materials, labour complete as per specifications.

STAIRCASE: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for staircase including cost of all materials, labour complete as per specification.

ROOF BEAMS & LINTELS: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for sides and soffits of beams, beam haunching's, cantilever girders, bressumers and lintels width, depth as per drawing including cost of all materials, labour complete as per specifications.

ROOF SLAB: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for suspended floors, landings, balconies and likes, thickness as per Drawing including cost of all materials, labour complete as per specifications.

CHAJJAS & CILL SLAB: Providing and removing centering, shuttering, strutting, propping etc., and removal of form work for chajja, corbels etc., including edges including cost of all materials, labour complete as per specifications.

h. SUPER STRUCTURE WORKS: -

COLIMNS, LINTELS, ROOF BEAMS & SLAB, STAIRCASE, CHAJJAS CONCRETE: Providing and laying in position Reinforced cement concrete for all Super structures of building, Road works, Water works, Irrigation works & super structure works of bridges upto 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in layers, well compacted using needle vibrators. The cost includes all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications, M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates.

CILL CONCRETE: Providing and laying in position Cement Concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works from 0.50m to 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machineries, curing, and all the other appurtenances required to complete the work as per technical specifications, Mix 1:2:4 (M15) Using 20 mm nominal size graded crushed coarse aggregates.

- i. REINFORCEMENT** : Steel reinforcement shall be either tor steel of tested quality high yield strength deformed bars of grade FE 550 / 550D conforming to IS: 1786 or as called for on the drawings. Bars shall be

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free from deleterious materials, mill scale, loose rust, oil or paint. The contractor shall submit bar bending schedules for approval of the Employer prior to commencement of fabrication. These shall indicate the accurate dimensions and bending of bars as called for on the structural drawings. Fabrication shall be accurately done to the dimensions, spacing and ensuring minimum cover as called for on structural drawings. All steel shall be rigidly held in place with 18-gauge annealed steel wire. Cement mortar (1:2) covering blocks of required shape & thickness, M.S. chairs and spacer bars shall be used in order to ensure accurate positioning of reinforcement.

- j. **SOLID BLOCK MASONRY:** Providing and constructing load bearing wall with Solid Concrete blocks of size 400x200x200mm having block density more than 1800kg/m³ and minimum compressive strength of 4.00 N/mm² conforming to IS 2185 (Part - I) - 2005 and constructed with CM 1:4 as per IS 2572:2005 including cost of all materials, labour, scaffolding and curing, usage charges of machinery etc complete as per specifications.

Providing and constructing load bearing wall with Solid Concrete blocks of size 400x100x200mm having block density more than 1800kg/m³ and minimum compressive strength of 4.00 N/mm² conforming to IS 2185 (Part - I) - 2005 and constructed with CM 1:4 as per IS 2572:2005 including cost of all materials, labour, scaffolding and curing, usage charges of machinery etc complete as per specifications.

- k. **PLASTER MESH:** Providing and fixing suitable plaster mesh 100mm wide manufactured out of hot dipped galvanized iron of nominal thickness 0.35mm with a zinc coating of 120g/m² width, along route of walls chipped for services, junction between RCC and brick walls including cost of materials, labour for fixing complete as per specifications.

l. PLASTERING:

INTERNAL WALL: Providing 12 mm cement plaster on the rough side of single or half brick wall of mix :1:6 (1 cement: 6 fine sand) including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge

EXTERNAL WALL: Providing 18 mm cement plaster in two coats under layer 12 mm thick cement plaster with cement mortar 1:5 (1 cement : 5 coarse sand) and a top layer 6 mm thick cement plaster with cement mortar 1:3 (1 cement 3 coarse sand) finished rough with sponge to brick masonry including rounding off corners wherever required smooth rendering, providing and removing scaffolding, including cost of materials, labour, curing complete as per specifications and as per directions of Engineer-in-charge.

- m. **SAL WOOD DOOR FRAMES:** Providing Salwood frames of doors, windows, clerestory windows, ventilators and other frames, wrought, framed or assembled including making plaster groves, but including cost of materials, labour, usage charges complete as per specifications / drawing and as per directions of Engineer-in-charge.
- n. **FIXING OF DOOR FRAME:** Fixing of door frame in an existing opening including embedding frame in floor and walls after cutting masonry for holdfasts for embedding holdfast in cement concrete 1:3:6 of 20mm and down size granite metal painting two coats of coal tar to sides of frame, making good the damages to walls and floor as required and disposal of the debris with lead up to 50 m. including cost of materials, labour charges, complete as per specifications.
- o. **DOOR SHUTTER:** Providing and fixing flush door shutter made out of solid core block board type, well seasoned, chemicaly treated hard wood battens and internal frame with minimum 45 mm wide wooden frame alround door shutters covered with cross bonded wooden sheets (core veneer) hot pressed and fastened on both sides of the door using liquid phenol formaldehyde resin as per IS specifications 2202 (part-I)

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1991. from manufacturer complete as per specification -do- 30 mm thick both side commercial. As per the direction of Engineer Incharge.

- p. **TOILET DOOR FRAMES:** Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid door/window/Clerestory windows & other Frames/Chowkhat comprising of virgin PVC polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibres (wood powder/rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 g) fabricated with miter joints after applying PVC solvent cement and screwed with full body threaded star headed SS screws having minimum frame density of 850 kg/m³, screw withdrawal strength of 2200 N (Face) & 1100 N (Edge), minimum compressive strength of 58 N/mm², modulus of elasticity 900 N/mm² and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixed in position with M.S hold fast/lugs/SS dash fasteners of required Dia and length complete as per direction of Engineer-In-Charge (Frame Size 62 x 100 mm).

TOILET DOOR SHUTTER: Providing and fixing 30mm thickness factory made Green certified, Anti Termite, UV resistant, high water absorbant single extruded WPC (Wood Polymer Composite) solid plain flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 g) having minimum density of 650 kg/m³ and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength of 50 N/mm², modulus of elasticity 850 N/mm² and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixing with stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws The cost includes cost of materials, transportation, labour and fixing charges. including SS hinges, tower bolts, handles, locks & door stoppers, etc. as per direction of Engineer-In-Charge

- q. **UPVC WINDOWS:** Providing & fixing of 2-track x 2-panel sliding windows made out of multi chambered UPVC (Matching to RAL-9016) sections and with minimum TiO₂(Titanium Dioxide) at 6PHR with TPE(Thermo Plastic Elastomer) and lead free, gaskets -grey color having isolated drainage and reinforced with Galvanized Iron profile through-out the window frame. The outer frame having a overall size of 60mm width x 45mm height with reinforcement of 1mm thickness and Sash with overall size of 39mm X 58mm with GI reinforcement of 1mm for the frame and 1.5 mm for the sash. Coextruded Glazing bead for fixing of glass shall be of size 20mm x 24mm. Windows shall be provided with 5mm plain float glass, standard hardware& single point locking system with touch lock. Wall thickness of frame & sash shall be of 2-2.5 mm. Maximum possible size – 1819mm x 1819mm (The cost is inclusive of all fixtures and separate charges for minor T&P's shall not be made)
- r. **UPVC VENTILATOR:** Providing & fixing of louvered ventilator made out of multi chambered UPVC (Matching to RAL-9016) sections and with minimum TiO₂(Titanium Dioxide) at 6PHR with TPE (Thermo Plastic Elastomer) and lead free with gaskets -grey color having isolated drainage and reinforced with Galvanized Iron profile through-out the ventilator frame. The frame having overall size of 39mm x 39mm with GI reinforcement of 1mm thickness. Louver clip in Aluminium (powder coated in white) will be used on the frame along with plastic parts for fixing the 4 mm head glass. (The cost is inclusive of all fixtures and separate charges for minor T&P's shall not be made).
- s. **MS GRILL WORK FOR WINDOWS & VENTILATORS:** Providing and fixing M.S. grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete. Fixed to steel windows by welding.

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- t. **S, S. RAILING FOR RAMP/BALCONY/STAIR CASE:** Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying priming coat of approved steel primer. G.I. pipes including cost of materials, labour, usage charges of machinery complete as per specifications and as per directions of the Engineer-in-Charge.
- u. **FLOORING & SKIRTING – Granite (ENTRANCE, PORTICO, STAIRCASE & CORRIDORS):** Providing and laying Polished Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge. ** Polished Granite stone slab Black, Cat Eye, River Pink or equivalent..
- v. **FLOORING & SKIRTING – Vitrified Tiles (SPORTS & COMPUTER ROOM, LABS, CLASS ROOMS):** Providing and laying Vitrified tiles with thickness 9-10 mm in different sizes with water absorption less than 0.08 % and conforming to I.S. 15622, of approved make, in all colours & shade, over 12 mm thick bed of cement mortar 1:3 (1 cement: 3 coarse sand), jointing with grey cement slurry @ 3.3 kg/ m2 including grouting the joint with white cement & matching pigments etc. complete.e. Size of Tile 600x600 mm .
- w. **TOILET FLOORING:** Providing and laying Ceramic floor tiles of size 300x300 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS : 15622, of approved make, in all colors, shades, except White, Ivory, Grey, Fume Red Brown, laid on 20 mm thick bed of cement mortar 1:4 (1 Cement : 4 Coarse sand), jointing with grey cement slurry @ 3.3 kg/ m2 including pointing the joints with white cement and matching pigments etc., complete
- x. **DADOOING:** Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622 (thickness to be specified by the manufacturer), of approved make, in all colors, shades except burgundy, bottle green, black of any size as approved by Engineer- in-Charge, in skirting, risers of steps and dados, over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @ 3.3kg per m2, including pointing in white cement mixed with pigment of matching shade complete. As per drawing and as per directions of the Engineer-in-Charge.
- y. **WASH BASIN COUNTER:** Providing and fixing 18 mm thick gang saw cut granite of any color and shade, mirror polished, pre-moulded and prepolished, machine cut for kitchen platforms, vanity counters, window sills, facias and similar locations of required size, approved shade, colour and texture laid over 20 mm thick base cement mortar 1:4 (1 cement : 4 coarse sand), joints treated with white cement, mixed with matching pigment, epoxy touch up, including rubbing, curing, moulding and polishing to edges to give high gloss finish etc. complete at all levels.
- z. **URINAL GRANITE PARTITION:** Providing and fixing granite stone slab with table rubbed, edges rounded and polished, of size 75x50 cm deep and 1.8 cm thick, fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in- charge and finished smooth.
- aa. **CEMENT CONCRETE (Screed Concrete);** Providing and laying in position Cement Concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works from 0.50m to 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticisers, laid in layers, well compacted using needle vibrators, providing weep holes wherever necessary, including all lead & lifts, cost of all materials of quality, confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications. Mix 1:2:4 (M15) Using 20 mm nominal size graded crushed coarse aggregates.

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bb. PAINTING WORKS: -

PUTTY FOR INTERNAL WALLS & CEILING: Providing and applying white cement based putty of average thickness 1 mm, of approved brand and manufacturer, over the plastered wall surface to prepare the surface even and smooth complete as per specifications and as per directions of Engineer in charge.

PRIMER FOR INTERNAL WALLS & CEILING: Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content. With water thinnable cement primer on wall surface having VOC content less than 50 g/L as per specifications.

INTERNAL PAINT FOR INTERNAL WALLS & CEILING: Wall painting with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/litre of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour. Two coats as per specifications.

ACRYLIC SMOOTH EXTERIOR PAINT WITH PRIMER FOR EXTERNAL WALLS: Finishing walls with Acrylic Smooth exterior paint of required shade :New work (Two coat applied @ 1.67 ltr/10 m² over and including priming coat of exterior primer applied @ 2.20 kg/10 m²) with paint of approved quality to give an even shade, after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge.

SYNTHETIC ENAMEL PAINT FOR STEEL & WOOD WORKS: Painting with synthetic enamel paint of approved brand and manufacture to give an even shade :Two coats on new work after thoroughly brooming the surface to remove all dirt, dust, mortar drops and foreign matter including preparing the surface even and sand paper smooth, cost of materials, labour complete as per specifications and as per directions of Engineer-in-charge.

cc. SINK OF SIZE 60x45x20 CM FOR LABORATORY: Providing and fixing white vitreous china laboratory sink with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P. brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good the wall wherever required.

dd. WATERPROOF TREATMENT FOR TOILET AREAS & TERRACE: Providing and laying water proofing treatment to the Roof with PU based single component elastomeric pure polyurethane based coating on New terrace/Chajjas/Sunken portion of WC: Bathroom, cold applied PU waterproofing membrane that is highly elastic with elongation greater than 400% and tensile strength greater than 2MPa as per ASTM D412. The waterproofing membrane to be applied in 2coats 1.6kg per m² to achieve final DFT (dry film thickness) of 1mm including prime coat of epoxy primer @150 g per m² and protection with 120gsm Geo-textile over the waterproofing membrane. The finished cost includes surface preparation, making coving at Junction, Bore Packing, treatment of construction joints completely as per specification & with a 10 years warranty on product & work from certified manufacturers as per the direction of the Engineer In charge

ee. CINDER CONCRETE FOR TOILET: Providing and laying cinder concrete in cement 1:15 (1 cement:15 cinder of 12.5mm nominal gauge) on terraced roof or sunken slabs, laid to slope compacting, including cost of materials, labour, curing complete as per specification.

ff. TERRACE RAINWATER DOWN TAKE PIPES: Providing and fixing on wall face unplasticised Rigid PVC rainwater pipes of 100 & 150mm dia conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) Single socketed pipes,

gg. POLYETHYLENE WATER STORAGE TANKS 16000.00 LITERS CAPACITY WITH COVER: Providing and placing on terrace, polyethylene water storage tanks with manhole lid and suitable locking

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arrangements, making holes of suitable diameter for inlet, outlet and overflow pipes, including cost of all materials, labour, transport charges, HOM of equipments and testing complete as per specification. Along with M.S. Ladder- 1 No from terrace to Tank level for maintenance purposes.

hh. WATER SUPPLY AND SANITARY SYSTEM - INTERNAL & EXTERNAL MATERIALS, FIXTURES SHALL BE WITH ISI MARKS AND PWD / WATER SUPPLY SEWERAGE TECHNICAL SPECIFICATIONS.

1. Providing and fixing brass bib cock of approved quality : 15 mm nominal bore.
2. Providing and fixing unplasticised PVC connection pipe with brass unions : 20 mm nominal bore.
3. Providing and fixing on wall face unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A, including jointing with seal ring conforming to IS : 5382, leaving 10 mm gap for thermal expansion, (i) single socketed pipes 100mm diameter.
4. Earth work excavation for pipelines/cables by Manual means upto 600 mm trench width, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, including dressing of excavated surfaces, disposing off or leveling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m. Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering and lift upto 1.5 m including cost of labour, tools, usage & other appurtenances required to complete the work.. In all kinds of soils. Depth upto 1.50m.
5. Cutting of holes upto 15 x15 cm in RCC floors and roofs for passing drain pipes etc and repairing the hole after insertion of drain pipe etc with cement mortar 1:2:4 (1 cement 2: coarse sand 4: graded stone aggregate 20 mm nominal size) including finishing complete so as to make it leak proof.
6. Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fittings arrangement of approved quality and colour. 600 mm long towel rail with total length of 645 mm, width 78 mm and effective height of 88 mm, weighing not less than 190 g.
7. Providing and fixing Brass full way valve gate with C.I. wheel of approved quality (screwed end) : 25 mm nominal bore.
8. Providing and fixing Chlorinated Poly Vinyl Chloride (CPVC) pipes having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings, including fixing the pipe with clamps at 1.0m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in charge Internal work - Exposed on wall - 40mm nominal dia pipes.
9. Providing and fixing 600x450 mm beveled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.
10. Providing and fixing PVC (S.W.R) Nahani Trap 10cms x 10cms with all fitting arrangements & all necessary accessories complete.
11. Providing and fixing PTMT grating of approved quality and colour 100 mm nominal dia.
12. Providing and fixing Chlorinated Poly Vinyl Chloride (CPVC) pipes having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings, including fixing the pipe with clamps at 1.0m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer in charge. Concealed work, including cutting chases & making good the walls etc. - 20mm nominal dia pipes.
13. Providing and fixing Chlorinated Poly Vinyl Chloride (CPVC) pipes having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings, including fixing the pipe with clamps at 1.0m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in charge - 25mm nominal dia pipes.
14. Providing and fixing Chlorinated Poly Vinyl Chloride (CPVC) pipes having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings, including fixing the pipe with clamps at 1.0m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in charge Internal work - Exposed on wall - 32mm nominal dia pipes.
15. Providing and fixing Brass full way valve gate with C.I. wheel of approved quality (screwed end) : 40 mm nominal bore.
16. Providing and placing on terrace(at all floor levels), polyethylene water storage tanks, IS : 12701 marked, with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflow pipes but without fittings and the base support for tank.
17. Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats

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complete : 25 mm nominal bore.

18. Providing and fixing PTMT pillar cock of approved quality and colour. 15 mm nominal bore, 125 mm long foam flow, weighing not less than 120 gms.

19. Providing and fixing PTMT stop cock of approved quality and colour 15 mm nominal bore, 86 mm long, weighing not less than 88 g.

20. Providing and fixing PTMT soap Dish Holder having length of 138mm, breadth 102mm, height of 75mm with concealed fitting arrangements, weighing not less than 106 g.

21. Providing and fixing square-mouth S.W. gully trap class SP-1 complete with C.I. grating brick masonry chamber 150x100 mm size P type with non modular common burnt clay bricks of designation 3.5 & with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70 kg as per standard design.

22. Providing, Single Phase Submersible Pump Sets of 100mm dia (4 inch) suitable for bore well confirming to IS 8034-2000 specifications, to work site with testing of as per instructions of engineer incharge of work and latest amendments. 3.00 HP/2.2KW, 9 ST.

23. Constructing brick masonry chamber of internal dimension 600x600mm and depth of 600mm (inner dimensions) with modular bricks of CD 75 in cement mortar 1:6, bed concrete 150mm thick with 1:3:6, plastering 12 mm thick with cement mortar 1:4, CC 1:2:4 coping 75mm thk for fixing CI cover & frame etc. excluding the cost of CI frame and cover.

24. Providing and fixing MS inspection door of size 60 cms x 60 cms, including MS frame made of 50x50x6mm angle, shutters made of 3mm thick MS sheets, with hinges, locking arrangements at top etc. including painting with anticorrosive approved paint etc. complete including all lead and lifts etc.

25. Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100 mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required: White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests.

26. Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) with seat and lid, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever), conforming to IS : 7231, with all fittings and fixtures complete, including cutting and making good the walls and floors wherever required : W.C. pan with ISI marked black solid plastic seat and lid.

27. Providing and fixing white vitreous china wash basin including making all connections but including the cost of fittings : Flat back wash basin of size 630x450 mm.

28. Providing and fixing Unplasticised Polyvinyl Chloride (uPVC) pipes, for cold water supply including all uPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step uPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External work 80 mm nominal dia Pipes.

29. Providing and fixing Unplasticised Polyvinyl Chloride (uPVC) pipes, for cold water supply including all uPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step uPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External work 100 mm nominal dia Pipes.

30. Providing and fixing Unplasticised Polyvinyl Chloride (uPVC) pipes, for cold water supply including all uPVC plain & brass threaded fittings This includes jointing of pipes & fittings with one step uPVC solvent cement, trenching, refilling & testing of joints complete as per direction of Engineer in Charge. External work 150 mm nominal dia Pipes.

31. Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350 mm and 340x410x265 mm sizes respectively with automatic flushing cistern with standard flush pipe and C.P. brass spreaders with brass unions and G.I clamps complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required : One urinal basin with 5 litre white P.V.C. automatic flushing cistern.

32. Providing and fixing white vitreous china laboratory sink with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete, including painting of fittings and brackets, cutting and making good the wall wherever required : Size 600x450x200 mm

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Sl.No.	Particulars	Qty for one House
A	Water Supply	
01.	20mm to 50mm Dia CPVC pipes with necessary fittings for water supply as shown in the drawing.	As per the approved drawing
02.	Brass bib Cock, Brass stop cock, C.P. brass stop cock, PTMT pillar cock, Un-plasticised PVC connection pipe, Gun metal non-return valve, pillar cock, Brass full way valve gate, ball valve (brass), mirror, Soap dish, towel rail, Water meter, Ball Valve.	As per the approved drawing
B	Sanitary Supply	
03.	European type Closet With 10 litre flushing cistern Health faucet Including all fixtures	As per the approved drawing
04.	Water closet squatting pan (Indian type W.C. pan) Including all fixtures	As per the approved drawing
05.	Hand Wash basin Including all fixtures and white vitreous china laboratory sink with C.I. brackets,	As per the approved drawing
06.	Urinal basin Including all fixtures	As per the approved drawing
07.	Long body bib cock in Lab	As per the approved drawing
08.	PVC (S.W.R) Multi Floor Trap with grating	As per the approved drawing
09.	Gully Trap, 455x610 & 500X700 inspection chamber	As per the approved drawing
10.	32mm,50mm,75mm, 110mm, 150mm dia PVC Pipes with necessary fittings	As per the approved drawing
11.	Main Connection for external main line	As per the approved drawing
12.	Cutting holes in R.C.C. floors, roofs, beams, Walls, Foundation.	As per the approved drawing
13.	External Sanitary Main line -100mm & 150mm dia	As per the approved drawing
14.	Constructing brick masonry chamber of internal dimension 600x600mm and depth of 600mm with MS inspection door	As per the approved drawing
15.	Manholes for connecting to local sewage line	As per the approved drawing

Note: The bidder has to provide the fittings and fixtures as per requirement and as per approved drawings.
All internal piping (concealed) with CPVC pipes as per NBC.

ELECTRICAL SYSTEM - INTERNAL & EXTERNAL MATERIALS, FIXTURES SHALL BE WITH ISI MARKS AND AS PER GESCOM / PWD TECHNICAL SPECIFICATIONS.

1. Concealed Conduit System Supplying Heavy Gauge PVC Conduit pipe mm dia thick confirming to IS 2509 with suitable size bends, metal/PVC junction boxes adhesive paste etc., and running before concreting the slab. The conduit should be tied to the reinforcement rods by using binding wires and unused ways of junction boxes and pipes ends should be covered using PVC end enclosures. run with 18SWG GI fish wire wherever necessary. 19/20 mm dia 2mm thick.
2. Concealed Conduit System Supplying Heavy Gauge PVC Conduit pipe mm dia thick confirming to IS 2509 with suitable size bends, metal/PVC junction boxes adhesive paste etc., and running before concreting the slab. The conduit should be tied to the reinforcement rods by using binding wires and unused ways of junction boxes and pipes ends should be covered using PVC end enclosures. run with 18SWG GI fish wire wherever necessary . 25mm dia 2mm thick.
3. Supplying heavy gauge PVC Conduit Pipediamm thick with suitable size bends, metal junction boxes adhesive paste etc., by groove cutting in the wall and fixing by bracing U or J hooks and cement plastering up to the wall surface and run with 18 SWG GI fish wire run throughout the conduit wherever necessary.19/20mm dia 2mm thick.
4. Supplying heavy gauge PVC Conduit Pipediamm thick with suitable size bends, metal junction boxes adhesive paste etc., by groove cutting in the wall and fixing by bracing U or J hooks and cement plastering up to the wall surface and run with 18 SWG GI fish wire run throughout the conduit wherever necessary. 25mm dia 2mm thick.
5. Supplying and wiring adopting loop system in existing PVC Conduit/casing capping casing capping using 2x1.5Sqmm (Phase & Neutral) & 1x1.0 sqmm (Earth wire) FRLS multi strand PVC insulated copper wire (confirming to IS-694: and latest amendments) without control switch shall be fixed on the existing plastic sheet/ gang box, the other end of the wires shall be terminated with sufficient loose length in a wood/PVC round block. complete for each outlet.Short point upto 3Mtr from tapping point to out let via switch.
6. Supplying and wiring adopting loop system in existing PVC Conduit/casing capping casing capping using 2x1.5Sqmm (Phase & Neutral) & 1x1.0 sqmm (Earth wire) FRLS multi strand PVC insulated copper wire (confirming to IS-694: and latest amendments) without control switch shall be fixed on the existing plastic sheet/ gang box, the other end of the wires shall be terminated with sufficient loose length in a wood/PVC round block. complete for each outlet. Medium point above 3Mtr upto 6Mtr from tapping point to out let via switch box
7. Supplying and wiring adopting loop system in existing PVC Conduit/casing capping casing capping using 2x1.5Sqmm (Phase & Neutral) & 1x1.0 sqmm (Earth wire) FRLS multi strand PVC insulated copper wire (confirming to IS-694: and latest amendments) without control switch shall be fixed on the existing plastic sheet/ gang box, the other end of the wires shall be terminated with sufficient loose length in a wood/PVC round block. complete for each outlet. Long point above 6Mtr upto 10Mtr from tapping point to out let via switch box
8. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall . 1-2 way
9. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall 4-5 way.
10. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall 6way.

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11. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall 8 Way.
12. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall 10-12way.
13. supplying and flush mounting powder coated /galvanized metal box suitable for mounting modular switch plates. The box should be firmly flush mounted after due groove cutting in brick/stone/c.c wall . 18 way.
14. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box . 1-2 module.
15. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box. 4 module.
16. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box. 6 module.
17. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box. 8 module.
18. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box.10-12 module.
19. Supplying and fixing superior quality switch mounting poly carbonate plate with necessary supporting back plate with required nos of machine tools, bolts, nuts etc., complete on the existing metal/PVC box. 18 module.
20. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293.6A One Way Switch.
21. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. 6Amps two way.
22. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. 6Amps 3way socket.
23. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. Stepped Fan Regulator Two Module.
24. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. 6 Amps Bell Push.
25. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. 32Amps DP Switch.
26. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. 6/16Amps universal socket.

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27. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. TV/Telephone socket.
28. Supplying and fixing of modular switch & connected accessories on existing modular switch plate as per IS 3854 and IS 1293. RJ45/I.O Outlet Cat-6.
29. Supplying and drawing PVC flexible one pair telephone unarmoured tinned copper cable . 2 pair.
30. Supplying and drawing PVC flexible one pair telephone unarmoured tinned copper cable. TV cable. RG-6.
31. Supplying and drawing UTP-CAT 6E LAN cable.
32. Wiring for lighting /Popwer Circuit using one FRLS/PVC insulated 1100v Grade , multistand Copper with Low conductor resistance single core wire in open or concealed system of wiring with specified IS 694:2010 . 1.5 sqmm.
33. Wiring for lighting /Popwer Circuit using one FRLS/PVC insulated 1100v Grade , multistand Copper with Low conductor resistance single core wire in open or concealed system of wiring with specified IS 694 :2010, . 2.5 Sqmm.
34. Wiring for lighting /Popwer Circuit using one FRLS/PVC insulated 1100v Grade , multistand Copper with Low conductor resistance single core wire in open or concealed system of wiring with specified IS 694 :2010 . 4 Sqmm.
35. Wiring for lighting /Popwer Circuit using one FRLS/PVC insulated 1100v Grade , multistand Copper with Low conductor resistance single core wire in open or concealed system of wiring with specified IS 694 :2010 . 6 Sqmm.
36. supplying 4mm thick white plastic plate and covering for junction boxes of size 110mm conduit using necessary machine screws. 110mm
37. Supplying And Fixing Metal Fan Box with Round Hook.
38. Supplying And fixing/replacing of 6/16/32A electrical accessories on existing switch board. 6A Batten Holder
39. Supplying and fixing of LED Bulkhead of 10W with IP65 protection and IK 08 impact resistance suitable for surface and wall mounting applications.
40. Supplying & fixing of retrofit type - LED bulb 12 W with OPAL acrylic diffuser comprising of LED source with CCT 6500 degree K, CRI> 70%. efficacy >80 lumen per W, life> 25000 burning hours and Compliance to IS 10322/IEC 60598, LM 79 & LM 80. The LED are driven by HF electronic driver integrated in the system, with PF > 0.95, power loss should < 5% of lamp Wage., short circuit & open circuit protection to be integrated in the circuit, THD less than 20%, Life as per LM 79. The operating input voltage should be between 130 to 275 V. BIS Approved and Tested by NABL/CPRI accredited laboratory with 2 years Warranty against any manufacturing defect working under standard electrical condition. 12W, 6500K
41. Supplying offeet - PVC Batten with integrated LED tubeW with high quality diffuser with Life of 25000 burning hours & 70% lumen maintenance with CRI > 80. Power Input: 220-240V @ 50/60Hz & Power factor >0.9 along with CE approved. 2 years Warranty against any manufacturing defect working under standard electrical condition. LED light fighting 2x 4' - 20 /22 w.
42. Supplying of recess mounting non integral type LED 1'x4' 34-36W luminaire comprising of pressure decast/extruded aluminium housing, with spring loaded fase ceiling clamps, Power LEDs with CCT 6500 degree K, CRI> 70%. efficacy >100 lumen per watt, 120degree beam spread, life> 25000

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burning hours and Compliance to IS 10322/IEC 60598, LM 79 & LM 80. The lamp compartment is enclosed with anti glare opal diffuser which enhances the lighting level. LEDs are driven by HF electronic driver integrated in a separate control gear assembly., with PF > 0.95, power loss should < 5% of lamp wattage., short circuit & open circuit protection to be integrated in the circuit, , THD less than 20%, Life as per LM 79. The operating input voltage should be between 130 to 275 volts. BIS Approved and Tested by NABL/ CPRI accredited laboratory with 2 years Warranty against any manufacturing defect working under standard electrical condition. LED modular down light 1'x4' 34-36W.

43. Fixing all types and all capacities of fluorescent/false ceiling/spot light/CFL/LED fittings indoor on the wall / ceiling/ rafters / girders using 23/0.0076" twin twisted PVC insulated wires, required Nos of round blocks and clamps (if required) a) on the wall / ceiling/ rafters / girders.
44. Supply of LED 70W Streetlight luminaire with pressure die cast aluminium housing body for optimal thermal dissipation. Lamp compartment comprising of anti glare clear diffuser with Injection moulded polycarbonate material, delivering superior light output Rated life Burning Hrs 50000 hr @ Lumen Maintenance of 70%, maximum light intensity should be between 60 degrees to 70 degrees. CCT > 5500K, IP66 optical and electrical compartment & impact resistance of complete luminaire > IK08. Power Factor >0.9 with mains, Surge Protection- Min 5KV along with Over voltage/ Overload, short circuit/miss-wiring protection. Compatible for pole mounting with outer dia of 40mm to 50mm. Universal Voltage driver to operate wide voltage range from 100V to 270V 50/60Hz application. Compliance to IS 10322/IEC 60598, LM 79 & LM 80 Adherence with RoHS. UL approved MCPCB. Top access street light with single screw to ensure ease of maintenance at the sight site location with minimized minimal tools. LED Light fixture withW System Power consumption. LED Efficiency>130lm/w, nominal CRI >75. Luminaire manufacturer should have in-house facility accredited by NABL/CPRI & any Government certified agency & Design & Development facility certified by ISO 9001:2008. Housing with supplier word mark /name shall be Engraved / Embossing on the die cast housing/ Body part. Warranty of 2 Years against any manufacturing defect working under standard electrical conditions as mentioned above should be given by LED manufacturer & Cree/Nichia/ Lumileds/Osram make LED Source. LED Streetlight 70watts.
45. Supplying and fixing of ...mm dia class A GI pipe bracket up to 2 Mtr long bent at suitable angle and fixing to his bracket 1x40/2x40 watts fluroscent tube street lights fitting of all capacities or GI or CL or rail or RCC pole /wall using suitable clamps , bolts, and nuts and wiring using suitablke capacity using 25mm dia GI Pipe.
46. Supplying of 1440rpm heavy duty exhaust fan with bracket blades suitable to operate on 230V 50Hz, AC Supply complete.12" Sweep (300 mm).
47. Fixing one exhaust fan after making a suitable notch in the wall and finishing with cement mortar and colouring to match the existing wall or brackets, with bolts and nuts and a 5 A, ceiling rose with sufficient length of 23 / 0.0076 inch PVC insulated twin core wire of approved make with wire mesh and wooden frame.
48. Supplying of Ceiling Fan with Capacitor rating As per guideline of BEE 5 star rating and IS:374/19 and also comply with IS: 1709/1984 with latest amendment, rated voltage 220 V/50 Hz, Rated power upto 35 W +/- 10 %, Rated current As per IS:374/19, Rated power factor 0.9 lagging(min), Rated speed 350 +/- 10% RPM, rated air delivery 210 +/- 10% Cubic Meter Minimum, Rated service value 6.2 CMM / W, Three Blades of blade leaf 1.05 mm thick Aluminium Alloy sheet, Class B motor insulation, Bearing Two ball bearings, Top 6202, Bottom 6201, as per IS specification, Motor winding. Temp rise Shall not exceed 75 deg C over and ambient of 40 0C by resistance method at 245 V, Insulation resistance Shall not be less than Two Mega Ohms (2M Ohms), Leakage current Should

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not exceed 210 micro Amp, Power input, W& current, Air Delivery & Fan Speed as per IS:374/2019 with latest amendment, 2year manufacturer Warranty. (BLDC fans) - 48" Sweep 5 Star (1200 mm).

49. Fixing a ceiling/Wall mounting fan of all capacities and all types to the existing 'S' hook with fan regulator to the existing board together with supplying and fixing a 5 amps, ceiling rose, necessary length of 23 / 0.0076 inch PVC insulated twin twisted copper wire and wiring.
50. Supplying and fixing miniature circuit breakers on existing MCB distribution boards using necessary fixing materials and 'C' Type curve, indicator ON/OFF, energy cross-3 with Short circuit breaking capacity of 10K and complete wiring as required confirming to IEC 60898.6-32 Amps DP.
51. Supplying and fixing miniature circuit breakers on existing MCB distribution boards using necessary fixing materials and 'C' Type curve, indicator ON/OFF, energy cross-3 with Short circuit breaking capacity of 10K and complete wiring as required confirming to IEC 60898.6-32Amps TPN.
52. Supplying and fixing miniature circuit breakers on existing MCB distribution boards using necessary fixing materials and 'C' Type curve, indicator ON/OFF, energy cross-3 with Short circuit breaking capacity of 10K and complete wiring as required confirming to IEC 60898. 50-63Amps TPN.
53. Supplying and fixing regular MCB distribution boards on wall / wood board / flush mounting using required clamps, bolts, nuts etc., with provision for fixing suitable type capacity MCB's single phase / 3 phase / single door with powder coated painting. Made out of 14 SWG MS enclosure. III- Double Door 4 Way TP & N.
54. Supplying and fixing regular MCB distribution boards on wall / wood board / flush mounting using required clamps, bolts, nuts etc., with provision for fixing suitable type capacity MCB's single phase / 3 phase / single door with powder coated painting. Made out of 14 SWG MS enclosure. 6Way TP & N Double Door.
55. Supplying, fixing and wiring Earth Leakage Miniature Circuit Breaker [ELMCB] 240/450V up to 300mA sensitivity on existing wood/panel board.- 32 to 40 Amps 2 pole.
56. Supplying,fixingandwiringResidualcurrentcircuitbreaker(RCCB)240/450V upto 300mA sensitivity on existing wood/ panel board. 63 A 4 pole.
57. Fabricating supplying and mounting MS box made out SWG suitable for floor /wall mounting, fully weather proof with provision for better heat dissipation, provided with hinged front cover, equipped with tamper proof locking arrangements, with suitable size clamps with necessary cable entry pipe with gland and box should be finished with 7tanks treatment with powder coated paint and finally finished with approved colour etc., complete. 16SWG.
58. Supplying and Fixing hylum plastic sheet 3mm thick with necessary niches for fixing switches, regulators etc, and fixing on existing wood or metal box using N.F screws.
59. Supplying and fixing Moulded Case Circuit Breaker (MCCB) over the existing wood/panel board using necessary screws, bolts, nuts, necessary phase separators, handle and wiring complete. Protection of Overload & Short circuitwith adjustable thermal magnetic release, Micro processor release shall have Earth Fault as per IS/IEC 60947-2 . (Icu=100% lcs). In 4P MCCB, all Poles should have protection for Short-Circuit/Over Load. For Microprocessor MCCBS Facility for segregating Priority and Non-Priority loads must be available in the MCCB. MCCB shall be provided with double insulation (insula tion between front cover and internal power circuits to avoid any accidental contact with live current carrying path with the front cover open). Multi-pole breakers shall be designed to break all the poles simultaneously and they shall have a single mechanism.FOUR Pole 100 A 25 kA.

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60. Supplying and fixing of LED type panel board indicating lamp with required colour suitable for 220v A.C. 50 Hz 12/24v D.C.(48/6.36).
61. Supplying amps rated 3 phase with neutral bus bar using required capacity electrolytic alluminium strips covered with heat shrinkable coloured PVC sleeve, mounted on phenolic/FRP/DMC insulator which are mounted on powder coated 40X6mm M.S.flat frame work in existing panel board.The bus bar shall have suitable holes for termination of incoming and outgoing cables as per IS specification with necessary bolts, nuts and washers etc., complete. -250Amps 4x30x10mm Aluminium Strips.
62. Supplying, fixing and wiring earth leakage relay with core balanced current transformer suitable for single phase 50 Hz AC with latest microcontroller based, digital readout of percentage leakage current, programmable delay/auto/ manual reset facility suitable to mount on DIN rail/ flush mounting on panel board.
63. Supplying of on load change over switches 4 poles, AC-23A Duty, 415V, 50Hz, AC Supply. (Open Execution) - 100A.
64. Supplying of multi function digital meter with three line back light LCD type display for voltage, Current, frequency, Power, power factor, kVA, kWh, kVAR suitable for 3 phase, 4 wire LT network with IP 54 degree of protection and completely wired as required with communication Port and Class 0.5s accuracy.
65. Supplying, fixing and wiring heavy duty low voltage capacitors conforming to IS 2834. 3 phase, 400/440 volts grade, for power factor improvement of rotating machineries like induction motor.
66. Supplying and fixing Electronic Trivector Meter (ETV) suitable for operation LT operation and -CT operated meter in polycarbonate body in class 0.5 accuracy as per IS 14697 and completely wired.
67. Supplying, fixing, wiring, earth electrode for grounding conduits, I.C. cutouts and other equipment's on the meter board using 40 mm dia 2.90 mm thick GI pipe 2.5m long buried in a pit . The pit should be filled with equal proportion of salt and charcoal 150 mm all-round the pipe to complete depth. The connection from the pipe to the conduit etc., is to be established through GI wire of size as per ISI specification 7.3.3. of IS 732 using 12 mm dia bolts, nuts, washers and check nuts etc., the pipe shall have 16 through holes of 12 mm dia.
68. Supplying fixing and wiring earth electrode for grounding of lifts, transformers, DG sets etc. using 40 mm dia 2.9 mm thick 2.5m long GI pipe with GI funnel with mesh and suitable size reducer fixed on the top of the earth electrode.The funnel should be enclosed in a CC chamber of 400x400x400 mm with a cast iron cover. The earth electrode shall have staggered holes of 12 mm dia and the electrode should be covered 150 mm all-round with alternate layers of salt and charcoal from the bottom of the CC chamber. The connection from the electrode is to be established through GI strip using GI bolts and nuts.
69. GI/Copper strips for grounding connections, using necessary fixing materials as required. 25 x 6 mm GI strip
70. Providing, Laying and Fixing GI pipes conforming to IS 1239:1990 with latest amendments complete with GI fittings (excluding the cost of fittings) with cuts and threads wherever necessary, including testing for water tightness, with all lead and commissioning. (contractor will make his own arrangements for procuring water for testing) For Heavy Duty GI pipe:Heavy Duty GI pipe of 50mm dia .Road Crossing for Cable laying.
71. Pole mounted fibre glass reinforced aerial fuse board 60 Amps - 3way Way(Dwg No. BESCOM/GM/QS&S/24 Dtd 24.11.2018).

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72. Caution/Danger Board

73. Fixing Danger Board

74. Earth work excavation for pipelines/cables by Manual means upto 600 mm trench width, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, including dressing of excavated surfaces, disposing off or leveling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m. Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering and lift upto 1.5 m including cost of labour, tools, usage& other appurtenances required to complete the work. In all kinds of soils. Depth upto 1.50m

75. Supply and delivery of Centrifugal pumpset at site brand new best make and with discharge duty confirming to ISI standards and its latest amendments. 3 HP, size 50x40 Head 30M, Discharge 198 LPM Each 18816.

76. Supply and delivery at site brand new best make starter/ control panel suitable for following HP centrifugal pump confirming with ISI mark and its latest amendments. Upto 7.5 HP centrifugal pump.

Sl.No.	Particulars	
01.	Light Points	As per the approved drawing
02.	Two-way light point	As per the approved drawing
03.	Ceiling Fan Points	As per the approved drawing
04.	Exhaust fan points	As per the approved drawing
05.	6A Plug Points (Independent)	As per the approved drawing
06.	6A Plug Points	As per the approved drawing
07.	Call bell	As per the approved drawing
08.	5A Power socket point	As per the approved drawing
09.	15A Power Socket	As per the approved drawing
10.	Telephone socket point	As per the approved drawing
11.	TV Socket Point and Network Socket point with cables	As per the approved drawing
12.	Wiring 1.5, 2.5, 4 & 6 Sqmm,	As per the approved drawing
13.	Point wiring, Switches and sockets, UPS and Raw power Wiring, UPS and Raw power Circuit and Mains, Distribution boards Light Fittings and fans, Building lighting, Telephone, networking and CCTV conduit and wiring, Meter Board and Main panel, Earthing and Earth strips, Cable from tapping point.	As per the approved drawing

ii. FLOOR TO FLOOR HEIGHT (INCLUDING ROOF SLAB): 3.60 MTS (As per drawing)

jj. Chejjas: sizes as per drawing with drip molding.

kk. Borewell & Pump Erection- 2 Drilling & 1 Pump

1. Supplying and drawing 3 core flat PVC sheathed submersible pump cable manufactured with electrolytic grade copper with flexible copper with low resistance conductor confirming to IS:8130-1984 and virgin grade PVC insulation and powder coating extruded PVC sheathed suitable for working voltage upto 1100Volts as per IS-694:1990. 3C X 6.0Sq.mm.
2. Supplying fixing and wiring earth electrode for grounding of lifts, transformers, DG sets etc. using 40mm dia 2.9mm thick 2.5 mtr long GI pipe with GI funnel with mesh and suitable size reducer fixed on the top of the earth electrode. The funnel should be enclosed in a CC chamber of 400x400x400mm with a cast iron cover. The earth electrode shall have staggered holes of 12mm dia and the electrode should be covered 150mm all-round with alternate layers of salt and charcoal from the bottom of the CC chamber. The connection from the electrode is to be established through GI strip using GI bolts and nuts..
3. Digging of trench of 0.6m deep x 0.50 mtr wide refilling the trench to the required ground level and consolidating etc., complete.(As per Civil SR KSRB I-2, P-7) - In soil (hard).
4. Providing and filling sand in excavated trench to cover already laid UG cable to a depth of 150mm all-round the cable.
5. Providing, Laying and Fixing of GI pipes conforming to IS 1239:1990 with latest amendments complete with GI fittings (excluding the cost of fittings) with cuts and threads wherever necessary, including testing for water tightness, with all lead and commissioning. (contractor will make his own arrangements for procuring water for testing) For:Heavy Duty GI Pipe etc. complete on pole/wall/drain crossing with necessary clamping arrangements for UG cable of 1.1 KV class - 40mm.
6. Supplying and fixing L.T. cast Iron pot heads suitable for 1.1 KV class UG cable filled with necessary bituumen/insulating compound complete with terminals, clamps, bolts, nuts and washers etc. 25Sqmm.
7. Supplying tinned copper lugs and crimping and wiring to terminal point for wire of the following sizes. 25 sqmm Long Barrel
8. Supplying, fixing and wiring heavy duty low voltage capacitors conforming to IS 2834. 3 phase, 400/440 volts grade, for power factor improvement of rotating machineries like induction motor.
9. Fixing a shunt capacitors ofKVAR capacity with necessary clamps, bolts and nuts on existing wooden or metal board including banking of more than one capacitor. Up to 5 KVAR
10. Supplying of 1.1 KV LT UG cable XLPE or Heat resistant PVC insulated, PVC extruded Inner sheath armoured UG LT cable as per IS-1554 (Part-1) or IS-7098 Part-1, Armouring strip thickness in average +5% and resistivity 14 Ohms/Kms (Max) as per IS-3975 3.5 core 25 sqmm.
11. Labour charges for laying of 1.1 KV class UG cable in existing trench GI pipe / stoneware pipe / on wall / on pole as required.In existing trench/duct. - 25 sqmm to 75 sqmm.
12. Sinking of Borewell of 165mm dia clear using super fast hydraulic rig of capacity 300 PSIG & above 1100 CMF & above in all strata including over burden upto 20 m. Fixing of casing pipes, collars and cap with necessary cutting, threading and welding including transportation of rig and supporting vehicle, crew charges and cost of consumables etc., complete including yield testing at the final depth with a minimum working of compressor for one hour (Excluding cost of casing pipes, collars, cap etc., complete) Depth (150-200mt).
13. Geophysical investigation at site for sinking borewells for supplying drinking water to the habitation either through the Hand Pump MWS or P.W.S.S, by vertical electrical sounding by adopting Verner or Schlumbergers's method, including reconnaissance survey of geological formation. Geophysical investigation of existing ground water in the vicinity, its quality, quantity and acceptability of the users, indicating the location of the site, recommended depth of casing pipe required to seal the top unconsolidated formation including an extra depth of 1.0 metre in consolidated formation for proper seating of casing pipe, depth of drilling required to cover full depth of aquifer proposed to be tapped, probable yield and other information required including transportation of instruments and accessories to work site, engaging technical personal and labour required etc. NOTE: 1) Additional rate on item

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- 1&2 is allowed for drilling in over burden and fixing Casing pipes beyond 20 M (for fixing Casing pipes only) a) Above 20 M and upto 30 M - 15%, b) Above 30 M - 30% (Measurement of overburden is restricted to the depth of casing pipe fixed excluding initial depth of 20M and projection above ground level). 2) A sum of Rs. 100/- is to be deducted for Dry Borewell towards yield test.
14. Supply and delivery at site 50mm(2") dia heavy duty unplasticized PVC Column pipes with heavy duty collars, rubber profile ring, vibration control profile ring, freezing and turbulence free leak proof EPDM ring with ISI mark with its latest amendments.
 15. Providing, supplying to work site, Submersible Pump Set of 150mm dia suitable for bore well and confirming to IS 8034-2000; 3Phase, SS Bowl & Impeller with Low volt Motor as per specifications, as per necessary amendments and instructions of engineer incharge of work. 12.50 HP - 135 LPM @ 210 m = 15 STG Outlet Dia - 2.00.
 16. Providing, laying and jointing HDPE pipes of specified grade and conforming to IS 4984-2016 with latest amendments and conveying to work site including loading and unloading at both destinations and rolling and lowering into trenches, laying true to line and jointing of pipes and specials with electrofusion welding, giving hydraulic test as per relevant ISS with all lead and lifts including encasing the pipe around to a depth of not less than 15 cms. with soft gravel or selected earth available from the excavation, testing and commissioning. The rate is exclusive of required specials and fittings wherever necessary like saddle Tee, stub ends, flanged sets, bends, reducers etc. complete (Contractor will make his own arrangements for procuring water for testing) etc. complete. NOTE: Upto 110mm dia Coil shall be used. For :HDPE PE 80 PN 6.0 HDPE Grade PE80-PN6.0, 63mm dia
 17. Supply and delivery at site of brand new best make non-return valve as per IS 778/1984 with ISI Mark and as per its latest amendments Size 65 mm.
 18. Supply of ISI mark 175mm nominal bore, plain and steel casing pipe grade of steel Fe 410 of wall thickness conforming to IS 4270-2001 and latest amendments, electrical resistance welded steel tubes, material and conforming to IS 1387-1993 and manufactured by basic open hearth electric or basic oxygen process in random length of 5-7m both ends. threaded conforming to IS 554-1985 one end fixed with socket conforming to IS 4270-2001 and the other end with screwed pipes all shall be responsibly free from defects. The tubes shall be responsible straight end should be with ISI marking weighing 25.10kg/m. prices include Collar-Medium duty
 19. Supply and delivery at site of brand new best make gate valve as per IS 778/1984 with ISI Mark and as per its latest amendments Size 65 mm.
 20. Providing and laying at site of work MS casing caps as per IS 1239 (part-II) 1982 with all latest amendments if any for any dia. The thickness of plate used for covering one end shall be 3mm (minimum). The dimensions of caps and collars shall be strictly as per IS 1239 (Part-II) 1982 with all amendments including cost of material and labour charges for fixing, if any etc. complete with all lead and lifts and as directed by the Engineer in charge.
 21. Providing and fixing MS casing collars as per IS 1239 (part-II) 1982 with all latest amendments if any for any dia. The thickness of plate used for covering one end shall be 3mm (minimum). The dimensions of caps and collars shall be strictly as per IS 1239 (Part-II) 1982 with all amendments
 22. RCC hume pipe Circular pump house: Supplying precast RCC Circular Hume pipe pump house with M.S door and RCC conical roof as per specification and drawings - Internal dia Mtr. 1200 mm & height of 2.5 Mtr. With Wall thickness 65mm
 23. Erection and positioning of RCC Hume pipe pump house/Cistern on size stone masonry platform including transportation charges and handling, finishing with all necessary tools, plants and materials etc., complete as directed by the Engineer in charge of the work.
 24. Earth work excavation for pipelines/cables by Manual means upto 600 mm trench width, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, removal of stumps and other deleterious matter, including dressing of excavated surfaces, disposing off or leveling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m. Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering and lift upto 1.5 m including cost of labour, tools, usage & other appurtenances required to complete the work. (PWD SR 2023-24, Vol. 02 Item Code; 1.6.1)
 25. Providing and constructing load bearing wall with Solid Concrete blocks of size 400x200x200mm having block density more than 1800kg/m³ and minimum compressive strength of 4.00 N/mm² conforming to IS 2185 (Part - I) - 2005 and constructed with CM 1:4 as per IS 2572:2005 including

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cost of all materials, labour, scaffolding and curing, usage charges of machinery etc complete as per specifications and as per the direction of Engineer Incharge (PWD SR 2023-24 Vol. 02 Item Code: 6.32)

26. Providing and laying in position Cement Concrete for all Sub structures of building, Irrigation works, Sub structure works of bridges, Drain works & other parallel works from 0.50m to 3.50 m height. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticisers, laid in layers, well compacted using needle vibrators, providing weep holes wherever necessary, including all lead & lifts, cost of all materials of quality, confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications. As per the direction of Engineer Incharge. (for DPC and Flagging Concrete (PWD SR 2023-24 Vol. 01 Item Code 2.4.1)
27. Fabricating supplying and mounting MS box made out... SWG suitable for floor /wall mounting fully weather proof with provision for better heat disipation. Provided with hinged front cover, equipped with tamper proof locking arrangements, with suitable size clamps with necessary cable entry pipe with gland and box should be finished with 2 coats of red oxide primer paint and finally finished with approved colour enameled metal paint etc., complete 16SWG.
28. Supplying and fixing angle iron frame work fabricated out of M.S. angle iron.. and M.S. flat ... with bolts, washers etc., and painted with 2 coats of red oxide and then two coats of approved paint.
29. Supplying, fixing and wiring 50/5 to 400/5Amps 5VA burden Current Transformer. Class 0.5 accuracy with Tape Wound.
30. Supplying and fixing of LED type panel board indicating lamp with required colour suitable for 230/440v A.C. 50 Hz 12/24v D.C.
31. Supplying fully automatic star-delta starter unit push button type with suitable wires, 3 contactors, one adjustable thermal timer mounted on a common base plate held in steel enclosure for use on 400/440 volts 3 phase and wired after fixing to the existing wooden board for motor. Upto 12.5 HP.
32. Supplying and fixing single phase preventer using necessary wires over an existing panel board suitable for motor up to 20 HP capacities.
33. Supplying of TPST with rewirable porcelain channels in SM enclosure. Made out of 14 SWG powder coated paint of approved colour. 63Amps
34. Supplying, fixing and wiring heavy duty low voltage capacitors conforming to IS 2834. 3 phase, 400/440 volts grade, for power factor improvement of rotating machineries like induction motor.
35. Supply and fixing polished wood board made of not less than 15mm thick plank on both sides of not more than 2 pieces and fixing the same to the wall using tapered inverted wooden plugs screws. 20"x20"x2.5"
36. Supplying & fixing of Porcelain fuse channel with cut out on existing wooden/panel using necessary nuts, bolts and washers. 63Amps
37. Supplying, fixing and wiring 0 to 600Volts 96x96mm AC Voltmeter on existing panel/wood board.
38. Supplying, fixing and wiring 0 to 100amps Direct Reading AC analog type Ammeter
39. Wiring for lighting /Power Circuit using one FRLS/PVC insulated 1100v Grade, multistrand Copper with Low conductor resistance single core wire in open or concealed system of wiring with specified IS 694 confirming to latest amendments. 6 sqmm

- II. **Drinking Water (RO Unit) 1No-** Water purification plants: Providing, Installation and Commissioning of automatic Water purification plant (RO+UF) with all accessories piping, product water tank on single phase power supply as per the enclosed detailed Technical Specifications including cost of material, loading and unloading and as directed by the Engineer in charge. (Ref- detailed specification enclosed separately). Note:- 1. The above rates mentioned are only for the preparation of estimate purpose. 2. All items are to be of BSI /NFS standards, with BSI / NFS mark. 3. Tenders to be invited for procurement. 4. No direct payment should be made under any situation or condition or on any account. 5. After commissioning of plant necessary testing to be done for the satisfactory of Engineer Incharge. Note : Refer the ANNEXURE : F for Detailed Specification of Each components. For 500 LPH SS : Skid Type (Indoor mounting)

mm. Solar Panel – 8 No's

77. Supplying Installation, Testing and Commissioning of on-grid Solar Photovoltaic Power Plant conforming to various applicable standards BIS, IEC, MNRE guidelines, the Central Electricity Authority Regulations and CPWD Specifications as amended up to date, consisting of Mono/Poly Crystalline silicon solar cells module, net metering facility, necessary control, protections, earthing, cabling, mounting structure, junction boxes, power conditioning units, Real time online web interfaced Data Monitoring System, Distribution panels, grid connecting arrangement, conduits, pipes, cable trays and other accessories etc. as required
78. High Energy Efficiency Solar Photovoltaic Module of capacity 330 Wp or above, manufactured in India, conforming to IS 14286/IEC 61215, IS/IEC 61730-Part-1, IS/IEC 61730-Part-2. Solar Photovoltaic Module conversion efficiency shall not be less than 23% at STC with temperature coefficient of Pmax better than -0.30% per 0C. PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years. Solar Modules shall be designed to operate in relative humidity upto 100% with temperature between -10 0C and +85 0C. Further, each PV module used in any solar power project must have Radio frequency identification tag with information such as name of manufacturer, month and year of manufacturing, country of origin (separately for Solar cell and module), I-V curve, Unique Serial No and Model No of the module, Wattage, Im, Vm and FF, name of test lab issuing IEC certificate.
79. Power Conditioning Unit (PCU) of 350-800 V DC Input voltage range and 415 V AC, three phase, 4 wire, 50Hz +/- 2.5 Hz, output voltage suitable to generate AC with a variation of 10% at nominal voltage. Power with efficiency not less than 97%, total harmonic distortion less than 3% and suitable for ambient temperature from 0 to 50 0C, Minimum IP-65 for outdoor and Minimum IP 21 for indoor, Built-in meter and data logger, MPPT, switching devices IGBT/MOSFETs and controller Microprocessor /DSP. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown. The PCU shall be able to withstand unbalanced load conforming to IEC standard with shutdown/standby mode. It must be provided with grid islanding along with manual disconnect pole isolation switch besides automatic disconnection. Minimum protections: Mains Under / Over Voltage, Over current, Over/Under grid frequency, Over temperature, Surge voltage induced at output due to external source, Short-circuit, Lightening, Anti Islanding (for grid synch.Mode) and other protections as per applicable standards. LCD/LED display of minimum parameters: DC input voltage, DC current, AC Voltage and current (all 3 phases, in case of 3 phase), Instantaneous & cumulative AC output power, Daily DC energy produced and other parameters applicable standard. Communication interface RS 485 / RS 232.
80. Module mounting structure: The roof top solar plant generation units shall be installed by using supporting Aluminium/Galvanized MS structure (mass of zinc coating shall be as per IS4759) having minimum head room clearance of 2.4 meter above the terrace level / ground level. The mounting structure would be designed to sustain wind load and seismic parameter of the site of installation. All the structure shall be design as per applicable BIS code and the material shall also confirm the applicable BIS Code. Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. The suitable arrangements for maintenance and cleaning shall be provided.
81. Real time online web interfaced Data Monitoring System complete with accessories for various parameters such as Solar Irradiance, temperature, AC Output Voltage and current, Output Power, Power factor, DC Input Voltage and Current, Time Active, Time disabled, Time Idle, Power produced and other parameters as per standard practices.
82. Array junction box & Main junction box with IP 65 protection and termination arrangement for incoming and outgoing cable along with glands, lugs and other accessories etc. as required. Each junction box shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy with full dust, water & vermin proof arrangement with High quality Suitable capacity Metal Oxide Varistors(MOVs) (semiconductor diode with resistant applied voltage)/ surge arrestors and suitable Reverse Blocking Diodes, isolation switches isolate the DC input to Inverter, copper bus bar etc.
83. Lightning, surge voltage protection, earthing protection and grid islanding
84. Cables: Connections & Interconnections by required size IR/UV protected XLPE insulated copper

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conductor 1.1 kV grade armored power and control cables (ISI Marked) along with supplying & fixing of necessary channel/conduit, GI cable trays, supports, lugs, thimble and other accessories etc. as required

85. DC Distribution Board And AC Distribution Panel Board: IP65, free standing, metal clad, having copper bus bar, having required protection and control gears, connection-interconnection, etc. as required (DSR-EM-2025 Chapter - 17, Item No 17.1)

nn. Rainwater Harvesting

1. Earth work excavation for pipeline trenches in all kinds of soils by mechanical means as per drawing and technical specifications, including setting out, construction of shoring, strutting, barricading, caution lights, bracing, using sight rails & bonding rods at every 100 mm wherever necessary as directed, removal of stumps and other deleterious matter, dressing of sides and levelling the bottom of trench to the extent required, utilising the available excavated earth locally for the work etc., and all other appurtenances complete in the following strata. : Depth exceeding 1.5 m, but not exceeding 3 m.

2. Earth work excavation for pipeline trenches in all kinds of soils by mechanical means as per drawing and technical specifications, including setting out, construction of shoring, strutting, barricading, caution lights, bracing, using sight rails & bonding rods at every 100 mm wherever necessary as directed, removal of stumps and other deleterious matter, dressing of sides and levelling the bottom of trench to the extent required, utilising the available excavated earth locally for the work etc., and all other appurtenances complete in the following strata. : Ordinary/soft rock (without requiring blasting) Depth exceeding 3 m, but not exceeding 4.50 m

3. Providing S&S RCC SPUN / VIBRATED CAST PIPES (REINFORCED) pipes NP-3 Class conforming to IS:458-1988 with latest amendments using ordinary portland cement, for sanitary works and conveying to work site, rolling and lowering into trenches, laying true to line and level including loading and unloading at both destinations and jointing of pipes and specials, perfect linking of joints with jack to correct position including cost of jointing materials, i.e, rubber rings conforming to IS: 5382 for S&S RCC pipes, with all leads and lifts as directed and giving necessary hydraulic test as per ISS to the required pressure and commissioning etc. complete. (Contractor will make his own arrangements for procuring water for testing). Before the execution of the work, the contractor shall carry out the survey..

4. Supplying, filling, spreading & leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.

5. Supplying, filling, spreading & leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads & lifts, all complete as per direction of Engineer-in-charge.

6. Supplying, filling, spreading & leveling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads & lifts, all complete as per direction of Engineer -in-charge.

7. Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations and other similar works etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.

8. Providing and laying in Reinforced cement concrete for all Basement & surface level works, return walls, retaining walls, sunken floors etc. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticisers, laid in layers, well compacted using needle vibrators, providing weep holes wherever necessary, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machinery, curing and all other appurtenances required to complete the work as per technical specifications. (The cost of steel reinforcement & formwork to be paid separately).

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9. Supplying, fitting and placing TMT FE 550 / 550D Steel Reinforcement including cost of all materials, machinery, labour, cleaning, straightening, cutting, bending, hooking, lapping/welding joints, tying with binding wire / soft annealed steel wire and other ancillary operations complete as per drawing and technical specification.

10. Providing PVC ringite pipes conforming to IS 4985:2000 with latest amendments and conveying to worksite, rolling and lowering into trenches, laying true to line and level and perfect linking at joints, testing and commissioning, including loading unloading at both destinations and cuts of pipes wherever necessary including jointing of PVC pipes and specials (excluding cost of specials) with jointing of approved type, with all labour with all lead & lift including encasing the pipe around to a depth of not less than 15 cms. with soft gravel or selected earth available from the excavation etc. complete and giving necessary hydraulic test to the required pressure as per ISS (Contractor will make his own arrangements for procuring water for testing) etc. complete For : PVC pipes 160mm dia, 6 kg/sqcm & class 3

oo. U G Sump

1. Earth work excavation for Foundation by mechanical means for all works & depth upto 3 m, as per drawing and technical specifications, including setting out, shoring, strutting, barricading, caution lights, including dressing of excavated surfaces, disposing off or levelling the excavated earth or sorting & stacking the selected earth for reuse in a radius of 50 m and lift upto 1.5 m including cost of labour, tools, usage of machinery & other appurtenances required to complete the work In all kinds of soils Depth upto 3 m .As per the direction of Engineer Incharge.

2. Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations and other similar works etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m. As per the direction of Engineer Incharge

3. Providing and laying in position Cement Concrete for levelling course for all works in foundation. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed, laid in layers not exceeding 150 mm thickness, well compacted using plate vibrators, including all lead & lifts, cost of all materials of quality, labour, Usage charges of machinery, curing, and all the other appurtenances required to complete the work as per technical specifications. Mix 1:3:6 Using 40 mm nominal size graded crushed coarse aggregates. As per the direction of Engineer Incharge.

4. Providing and laying in position Cement Concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications. M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. As per the direction of Engineer Incharge. For Footing Including shuttering.

5. Providing and laying in position Cement Concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications. M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. As per the direction of Engineer Incharge. For wall Including shuttering

6. Providing and laying in position Cement Concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications. M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. As per the direction of Engineer Incharge. For slab Including shuttering

7. Providing and laying in position Cement Concrete for all Foundation works. The granite/trap/basalt crushed graded coarse aggregates and fine aggregates as per relevant IS Codes machine mixed with super plasticizers laid in finished layers, well compacted using needle vibrators, including all lead & lifts, cost of all materials, quality confirming to the requirements of relevant IS codes, labour, Usage charges of machinery, curing and all the other appurtenances required to complete the work as per technical specifications. M25 Design Mix Using 20 mm nominal size graded crushed coarse aggregates. As per the direction of Engineer Incharge. For Beam Including shuttering

8. Supplying, fitting and placing TMT FE 550 / 550D Steel Reinforcement including cost of all materials, machinery, labour, cleaning, straightening, cutting, bending, hooking, lapping/welding joints, tying with binding wire

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/ soft annealed steel wire and other ancillary operations complete as per drawing and technical specification. As per the direction of Engineer Incharge.

9. Providing and laying water proofing treatment to the Retaining wall area with PU Elastomeric Single component liquid applied, cold applied, moisture cured high tensile elastomeric PU waterproofing membrane having elongation of more than 400% and having solid content of above 90% @1.6kg/m² in 2 coats to achieve final DFT (Dry Film Thickness) of 1mm including prime coat of epoxy primer @150 g/m². The cost is inclusive of surface preparation, crack filling, repair of loose mortar etc. completely as per specification

10. Providing and fixing MS inspection door of size 60 cms x 60 cms, including MS frame made of 50x50x6mm angle, shutters made of 3mm thick MS sheets, with hinges, locking arrangements at top etc. including painting with anticorrosive approved paint etc. complete including all lead and lifts etc.

pp. External Electrification work

1. Supply and erection of 9 Mtr RCC Pole including earth work etc., complete as per the standard technical specification of BESCOM.. RCC Pole - 9 Mtr Long, 150 Kg WL Sq Section.

2. Supply and erection of Double Pole TC structural set including all hardware suitable for 100/300 kVA 4/5 Star Rated Transformer on RCC Pole - 9 Mtr Long, 145 Kg WL – GI.

3. Supplying and Fixing including all Hardware etc complete as per the standard technical specification of BESCOM - 11 kV, 200 Amps Single Break GOS.

4. Supplying and Fixing H - Frame Set for fixing 11 kV, 200 Amps Single Break GOS - (For DP structure for providing New GOS for sectionalisation) – GI.

5. Supplying and Fixing including all Hardware etc complete as per the standard technical specification of BESCOM - 11 kV, HG Fuse Unit with Solid Core Insulator.

6. Supplying and Fixing including all Hardware etc complete as per the standard technical specification of BESCOM. - 10 kV, 5 kA Lightning Arrester Polymeric type with GROUND DISCONNECTOR.

7. PSCC Pole - 9 Mtr Long, 200 Kg WL (Dwg No. BESCOM/GM/QS&S/50 Dtd 24.11.2018) as per REC Standards.

8. Supply and fixing ofcross arm including all Hardware complete as per the standard technical specification BESCOM - 11 kV, Horizontal Cross Arm - Galvanised Iron (GI).

9. Supplying and Fixing including all Hardware etc complete as per the standard technical specification BESCOM - HT ST Support 50x8 mm Flat – GI.

10. Supplying and Fixing Strain Clamp, 3 Bolt type for 70/90 kN Disc Insulator including all Hardware etc complete as per the standard technical specification of BESCOM.

11. Supplying and Fixingincluding all Hardware etc complete as per the standard technical specification BESCOM - 11 kV, 5 kN Composite/Polymeric Pin Insulator (24 mm dia FRP Rod).

12. Supplying and Fixing including all Hardware etc complete as per the standard technical specification BESCOM - GUY Set .

13. Spiral Earth Electrode.

14. Supplying and fixing of DANGER / CAUTION board.

15. Jelly Spreading (20-25 mm) : Supplying and providing jelly in the station yard of uniform thickness of 100 mm including the cost of materials, labour charges, required tools and plants etc., complete. Work shall be carried out as per the instructions of Engineer- in-charge of works as per the standard procedure.

16. Distribution Transformer - 3 Phase, 11kV/433V - Stacked CRGO Core with Oil as per IS-1180 (Part-1): 2014 CABLE ENTRY TYPE, 63 kVA, Aluminum Wdg, Star 2 (5 Star).

17. For Distribution Transformer Centre (DTC) MS Box for housing the ETV Meter 3 Phase 4 Wire 5 Amps, with associated LT CT 0.5 Accuracy Class, ring type, with wiring Clamps, B&N and all other accessories required.

(EXCLUDING ETV METER) With CT Ratio 100/5 for 50/63 kVA DTC.

18. LT 3 Phase, 4 Wire, CT Operated DLMS Complaint ETV Meter-5A, class 0.5s Accuracy (Used for 25 HP/18KW & Above Installations, DTC Metering).

19. 1.1 kV, XLPE or Heat resistant PVC insulated, PVC extruded Inner Sheath Armoured LTUG Cable as per IS-1554 (Part-

1) or IS-7098 Part-1, Armouring strip thickness and resistivity as per IS-3975 50 Sqmm, 3.5 Core, (16 GI Strips - 4 x 0.8 mm).

20. Epoxy Terminating Kit (Pothead) suitable for 1.1 kV, LTUG Cable, Up to 4C x 50 Sqmm.

21. Alkathine tube, Transparent Alkathine tube 19 mm dia, 2 mm thick in coils of 30 Mtr.

22. Supplying and fixing of class B GI pipe on pole/wall/drain crossing with necessary clamping arrangements

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for UG cable of 1.1 KV class - 100 mm.

23. Supplying fixing and wiring earthelectrode for grounding of lifts, transformers, DG set etc. using 40mm dia 2.9mm thick 2.5m long GI pipe with GI funnel with mesh and suitable sized reducer fixed on the top of the earthelectrode. The funnel should be enclosed in a CC chamber of 400x400x400mm with a cast iron cover. The earthelectrodes shall have staggered holes of 12mm dia and the electrodes should be covered 150mm all-

round with alternate layers of salt and charcoal from the bottom of the CC chamber. The connection from the electrode is to be established through GI strip using GI bolts and nuts.

24. GI/Copper strips for grounding connections, using necessary fixing materials as required. 25 x 6 mm GI strip.

25. Guy Wire & GI Wire as per IS-2141, 8 SWG GI Wire (4.064 mm Dia), Std Wt: 131 Kg/KM.

26. LT Protection Kit

(Dwg No. BESCOM/GM/QS&S/10 Dtd 24.11.2018).

27. b) LT Wiring (From DTC to LT Line Through Metering Box & LT Protection Kit) SINGLE CIRCUIT (Material Charges).

28. PVC Wire - 95 Sqmm Al Wt: 25 Kg, Total Wt: 36 Kg/100 Mtr Coil.

29. 95 Sqmm Copper Terminal, Apprx Wt: 58 Gm.

30. PG Clamp Rabbit to Insulated Wire 95 Sqmm (Dwg No. BESCOM/GM/QS&S/43).

31. For TC Wiring (Dwg No. BESCOM/GM/QS&S/38).

32. GI Fish Plate.

33. GI Barbed Wire 12 SWG

34. Supply and erection of 9 Mtr RCC Pole including earth work etc., complete as per the standard technical specification of BESCOM.. RCC Pole - 9 Mtr Long, 150 Kg WL Sq Section.

35. Supply and erection of Double Pole TC structural set including all hardware suitable for 100/300 kVA 4/5 Star Rated Transformer on RCC Pole - 9 Mtr Long, 145 Kg WL – GI.

36. Supplying and Fixing including all Hardware etc complete as per the standard technical specification of BESCOM - 11 kV, 200 Amps Single Break GOS.

37. Supplying and Fixing including all Hardware etc complete as per the standard technical specification of BESCOM - 11 kV, 200 Amps Single Break GOS.

38. Digging of Pit 1.6 Mtr depth for erection of 7.5/8 Mtr Long Steel/RCC/PSCC supports as per approved Drawing.

39. Erection of RCC/PSCC Pole of 7.5 to 8 Mtr long in a pit of 1.5 Mtr depth.

40. Fixing of GUY Set with break insulator making use of 7/3.15 mm (7/10 SWG) galvanised steel wire with turn buckle and anchoring arrangement as per approved drawing. (Excluding excavation of PIT) but using 2 nos of No. 15 Strain Insulator.

41. Digging of Pit for GUY SET ,Hard Soil.

42. Providing Spiral Earth Electrode type earthing (without charcoal, salt etc.,).

43. Stringing of conductor Rabbit ACSR, binding of conductor on each insulator and dead ending on strain or disc/strain insulator by means of clamps.

44. Pole Clamp-145 mm x 95.

45. Fixing of 2 Pin cross arm with Insulator and Braces fixing.

46. Fixing of 4 Pin cross arm with Insulator and Braces fixing.

ANY ITEM ESSENTIALLY REQUIRED FOR COMPLETION OF THE BUILDING PROPOSED BY THE EMPLOYER.

2.1.2 Special and General Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B Building Area.

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Devarahatti

Sl. No.	Particulars	Built up area in Sqmts	Remarks
1	Ground Floor	670.72 Sqm	Office, principal Room, Staff Room, Labs, Sports & Toilets
2	First Floor	622.76 Sqm	Class Room
3	Second Floor	622.76 Sqm	Class Room
4	Third Floor	412.72 Sqm	Class Room
5	Terrace Floor	23.18 Sqm	
	Total Built up Area	2352.14 Sqm	

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SECTION 3: QUALIFICATION INFORMATION

The information to be filled in by the Tenderer hereunder will be used for purposes of computing Tender Capacity as provided for in Clause 3 of the Instructions to Tenderers. This information will not be incorporated in the Contract.

3.1 Constitution or legal status of Tenderer

[Attach copy]

Place of registration:

Principal place of business:

Power of attorney of signatory of Bid

[Attach]

3.2

Description	Year	Value of the work
Total value of Civil Engineering construction work ¹ executed and payments received in the last five years (in Rs. lakhs)	2020-21	
	2021-22	
	2022-23	
	2023-24	
	2024-25	

3.3 Work performed as prime contractor (in the same name) on works of a similar nature over the last five years.

Project Name	Name of the Employer*	Description of work	Contract No.	Value of contract (Rs. Millions)	Date of issue of work order	Stipulated period of completion	Actual date of completion*	Remarks explaining reasons for delay in completion of work
2020-21								
2021-22								
2022-23								
2023-24								
2034-25								

3.4 Quantities of work executed as prime contractor (in the same name and style) in the last five years:

Year	Name of the Work	Name of the Employer*	Quantity of work performed				Remarks (indicate contract Ref)
			As per clause 3.2				
2020-21							
2021-22							
2022-23							
2023-24							
2024-25							

3.5 Information on which Tenders have been submitted and works which are yet to be completed as on the date of this Tender.

¹ Attach certificate (s) from Chartered Accountant

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(A) Existing commitments and on-going works:

Description of work	Place & State	Contract No. & Date	Name & address of Employer	Value of Contract (Rs. Crores)	Stipulated period of completion	² Value of work remaining to be completed (Rs. lakhs)	Anticipated date of completion

(B) Works for which Tenders already submitted:

Description of work	Place & State	Name & address of Employer	Value of Contract (Rs. Crores)	Stipulated period of completion	Date when decision is expected	Remarks if any

3.6 The following items of equipment are considered essential for successfully carrying out the works. The Tenderer should list all the information requested below.

Item of Equipment	Requirement		Owned	Owned and Available		Remarks
	No.	Capacity		No./Capacity	Age / Condition	

3.7 Reports on the financial standing of the tenderer, such as profit and loss statements and auditors reports for the last five years;

3.8 Qualification and experience of the key technical and management personnel in permanent employment with the tenderer and those that are proposed to be deployed on this contract, if awarded.

3.9 Name, address, and telephone, telex, and fax numbers of the Tenderers' bankers who may provide references if contacted by the Employer.

3.10 Evidence of access to financial resources to meet the qualification requirement specified in ITT Clause 3.3 (b): Cash in hand, Letter of Credit etc. List them below and attach certificate from the Banker in the suggested format as under:

² Attach certificate(s) from the Engineer(s)-in-Charge

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3.11 Clause Not Operated

Proposals for subcontracting components of works amounting to more than 20% of the contract price.

Item of Work	Value of Subcontract	Identified Sub-Contractor (Name and address)	Experience of similar work*

*Attach certificates from the respective Employers.

3.12 Information on litigations in which the Tenderer is involved:

Other Party (ies)	Employer	Details of dispute	Amount involved	Remarks showing present status

3.13 The proposed methodology and program of construction, backed with equipment planning and deployment, duly supported with broad calculations and quality control procedures proposed to be adopted, justifying their capability of execution and completion of the work as per technical specifications within the stipulated period of completion as per milestones.

BANKER’S CERTIFICATE

This is to certify that M/s. is a reputed company with good financial standing. If the contract for this work, namely " **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B** is awarded to the above firm, we shall be able to provide overdraft/credit facilities to the extent of Rs. to meet the working capital requirements for executing the above contract.

Name of the Bank,
Senior Bank Manager,
Address

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

SECTION 4: FORMS OF TENDER, LETTER OF ACCEPTANCE, NOTICE TO PROCEED WITH THE WORK AND AGREEMENT FORM

Form of Tender

Description of the Works: Tenders for the work of " **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B**

To:

The Managing Director,
RGHCL, 9th Floor E & F Block Cauvery Bhavan,
KG Road, Bangalore 560009.

GENTLEMEN,

We offer to execute the Works described above in accordance with the Conditions of Contract accompanying this Tender for the Contract Price of Rs. *[in figures]* _____ *[in letters]*.

This Tender and your written acceptance of it shall constitute a binding contract between us. We understand that you are not bound to accept the lowest or any Tender you receive.

We undertake that, in competing for (and, if the award is made to us, in executing) the above contract, we will strictly observe the laws against fraud and corruption in force in India namely "Prevention of Corruption Act 1988".

We hereby confirm that this Tender complies with the Tender validity and Earnest money deposit required by the Tender documents.

We attach herewith our current income tax clearance certificate.

Yours faithfully,

Authorized Signature:

Name & Title of Signatory:

Name of Tenderer

Address:

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

Letter of Acceptance

(Letter head paper of the Employer)

No.

Date:

To:

[Name and address of the Contractor]

Dear Sirs,

This is to notify you that your Tender dated _____ for execution of the work of Tenders for the work of "**Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B**" for the Contract Price of Rupees _____ (Rs. _____) [amount in words and figures], as corrected and modified in accordance with the Instructions to Tenderers is hereby accepted by our Agency.

You are hereby requested to furnish Security deposit plus additional security for unbalanced tenders in terms of Clause 25.5 of ITT, in the form detailed in Clause 29.1 of ITT for an amount of Rs. _____ within 20 days of the receipt of this letter of acceptance valid up to 30 days from the date of expiry of Defects Liability Period i.e. up to and sign the contract, failing which action as stated in Para 29.4 of ITT will be taken.

Yours faithfully,

General Manager (S D),
RGHCL, 9th Floor E & F Block Cauvery Bhavan,
KG Road, Bangalore 560009

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

Issue of Notice to proceed with the work
(letterhead of the Employer)

No:
Date

To

(name and address of the Contractor)

Dear Sirs:

Pursuant to your furnishing the requisite security deposit as stipulated in ITT Clause 29.1 and signing of the contract agreement for the work of “ ” **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B**

Tender Price of Rs. _____, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully,

General Manager (S D),
RGHCL, 9th Floor E & F Block Cauvery Bhavan,
KG Road, Bangalore 560009

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

AGREEMENT FORM

Agreement

This agreement made the _____ day of _____ 2024 between The General Manager (SD) on behalf of The Managing Director, RGHCL, Bangalore (hereinafter called “the Employer”) of the one part and _____ [name and address of contractor] (hereinafter called “the Contractor”) of the other part.

Whereas the Employer is desirous that the Contractor execute the Tenders for the work of " **Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B** (hereinafter called “the Works”) and the Employer has accepted the Tender by the Contractor for the execution and completion of such Works and the remedying of any defects therein at a contract price of Rupees.....

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they shall be deemed to form and be read and construed as part of this Agreement.
2. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy any defects therein in conformity in all aspects with the provisions of the Contract.
3. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying the defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.
4. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.,:
 - i. Letter of Acceptance.
 - ii. Notice to proceed with the works.
 - iii. Contractor’s Tender.
 - iv. Contract Data.
 - v. Conditions of contract (including Special Conditions of Contract);
 - vi. Specifications.
 - vii. Drawings.
 - viii. Bill of Quantities; and
 - ix. Any other document listed in the Contract Data as forming part of the contract.

In witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____
was hereunto affixed in the presence of:
Signed, Sealed and Delivered by the said _____

in the presence of:

Binding Signature of Employer _____
Binding Signature of Contractor _____

SECTION 5: CONDITIONS OF CONTRACT

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CONDITIONS OF CONTRACT

A. General

1. Definitions

- 1.1. Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but keep their defined meanings. Bold letters are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Tender.

Compensation events are those defined in Clause 38 hereunder.

The **Completion Date** is the date of completion of the Works as certified by the Employer in accordance with Sub Clause 46.1.

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

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or corporate body who's Tender to carry out the Works has been accepted by the Employer.

The **Contractor's Tender** is the completed Tender document submitted by the Contractor to the Employer.

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

Days are calendar days; **months** are calendar months.

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

The **Defects Liability Period** is the period named in the Contract Data and calculated from the Completion Date.

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

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

The **Initial Contract Price** is the Contract Price listed in the Employer's Letter of Acceptance.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Employer by issuing an extension of time.

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

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

The **Site** is the area defined as such in the Contract Data.

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Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Employer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the works. It does not necessarily coincide with any of the Site Possession Dates.

A **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract which includes work on the Site.

A **Variation** is an instruction given by the Employer which varies the Works.

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

2. Interpretation

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

2.2. The documents forming the Contract shall be interpreted in the following order of priority:

- 1) Agreement
- 2) Letter of Acceptance, notice to proceed with the works
- 3) Contractor's Tender
- 4) Contract Data
- 5) Conditions of Contract
- 6) Specifications
- 7) Drawings
- 8) Bill of quantities and
- 9) Any other document listed in the Contract Data as forming part of the Contract.

3. Law governing contract

3.1. The law governing the Contract is the Laws of India supplanted by the Karnataka Local Acts.

4. Employer's decisions

4.1. Except where otherwise specifically stated, the Employer will decide contractual matters between the Employer and the Contractor.

5. Delegation

5.1. The Employer may delegate any of his duties and responsibilities to other people after notifying the Contractor and may cancel any delegation after notifying the Contractor.

6. Communications

6.1. Communications between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective only when it is delivered (in terms of Indian Contract Act).

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7. Subcontracting: Allowed only for the specialized work viz., Electrical, Water Supply and Plumbing.

- 7.1. The Contractor may subcontract with the approval of the Employer but may not assign the Contract without the approval of the Employer in writing. Subcontracting does not alter the Contractors obligations.

8. Other Contractors

- 8.1. The Contractor shall cooperate and share the Site with other contractors, public authorities, utilities, and the Employer.

9. Personnel

- 9.1. The Contractor shall employ the technical personnel (of number and qualifications) as may be stipulated by RGHCL from time to time during the execution of the work. The technical staff so employed shall be available at site as may be stipulated by the Employer.
- 9.2. If the Employer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the work in the Contract.

10. Employer's and Contractor's risks

- 10.1. The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's risks

- 11.1. The Employer is responsible for the excepted risks which are:
- a. rebellion, riot commotion or disorder unless solely restricted to employees of the Contractor or his Sub-Contractors arising from the conduct of the Works; or
 - b. a cause due solely to the design of the Works, other than the Contractor's design; or
 - c. any operation of the forces of nature (in so far as it occurs on the Site) which an experienced contractor:
 - i. could not have reasonably foreseen; or
 - ii. could reasonably have foreseen, but against which he could not reasonably have taken at least one of the following measures.
 - (a) prevent loss or damage to physical property from occurring by taking appropriate measures or
 - (b) insure against such loss or damage

12. Contractor's risks

- 12.1. All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks are the responsibility of the Contractor.

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13. Insurance:

- 13.1. The Contractor shall prior to commencing the works, effect and thereafter maintain insurances, in the joint names of the Employer and the Contractor, (cover from the first working day after the Start Date to the end of Defects Liability Period), in the amounts stated in the Contract Data:
- a. for loss of or damage to the Works, Plants and Materials and the Contractor's equipment.
 - b. for liability of both Parties for loss, damage, death and injury to third parties or their property arising out of the Contractor's performance of the Contract including the Contractor's liability for damage to the Employer's property other than the Works and
 - c. for liability of both Parties and of any Employer's representative for death and injury to the Contractor's personnel except to the extent that liability arises from the negligence of the Employer, any Employer's representative or their Employees.
- 13.2. Policies and certificates for insurance shall be delivered by the Contractor to the Employer for his approval before the Start Date. All such insurance shall provide for compensation to be payable to rectify the loss or damage incurred. All payments received from insurers relating to loss or damage shall be held jointly by the Parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.
- 13.3. If the Contractor fails to effect or keep in force any of the insurances referred to in the previous sub-clauses or fails to provide satisfactory evidence, policies or receipts, the Employer may without prejudice to any other right or remedy, effect insurance for the cover relevant to such default and pay the premiums due and recover the same as a deduction from any other monies due to the Contractor. If no payments are due, the payment of the premiums shall be debt due.
- 13.4. Alterations to the terms of insurance shall not be made without the approval of the Employer.
- 13.5. Both Parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports:

- 14.1. The Contractor, in preparing the tender, shall rely on any site investigation reports referred to in the Contract data, supplemented by any information available to the Tenderer.

15. Queries about the Contract Data

- 15.1. The Employer will clarify queries on the Contract Data.

16. Contractor to construct the Works

- 16.1. The Contractor shall construct the Works in accordance with the Specification and Drawings.

17. The Works to be completed by the Intended Completion Date

- 17.1. The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the program submitted by the Contractor, as updated with the approval of the Employer, and complete them by the Intended Completion Date.

18. Approval by the Employer:

- 18.1. The Contractor shall submit Specification and drawings showing the proposed Temporary Works to the Employer, who is to approve them if they comply with the Specifications and Drawings.

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- 18.2. The Contractor shall be responsible for the design of Temporary Works
- 18.3. The Employer's approval shall not alter the Contractor's responsibility for design of the Temporary Works.
- 18.4. The Contractor shall obtain approval of third parties to the design of third parties to the design of the temporary Works where required.
- 18.5. All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Employer before their use.

19. Safety

- 19.1. The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

- 20.1. Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Employer of such discoveries and carry out the Employer's instructions for dealing with them.

21. Possession of the Site

- 21.1. The Employer shall give possession of all parts of the Site to the Contractor. If possession of a part is not given by the date stated in the Contract Data, the Employer is deemed to have delayed the start of the relevant activities and this will be Compensation Event.

22. Access to the Site

- 22.1. The Contractor shall allow the Employer and any person authorized by the Employer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / assembled for the works.

23. Instructions

- 23.1. The Contractor shall carry out all instructions of the Employer which comply with the applicable laws where the Site is located.

24. Procedure for resolution of Disputes:

“Any Dispute or difference or claim arising out of, or in connection with, or relating to the present contract or the breach, termination or invalidity thereof, shall be referred to MD RGHCL & the decision of the MD, RGHCL is final and binding.

B. Time Control

25. Program

- 25.1. Within the time stated in the Contract Data the Contractor shall submit to the Employer for approval a Program showing the general methods, arrangements, order, and timing for all the activities in the Works.

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

- 25.2. The Employer's approval of the Program shall not alter the Contractor's obligations. The Contractor may revise the Program and submit it to the Employer again at any time. A revised Program is to show the effect of Variations and Compensation Events.

26. Extension of the Intended Completion Date

- 26.1. The Employer shall extend the Intended Completion Date if a Compensation Event occurs or a Variation is issued, which makes it impossible for Completion to be achieved by the Intended Completion Date.
- 26.2. The Employer shall decide whether and by how much extend the Intended Completion Date within 21 days of the Contractor asking the Employer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information.

27. Delays ordered by the Employer

- 27.1. The Employer may instruct the Contractor to delay the start or progress of any activity within the Works.

28. Management meetings

- 28.1. The Employer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the progress achieved and the plans for remaining work.
- 28.2. The responsibility of the parties for actions to be taken is to be decided by the Employer either at the management meeting or after the management meeting and stated in writing to be distributed to all who attended the meeting.

C. Quality Control

29. Identifying defects

- 29.1. The Employer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Employer may instruct the Contractor to search for a Defect and to uncover and test any work that the Employer considers may have a Defect

30. Tests

- 30.1. If the Employer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no Defect the test shall be a Compensation Event.

Tests / Quality Assurance:

The successful Contractor to establish field laboratory for conducting day to day testing of the materials viz., coarse aggregate, fine aggregate, sand, water, cement, steel and other materials used for the work etc., an casting of mortar and concrete cubes and its testing as per relevant Indian Standards. The tests are to be conducted in the presence of the Engineer or the PMC or Third-Party Consultant engaged by the Employer. The Employer is intending to engage a qualified PMC and Third-Party Consultant to supervise the work and Contractor to extend suitable cooperation to the Agency. The test results in standard format as per relevant codes IS codes, NBC, IRC, ASTM, etc and other codes as per frequency to be conducted periodically and to be maintained/documentated in the register.

The Cement and Reinforcement steel are to got tested in the approved laboratories and test results furnished periodically as per relevant Indian Standards

Employer can also independently get tested materials and conduct nondestructive tests on the structures at his discretion if the work is found to be sub-standard. In case of failed result, the contractor has to bear the expenses and also repair the structure to the satisfaction of the Employer at his cost.

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31. Correction of defects

- 31.1. The Employer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
- 31.2. Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the length of time specified by the Employer's notice.

32. Uncorrected defects

- 32.1. If the Contractor has not corrected a Defect within the time specified in the Employer's notice, the Employer will assess the cost of having the Defect corrected, and the Contractor will pay this amount.

D. Cost Control

33. Bill of Quantities (BOQ)

- 33.1. The BOQ shall contain items for the construction, installation, testing, and commissioning work to be done by the Contractor.
- 33.2. The BOQ is used to calculate the Contract Price. The Contractor is paid for the quantity of the work done at the rate in the BOQ for each item – **NOT OPERATED**
- 33.3. Payment mode for contract for each School buildings.

Stage of the work	% payment	Amount (rounded) (Rupees)
Foundation and up to plinth	20%	10043358
Ground floor slab	10%	5021679
1st floor slab	10%	5021679
2nd floor slab	10%	5021679
3 rd floor slab	10%	5021679
Finishing complete	35%	17575876
Handing over of key to Residential welfare association	2%	1004335
Handing over of Residential as build drawing	2%	1004335
Maintenance period and defect liability period 1 year	1%	502167
Total	100%	50216790

34. Variations Not Operated

- 34.1. The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him
- Increase or decrease of any item of work included in the Bill of Quantities (BOQ).
 - Omit any dwelling block/units/item of work; **DELETED**
 - Change the character or quality or kind of any item of work; **DELETED**
 - Change the levels, lines, positions and dimensions of any part of the work; **DELETED**
 - Execute additional items of work of any kind necessary for the completion of the work; and **DELETED**
 - Change in any specified sequence, methods or timing of construction of any part of the work. **DELETED**

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- 34.2. The Employer shall have power to order the Contractor to do any or all of the following as considered necessary or advisable during the progress of the work by him
- 34.3. The Contractor shall be bound to carry out the work in accordance with any instructions in this connection, which may be given to him in writing by the Employer and such alteration shall not vitiate or invalidate the contract.
- 34.4. Variations shall not be made by the Contractor without an order in writing by the Employer, provided that no order in writing shall be required for increase or decrease in the quantity of an item appearing in the BOQ so long as the work executed conforms to the approved drawings.
- 34.5. The Contractor shall promptly request in writing the Employer to confirm verbal orders and the officer issuing oral instructions shall confirm it in writing within 30 days, failing which the work shall be carried out as though no variation. In case variation is approved it shall be accompanied by BOQ, failing which the contractor shall be responsible for deviation if any. Further approval of Government has to be obtained for the variation exceeding 5%.

35. Payments for Variations

- 35.1. Payment for increase in the quantities of an item in the BOQ up to 25% of that provided in the Bill of Quantities shall be made at the rates quoted by the Contractor.
- 35.2. For quantities in excess of 125% of the tendered quantity of an item as given in the BOQ, the Contractor shall be paid at the rate entered in or derived from in the Schedule of Rates (applicable for the area of the work and current at the time of award of contract) plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract. - **Not Operated**
- 35.3. If there is no rate for the additional, substituted or altered item of the work in the BOQ, efforts would be made to derive the rates from those given in the BOQ or the Schedule of Rates (applicable for the area of the work and current at the time of award of contract and if found feasible the payment would be made at the derived rate for the item plus or minus the overall percentage of the original tendered rates over the current Schedule of Rates prevalent at the time of award of contract - **Not Operated**
- 35.4. If the rates for additional, substituted or altered item of work cannot be determined either as at 35.1 or 35.2 or 35.3 above, the Contractor shall be requested to submit his quotation for the items supported by analysis of the rate or rates claimed, within 7 days. - **Not Operated**
- 35.5. If the Contractor's quotation is determined unreasonable, the Employer may order the Variation and make a change to the Contract Price which shall be based on Employer's own forecast of the effects of the Variation on the Contractor's costs. - **Not Operated**
- 35.6. If the Employer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, no quotation shall be given, and the Variation shall be treated as a Compensation Event. - **Not Operated**
- 35.7. Under no circumstances the Contractor shall suspend the work on the plea of non-settlement of rates for items falling under this Clause.

36. Submission of bills for payment

- 36.1. The Contractor shall submit to the Employer monthly bills of the value of the work completed less the cumulative amount paid previously.

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36.2. The Employer shall check the Contractor's bill and determine the value of the work executed which shall comprise of (i) value of the quantities of the items in the BOQ completed and (ii) valuation of Variations and Compensation Events.

36.3. The Employer may exclude any item paid in a previous bill or reduce the proportion of any item previously paid in the light of later information.

37. Payments

37.1. Payments shall be adjusted for deductions for advance payments, other recoveries in terms of the contract and taxes, at source, as applicable under the law. The Employer shall pay the Contractor the within 60 days of submission of bill. The Contractor shall be liable to pay liquidated damages for shortfall in progress. A payment for the progress beyond the agreed program is subject to availability of the grants.

37.2. Items of the Works for which no rate or price has been entered in will not be paid for by the Employer and shall be deemed covered by other rates and prices in the Contract.

38. Compensation events

38.1. The following are Compensation events unless they are caused by the Contractor:

- a. The Employer does not give access to a part of the Site by the Site Possession Date stated in the Contract Data.
- b. The Employer orders a delay or does not issue drawings, specifications or instructions required for execution of works on time.
- c. The Employer instructs the Contractor to uncover or to carry out additional tests upon work which is then found to have no Defects.
- d. The Employer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
- e. The effect on the Contractor of any of the Employer's Risks.
- f. The Employer unreasonably delays issuing a Certificate of Completion.
- g. Other Compensation Events listed in the Contract Data or mentioned in the Contract.

38.2. If a Compensation Event would cause additional cost or would prevent the work being completed before the Intended Completion Date, the Contract Price shall be increased and/or the Intended Completion Date is extended. The Employer shall decide whether and by how much the Contract Price shall be increased and whether and by how much the Intended Completion Date shall be extended. – **NOT OPERATED – Refer Clause 16 of SCC**

38.3. As soon as information demonstrating the effect of each Compensation event upon the Contractor's forecast cost has been provided by the Contractor, it is to be assessed by the Employer, and the Contract Price shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Employer shall adjust the Contract Price based on Employer's own forecast. The Employer will assume that the Contractor will react competently and promptly to the event. - **Not Operated**

38.4. The Contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Employer.

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39. Tax

- 39.1. The rates quoted by the Contractor shall be deemed to be inclusive of the sales and other taxes that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.

40. Price Adjustment – NOT APPLICABLE

41. Liquidated damages

- 41.1. The Contractor shall pay liquidated damages to the Employer at the rate per day stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date (for the whole of the works or the milestone as stated in the Contract Data). The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages does not affect the Contractor's liabilities.
- 41.2. If the Intended Completion Date is extended after liquidated damages have been paid, the Employer shall correct any overpayment of liquidated damages by the Contractor by adjusting the next payment of bill.

42. Advance Payments:

- 42.1. The Employer shall make payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an unconditional bank guarantee in a form acceptable to the Employer issued by a Nationalized/Scheduled Bank in amounts equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.
- 42.2. The Contractor is to use the advance payment only to pay for Mobilization expenses required specifically for execution of the Works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Employer.
- 42.3. The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuation of the work done, variations, price adjustments, compensation events or liquidated damages.

43. Securities:

- 43.1. The Security deposit (including additional security for unbalanced tenders) shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in an amount and form and type of instrument acceptable to the Employer. The Security deposit shall be valid until a date 30 days from the date of expiry of Defects Liability Period and the additional security for unbalanced tenders shall be valid until a date 30 days from the date of issue of the certificate of completion.
- 43.2. "Severely Unbalanced tender is defines as a tender where the tender premium is negative beyond 10%. Additional security shall be collected for all Tenders whose tender Premium is negative beyond 10% , and no Additional Security shall be collected for all tenders whose Tender Premium is upto Minus 10%. Additional Security shall be collected only to the extent of negative premium beyond minus 10% "as per Govt order: ನೃಸಿಂಹ :410 ಸಮಸ 2017 ದಿನಾಂಕ:20.02.2018.

44. Cost of Repairs:

- 44.1. Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at the Contractor's cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

45. Completion

- 45.1. The Contractor shall request the Employer to issue a Certificate of Completion of the Works, and the Employer will do so upon deciding that the Work is completed.

46. Taking over

- 46.1. The Employer shall take over the Site and the Works within seven days of issuing a certificate of Completion.

47. Final account

- 47.1. The Contractor shall supply to the Employer a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Employer shall issue a Defect Liability Certificate and certify any final payment that is due to the Contractor within 90 days of receiving the Contractor's account if it is correct and complete. If it is not, the Employer shall issue within 90 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Employer shall decide on the amount payable to the Contractor and make payment within 60 days of receiving the Contractor's revised account.

48. As built drawings and /or Operating and Maintenance Manuals

- 48.1. If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.
- 48.2. If the Contractor does not supply the Drawings by the dates stated in the Contract Data, or they do not receive the Employer's approval, the Employer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

49. Termination

- 49.1. The Employer may terminate the Contract if the other party causes a fundamental breach of the Contract.
- 49.2. Fundamental breaches of Contract include, but shall not be limited to the following:
- a. the Contractor stops work for 45 days when no stoppage of work is shown on the current Program and the stoppage has not been authorized by the Employer.
 - b. Deleted.
 - c. The Contractor becomes bankrupt or goes into liquidation other than for a reconstruction or amalgamation.
 - d. Deleted
 - e. the Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Employer.
 - f. the Contractor does not maintain a security which is required.
 - g. the Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract data; and
 - h. if the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph: "corrupt practice" means the offering, giving, receiving or soliciting of anything of value to influence the action of a public official in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to

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influence a procurement process or the execution of a contract to the detriment of the Borrower, and

includes collusive practice among Tenderers (prior to or after Tender submission) designed to establish Tender prices at artificial non-competitive levels and to deprive the Borrower of the benefits of free and open competition.”

49.3. When either party to the Contract gives notice of a breach of contract to the Employer for a cause other than those listed under Sub Clause 49.2 above, the Employer shall decide whether the breach is fundamental or not.

49.4. Notwithstanding the above, the Employer may terminate the Contract for convenience.

49.5. If the Contract is terminated the Contractor shall stop work immediately, make the Site safe and secure and leave the Site as soon as reasonably possible.

50. Payment upon Termination

50.1. If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Employer shall prepare bill for the value of the work done less advance payments received up to the date of the bill, less other recoveries due in terms of the contract, less taxes due to be deducted at source as per applicable law and less the percentage to apply to the work not completed as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer.

50.2. If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Employer shall prepare bill for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract, and less taxes due to be deducted at source as per applicable law and make payment accordingly.

51. Property

51.1. All materials on the Site, Plant, Equipment, Temporary Works and Works are deemed to be the property of the Employer, if the Contract is terminated because of a Contractor's default.

52. Release from performance

52.1. If the Contract is frustrated by any event entirely outside the control of either the Employer or the Contractor the Employer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which commitment was made

F. SPECIAL CONDITIONS OF CONTRACT

1. Labour :

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

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

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2. Compliance with labour regulations :

During continuance of the contract, the Contractor and his sub contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, Employer shall have the right to deduct any money due to the Contractor including his amount of security deposit. The Employer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

3. Protection of Environment:

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation. During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

4. Arbitration (Clause 24) – NOT APPLICABLE / OPEARATED

5. The successful bidder's drawings like Layout plan, Design, Drawings, Specifications, Brands to be used in construction should be got vetted by the Architectural Engineering Firm Consultants engaged by the Employer, and afterwards General Manager (S D), RGHCL, Bangalore will accord approval. Designs should be got Proof Checked by agency appointed by General Manager (S D), RGHCL, Bangalore.
6. The tenderers drawings, Specifications and Brands to be used in construction should be got approved by The General Manager (S D), RGHCL, Bangalore before commencement of work at site.
7. Layout drawings and building plans will have to be got approved by General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan, KG Road Bangalore 560009.
8. Conditional Tenders will not be accepted.
9. Materials like steel, cement, asphalt etc., required for the work shall be procured by the Contractors themselves and should be got tested by the quality control authority, before use on works.

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10. Department will not supply any materials
11. Labour Welfare Fund (CESS) shall be deducted at the rate of 1% of the cost of the construction as per Construction Workers Welfare CESS Act-1996.
12. All Royalties and Taxes will be deducted as notified by the Government from time to time.
13. In the case of the death of a Contractor after executing the agreement / commencement of the work, his legal heir, if an eligible registered Contractor and willing can execute and complete the work at the accepted tender rates irrespective of the cost of the work or else the contract will be closed.
14. Payment for increased/decreased items upto 25% of tendered quantity, the payment shall be made on Pro-rata basis of that particular package for such increased/decreased dwelling units to the contractor.

15. Possession of the Site

If any dispute arises in any parcel of land, an alternate land nearby will be given to the contractor for taking up of house construction. Even if it is not possible, RGHCL will reserve right to withdraw a portion or full work to that extent of shortage of land.

The Employer shall give the possession of the site to the contractor in a phased manner. In the first instance, the employer shall give around 60% of the land and the balance land will be given.

If there are any Land Problem, the Employer will give the alternate land of nearer locations. If sufficient land is not available, then the Employer may restrict the land and may reduce the number of dwelling units to be constructed (maximum up to 25% of the tender). The Contractor shall execute the work in the given land and at the same rate as quoted in the tender. Payment will be made proportionately for the constructed houses (dwelling units).

Establishment of Labour sheds, production yards, site office and laboratory etc., lies with the tenderer. However, the tenderer may use the extra open space available in the allotted construction site.

15.1. Submission of Bills for Payment (Clause 36)

Tenderer should submit the bill for payment along with measurement book for each and every payment bill is requested by the tenderer. Without measurement book no bills are considered for payments.

- 15.1.1 The Intermediate Payment shall be in accordance with the Provisions made under **Para 15.1.3** below. The successful Tenderer shall submit the payment schedule along with work schedule as per the priced bill of quantities for the accepted lump sum amount of contract in accordance with **Clause No. 46, Page 76** and should get it approved from the Employer.
- 15.1.2 The Bills should be submitted to RGHCL after the approval of the committee formed for purpose which is as follows:
 1. Engineer – in – Charge of the Project
 2. PMC for the Project representative
 3. Contractors' representative
- 15.1.3 The Employer shall check the Contractor's Bill and determine the Value of the Work executed which shall comprise of Value of the Bill of Quantities based on the Priced Bill of Quantities submitted by the Contractor.
- 15.1.4 The detailed mile stones are explained in Section 6 Contract condition

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16. Compensation Events (Clause 38)

- 16.1 The following are the Compensation Events for Time Extension only unless they are caused by the Contractor. In any case, these Compensation Events shall not entitle the Contractor to claim financially whatsoever.
- (a) The Employer orders a Delay or does not approve Drawings, Specifications or Instructions Required for Execution of Works on time.
 - (b) The Employer instructs the Contractor to uncover or to carry out Additional Tests upon work which is then found to have no Defects.
 - (c) The Employer gives an Instruction for dealing with an Unforeseen Condition, caused by the Employer, or Additional Work required for Safety or other Reasons.
 - (d) The Effect on the Contractor of any of the Employer's Risks.
 - (e) The Employer unreasonably delays issuing a Certificate of Completion / Scheduled Payment.
 - (g) Other Compensation Events listed in the Contract Data or mentioned in the Contract.
- 16.2 If a Compensation Event would prevent the Work being completed before the Intended Completion Date, the Intended Completion Date may be extended. The Employer shall decide whether and by how much the Intended Completion Date shall be extended.
- 16.3 The Contractor shall not be entitled to Compensation to the Extent that the Employer's Interests are adversely affected by the Contractor not having given Early Warning or not having cooperated with the Employer.

17. Progress of Work

The Contractor shall give the Employer on the 4th Day of each Month a Progress Report of the Work done during the Previous Month.

The Progress of Work will be reviewed periodically by the Employer with the Contractor and Shortfalls, if any sorted out, the Contractor shall thereupon take such Action as may be necessary to bring back his Work to Schedule without any Additional Cost to the Employer by employing Overtime Operations, increasing the Number of Shifts, Capacity of the Equipment or otherwise as directed by the Employer and nothing shall be paid extra.

18. Drawings to be kept at Site

The Required Sets of the Drawings as approved by the Employer shall be kept by the Contractor at the Site and the same shall at all reasonable time be available for Inspection and Use by the Employer and his approved Representative and any other person authorized by the Employer in writing.

19. Inspection of Works

In addition to the Provisions of Relevant Clauses of the Contract, the Work shall also be open to Inspection by the Employer and his approved Representative. The Contractor shall at all times during the Usual Working Hours and at all times at which Reasonable Notices of the Intention of the Employer or his approved Representative as stated above to visit the Works shall have been given to the Contractor, either himself be present to receive the Orders and Instructions or have a responsible Site Engineer duly accredited in writing, to be present for that Purpose.

20. Night Work

For Completing the Work well within the Intended Completion Period, the Contractor might be required to work in two or more Shifts (including Night Work) and no Claim whatsoever shall be entertained on this account, notwithstanding, the Fact that the Contractor will have to pay to the Labours and other Staff engaged directly or indirectly on the Work according to the Provisions of the Labour Regulations and the Agreement entered into and for Extra Amounts towards any other Reason. None of the Permanent Works shall be carried out during Night or on Authorized Public Holidays without the permission in writing of the Employer except when Work is unavoidable or absolutely necessary for the Safety of Life, Property or Work in which case the Contractor shall immediately advise the Employer accordingly, provided that the Provisions of this Condition shall not be Applicable in the case of any Work which is customary to carry out by Rotation or in Double Shift.

21. Existing Services

Existing Drains, Pipes, Cables, Overhead Wires, Sewer Lines, Water Lines and similar Services encountered in the Course of the Execution of the Work shall be protected / maintained against the Damage by the Contractor. The Contractor shall not store Materials or otherwise occupy any part of the Site in a manner likely to hinder the Operation of such Services. In case Temporary Shifting of such Services is required to facilitate the Work, the Contractor at no Extra Cost shall do the same.

The Respective Departments in coordination with the Employer shall carry out Shifting of Major Services. The Decision as whether the Service in Question is Major or not, will be at the Discretion of the Employer. The Contractor will, however, be required to provide all help to ensure that the Work is carried out smoothly.

22. All Works at no extra cost to employer pertaining to Services including Rerouting / Diversion of Services, Routine Testing, Installation, etc. embracing in one or more than one Process shall be subject to Examination and Approval to each Stage thereof by the Employer or concerned Departments as would be notified by the Employer or his approved Representative when such Stage is ready. In default of such notice, the Employer shall be entitled to appraise the Quantity and the Extent thereof and the Decision of the Employer or his approved Representative in this regard shall be final and binding.
23. No Work shall be covered or put out of View without the approval of the Employer or his approved Representative and the Contractor shall afford Full Opportunity for Examination of such Services before these are permanently installed or extended thereof as per Site Requirement.
24. The Contractor shall make his own arrangement for the Disposal of the Spoils from the Works to such Place where the same shall not cause Nuisance and shall be acceptable to the Authorities concerned.
25. The Execution of any Items of Work where any Incidental Work is actually required but not specifically stated in the Tender Document, it is to be understood that the Amount quoted by the Contractor shall cover such Charges also and nothing extra on account of such Incidental Charges, if any, shall be paid.
26. The Contractor shall make his own arrangement at his own Cost for the Provision of Telephone Facilities at the Site of Works or at any other place.
27. The Electric and Water Connections to be obtained for use of the Work under the Contract are subject to the following Conditions.

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- a. The Contractor shall make his own arrangement for Electricity and Water Supply. However, the Employer will assist the Contractor to get Power from the concerned Department at the Contractor's Cost.
- b. The Employer shall in no way be Responsible for any Delay in getting the Electric Connection and Water and no Claim on this account whatsoever, shall be entertained. It shall be clearly understood that the Contractor has to make his own Arrangement for Generators for use before the Electric Connection is made available and also to be used as a Stand by Arrangement in case of Power Failure, etc. or in the case of Disconnection of Electric Supply by the concerned Department for any reason.
28. No Payment will be made to the Contractor for Damage caused by Rains, or other Natural Calamities or Accidents or Acts of God, during the Execution of the Works and no such Claim on this account will be entertained.
29. The Contractor is required to submit Rates of all Items he has used to derive the Tendered Price inclusive of Cost of all Labour, Materials, Plant, Machinery, Equipments, Carriage and other Inputs, Taxes, Royalties, etc.
30. The Contractor shall maintain in Good Condition all Work till the Completion of entire Work allotted to him. From the Commencement of the Work to the Completion of the same, the Work is to be under the Contractor's Charge. The Contractor is to be held Responsible for and to make good all Injuries, Damages and Repairs, rendered necessary by Fire, Rain, Floods or other Causes. The Employer shall not be held Responsible, for any Claims for Injuries to Personal Workmen or for Structural Damage to Property happening from any Neglect, Default, Want of Proper Care or Misconduct on the Part of the Contractor or of any other of his authorized Representatives in his Employment during the Execution of the Work. The Compensation, if any, shall be paid directly to the Department / Authority / Persons concerned, by the Contractor at his own Cost.
31. The Contractor will take all Necessary Measures for the Safety of Workers during Construction and provide, erect and maintain such Barricades, including Signs, Markings, Flags, Lights and Skilled Flagmen, as necessary, all around the Excavation / Construction Area and at such Intermediate Points, as directed by the Employer including the Proper Identification of the Construction Areas. He shall be Responsible for all Damages and Accidents on account of Construction and other Relevant Activities. Nothing shall be paid extra on account of above.

The Temporary Warning Signs / Lamps shall be installed at all Barricades during the Hours of Darkness and kept lit there at all times during these hours and nothing shall be paid extra.

Barricading and Safety Requirements are very Important Aspects to execute this Project. The above Provisions shall be followed strictly and at no time the Construction / Excavation Areas are to be left Unbarricaded or without Red Lamps during the Hours of Darkness. Failure to comply with the Requirements mentioned in the Preceding Paragraphs shall be deemed to be a Breach of Contract on the Part of the Contractor for which the Contractor shall be Liable to action under Relevant Clauses / Conditions of the Agreement.

In addition to other Actions being taken for such Breach of Contract, the Contractor shall be liable to pay compensation @ Rs.1000/- per Sqm of Area left Un barricaded.

The Employer shall give Notice to the Contractor for such Barricade and the Contractor shall comply with the same within one day of such Notice failing which he shall be liable to pay the above Compensation and Actions for the said Breach of Contract. The Decision of the Employer in respect of the above shall be final and binding.

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The Contractor shall use every Reasonable Means to prevent any of Roads, Bridges communicating with or on the Routes to the Site from being damaged by any Traffic of the Contractor or any of his Sub Contractors and in particular, shall select Routes and Vehicles to avoid such Unnecessary Damages.

32. Safety of Workers

In respect of all Labour directly or indirectly employed in the Work for the Performance of the Contractor's Part of this Agreement, the Contractor shall at his own Expense arrange for the Safety Provisions as per Indian Standard Safety Codes shown below and shall at his own Expense provide all Facilities in connection there with. In case, the Contractor fails to make Arrangement and provide Necessary Facilities as aforesaid, he shall be liable to pay Rs. 10000/- per Day for each day of Delay from the Date of Notice issued to the Contractor on this regard and in addition the Employer shall be at liberty to make Arrangement and provide Facilities as aforesaid and recover the Cost incurred on that behalf from the Contractor, and no Claims whatsoever shall be entertained.

- i. IS: 3696 (Part I) – 1966 Safety Code for Scaffolds and Ladders
- ii. IS: 3696 (Part II) – 1966 Safety Code for Scaffolds and Ladders, Part II Ladders
- iii. IS: 3764 – 1966 Safety Code for Excavation Work
- iv. IS 4081 – 1967 Safety Code for Blasting and Drilling Operations
- v. IS: 4138 – 1977 Safety Code for Working in Compressed Air
- vi. IS: 5121 Safety Code for Piling and other Deep Foundations
- vii. IS: 5916 – 1970 Safety Code for Construction involving Use of Hot Bituminous Materials
- viii. IS: 7293 – 1974 Safety Code for Working with Construction Machinery
- ix. IS: 7969 – 1975 Safety Code for Storage and Handling of Building Materials
- x. Any other Code and / or as per directions of the Employer.

- 33. The Employer shall have Full Powers to send Workmen and employ on the Premises to execute Fittings and other Work not included in the Contract. For whole Operations, the Contractor is to afford every Reasonable Facility during Ordinary Working Hours provided that such Operations shall be carried on in such a manner as not to impede the Progress of the Work included in this Contract in the opinion of the Employer.
- 34. The Contractor shall conduct his Work so that not to interfere with or hinder the Progress or Completion of the Work being performed by other Contractors, Piece Workers or by the Employer and shall as far as possible arrange his Work and shall place and dispose the Operations of the other Contractors, Piece Workers, or of the Employer. The Contractor shall arrange his Work with that of the others in an Acceptable Manner and shall perform it in Proper Sequence to the complete Satisfaction of the Employer at the Contractor's own Cost.
- 35. The Contractor shall assume all Liabilities, Financial or otherwise in connection with his Contract and shall protect and save the Employer from any and all Damages and Claims that may arise because of the Presence and Operations of others working on or near the Site. The Contractor shall assume all Responsibilities for all Work not completed or accepted because of the Presence and Operations of other Contractors or Piece Workers or of the Employer.
- 36. At the time of Construction, the Contractor shall embed all Electrical / other Fixtures like Base Plates, Brackets, Conduits, etc. for Layout Lighting, etc. as per the Directions of the Employer. Nothing Extra whatsoever will be payable on this account.
- 37. For execution of any Items of Work where Incidental Works such as Bailing out Water, Shoring, etc. are actually required but not specifically stated in the Tender, it is to be understood that the Lump Sum Amount quoted by the Contractor shall cover such Charges also and nothing Extra on account of such Incidental Charges, if any, shall be paid.

38. No Waiving of Legal Rights and Powers

The Employer shall not be precluded or stopped from taking any Measurements and Framing of Estimates or Detaining any Certificates made either before or after the Completion and Acceptance of the Work and Payment, from showing the True Amount and Character of the Works Performed and Materials furnished by the Contractor and from showing that any such Measurements, Estimates or Certificates Untrue or incorrectly made and that the Employer shall not be precluded or stopped from recovering from the Contractor and such Damages as it may be sustained by Reasons of his Failure to comply with the Terms and Conditions of the Contract. Neither the Acceptance by the Employer nor any Payment for Acceptance of the whole or any part of the Work nor any Extension of Time nor any Possession taken by the Employer shall operate as a Waiver of any Portion of the Contract or any Power herein reserved or of any Risk to Damage. A Waiver of any Breach of the Contract shall not be held to be a Waiver of any other or subsequent Breach.

39. The Contractor shall provide and bear all Expenses and Charges for Special or Temporary Service Roads required by him in Connections with Access to the Site at no Extra Charges and his Lump Sum Offer shall deem to include the same. He shall alter, adopt or maintain the same as required from time to time or as directed by the Employer. The Employer shall have Right of Way to this at all times and will not entitle the Contractor to claim Extra on this account.
40. The Tenderers shall also mention with their Tender Documents the Name of their Project Managers, Work Managers, Graduate Engineers who shall be engaged in this Work. The Biodata of such Engineers / Managers are to be enclosed with the Tender Documents.
41. The Tenderers may specify the Number and Category of each type of Skilled Personnel to be deputed by the Contractors. It may clearly be stated as to whether such Skilled Persons are under the Employment of the Tenderers or are still to be appointed by them. The Number of Skilled and Unskilled Persons to be employed shall be in agreement with the Programme of Work submitted by the Tenderers and discussed elsewhere in the Tender Documents.
42. The Tenderers shall specify the Details of Plant and Machinery to be deployed by them for the Work.
43. The Tenderers shall furnish a Cash Flow Chart on month – to – month basis for the entire Period of Execution of the Work. The Cash Flow Chart shall indicate specifically the Investments on such Items as Plant and Machinery, Shuttering and Staging, Materials mentioning Various Items like other Pre Stressing Materials, Sand, Grit and other Consumables. The Cash Flow shall indicate in Detail, the Inputs to be mobilized by the Contractor from his own Sources e.g. own Capital, Bank Loans, etc. and Resources to be supplemented by the Employer like Interim Payments against the Work done by the Contractor.

The above mentioned Cash Flow shall have Direct Relation with the Programme of Work and it shall be in consonance thereto. Any Inconsistency between the Inputs / Outputs of this Cash Flow and Programme of the Work may lead to the Disqualification of the Tenderer on this account.

Similarly, after Award of the Contract also the Contractor shall submit Similar Cash Flow Programmes and update such Details at monthly intervals for monitoring of the Project by the Employer.

44. The Contractor is expected to have a Workshop Facility available at Site for Fabrication / Additions and Alterations to the Shuttering, Pre Stressing Works and or other Allied Works. It may please be indicated as to whether the Workshop Facilities shall be provided in house or is proposed to be subcontracted locally. In both the cases, the Tenderer is to give the Details and Number of Equipments to be installed in the Workshop for above mentioned Work.

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45. The Employer might deploy Project Management Consultant (PMC) for Design Checking and Approval, Supervision, Quality Control, Progress Monitoring, etc. The Contractor shall abide by the Instructions / Suggestions given by the PMC for the successful completion of the Project.

46. Priced Bill of Quantities

The Successful Tenderer shall submit a Priced Bill of Quantities for the Agreed Lump Sum Amount of the Contract submitted by the successful tenderer shall form the Basis for arriving at the Interim Payments to be made to the Contractor by the Employer.

47. Release from Performance:

The tenderer will be released from performance after the following:

The tenderer is liable for the Defect Liability period for 01 years after completion of entire work.

48. Advance Payments:

- a. The Employer shall make payment to the Contractor of the amounts stated in the Contract Data by the date stated in the Contract Data, against provision by the Contractor of an unconditional bank guarantee in a form acceptable to the Employer issued by a Nationalized/Scheduled Bank in amounts equal to the advance payment. The guarantee shall remain effective until the advance payment has been repaid, but the amount of the guarantee shall be progressively reduced by the amounts repaid by the Contractor. Interest will not be charged on the advance payment.
- b. The Contractor is to use the advance payment only to pay for Mobilization expenses required specifically for execution of the Works. The Contractor shall demonstrate that advance payment has been used in this way by supplying copies of invoices or other documents to the Employer.
- c. The advance payment shall be repaid by deducting proportionate amounts from payments otherwise due to the Contractor, following the schedule of completed percentages of the Works on a payment basis. No account shall be taken of the advance payment or its repayment in assessing valuation of the work done, variations, price adjustments, compensation events or liquidated damages.

49. Release of Security Deposit

Security Deposit will be released on the satisfactory completion of defect liability period of 1 year.

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SECTION 6: CONTRACT DATA

The following documents are also part of the Contract:

- Site Investigation Reports

Clause Reference	
1.1	The Employer is: Managing Director, RGHCL, 9th Floor E & F Block Cauvery Bhavan KG Road Bangalore 560009 Email: rgrhclgmtech@gmail.com
1.1	Address; General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan KG Road Bangalore 560009 Email: rgrhclgmtech@gmail.com
1.1	Name of authorized Representative: General Manager (S D), RGHCL, 9th Floor E & F Block Cauvery Bhavan KG Road Bangalore 560009 Email: rgrhclgmtech@gmail.com
1.1	Engineer is: General Manager (S D), RGHCL,
1.1	The name and identification number of the Contract is: " Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B Location details given below: Devarahatti
1.1	The work consists of: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B The work will be awarded under Build and Transfer basis the work to be executed under the approved specification for housing units as per unit plan with dimensions provided by RGHCL Bangalore Design detailing prepare and approved by RGHCL.
1.1	The Start Date: The Start date shall be date of handing over of site.
1.1	The Site is located at 1) Devarahatti, Davanagere Taluk, Davanagere District, Karnataka
7	Sub-Contract: Allowed only for the specialized work viz., electrical, water supply and plumbing
8	Schedule of other Contractor: At present no other contractors are entrusted with the works at project locations.
9	Schedule of Key Personnel: Following minimum technical personnel shall be deployed 1. Project Manager cum Senior Civil Engineer-2, 2. Quantity & Quality Surveyor-2 3. Supervisors & supporting staff – as per requirement
13	Insurance requirements is:

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	No.	Type of Cover	Minimum Cover for Insurance
	i.	Works and of Plant and materials	The sum stated in the Agreement plus 20%
	ii.	Loss or damage to equipment	Full replacement cost
	iii.	Loss or damage to property of Third Party	Full replacement cost
	iv.	Personal injury or death insurance	
	a.	for Third Party	Rs. 5 lakhs per person
	b.	for Contractor's employees or labour	In accordance with the statutory requirements applicable to Karnataka
14	Site Report; The available data at the RGHCL Office on the site including soil test report may be refereed during the office hours.		
15	Queries about Contract Data: All queries on Contract Data are to be raised in writing in the scheduled Pre-Bid Conference on the date and time indicted in IFT and clarifications obtained.		
17	The Intended Completion Date for whole of the work: Nine Months calendar months including monsoon from the date of issue of work order.		
25	Program Methodology and Programme of Construction: Contractor should furnish a detailed acceptable programme for completing the project work within the stipulated time indicating the methodology, mobilization required etc., while submitting the tender. This programme reviewed and redrawn in discussion with the RGHCL and appended to agreement to be concluded for the work. The programme should indicate the key and critical equipments to be deployed for completing the work, its availability with the Contractor, if not available minimum period required for its procurements.		
26	Quality Control Project Management Consultants (PMC): RGHCL will appoint Project Management Consultants for site supervision, quality & quantity assurance and certification of work bills.		
27			

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	Miles Stones for Each Building:					
	Mile Stones	Percentage	Cost of work (in Rupees)	Cumulative cost (in Rupees)	Period from Work Order	Liquidated damages in Rs. per Day (@ 0.1% per day)
	Milestone- 1 (2 Months)	20.00	10043400	10043400	Two Months	10043
	Milestone- 2 (3 Months)	25.00	12554250	22597650	Three Months	12554
	Milestone- 3 (3 Months)	25.00	12554250	35151900	Three Months	12544
	Milestone- 4 (3 Months)	30.00	15064890	50216790	Three Months	15064
		100.00	50216790			50216
28	Management Meeting: The Contractor may be required to attend the Management Committee which will meet at least once in a month/as and when required to review the progress.					
30	Tests / Quality Assurance: The contractor has to establish own laboratory at site. Wherein the Contractor has to test materials to be used on the work in accordance with relevant Codes at his own cost. The successful Contractor to establish field laboratory for conducting day to day testing of the materials viz., coarse aggregate, fine aggregate, sand, water, cement, steel and other materials used for the work etc., an casting of mortar and concrete cubes and its testing as per relevant Indian Standards. The tests are to be conducted in the presence of the Engineer or the PMC or Third-Party Consultant engaged by the Employer. The Employer intends to engage a qualified PMC and Third-Party Consultant to supervise the work and Contractor to extend suitable cooperation to the Agency. The test results in standard format as per relevant codes IS codes, NBC, IRC, ASTM, etc and other codes as per frequency to be conducted periodically and to be maintained/documented in the register. The Cement and Reinforcement steel are to got tested in the approved laboratories and test results furnished periodically as per relevant Indian Standards Employer can also independently get tested materials and conduct non destructive tests on the structures at his discretion if the work is found to be sub-standard. In case of failed result the contactor has to bear the expenses and also repair the structure to the satisfaction of the Employer at his cost.					
31	The Defects Liability Period: 12 calendar months from the date of Completion					
40	Liquidated Damages for the whole of the works are: Rs. 50,21,679.00/- The maximum amount of liquidated damages for the whole of the works is ten percent (10%) of final contract price.					
42	The amount of Advance Payments are:					

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	Mobilization Advance of 5% of the Contract Price on submission of unconditional Bank Guarantee from Nationalized / Scheduled Bank valid for the Contract Period (Mobilization Advance to be drawn before end of three months of Contract Period).
46	<p>As Built Drawings:</p> <p>“As built” drawings in approved scale in 2 sets with soft copy to be submitted within 30 days of issue of certificate of completion of Whole or Section of the work as the case may be. The amount to be withheld for failing to supply “as built” drawings by the date required is Rs. 25.00 lakhs.</p>
47.2	<p>Fundamental Breach of Contract:</p> <p>The following event shall also be fundamental breach of the contract:</p> <p>The contractor has contravened Sub-clause 7.1 and Clause 9 of CC.</p>
48	<p>Payment up on Termination due to fundamental breach of contract by Contractor:</p> <p>The percentage to apply to the value of work not completed representing the Employer’s additional cost for completing the Works shall be 30 percent.</p>

SECTION 7: SPECIFICATIONS

IMPORTANT NOTE:

- 1. The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in Volume -I.**
 - 2. The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.**
 - 3. The specifications in this Section covers stipulations for items generally executed in building works and other infrastructure works required to be executed for completion of the project as per the prevailing standard practice. However specifications relevant to BOQ shall be followed.**
 - 4. The specifications, standards and codes are made a part of this specification. All standards, specifications, codes of practices referred to herein shall be the latest edition including all applicable official amendments and revision.**
 - 5. Technical Specifications**
 - a. The specifications, which are not available in this document, for the same the Contractor, shall follow specifications as per PWD Handbook and National Building Code of latest edition.**
 - b. Further, in the case of any class of work for which there is no such specification available in this document as well as in PWD Handbook and National Building Code, such work shall be carried out in accordance with the instructions and requirements of the Engineer-in-Charge of the work.**
 - c. Wherever there is conflict in the specifications within the document the higher specifications shall be adopted.**
-
- 1. General**
 - 1.1.** This specification establishes and defines the requirement of various materials to be used in Civil and Structural works.
 - 1.2.** Whenever any reference to IS Code is made, the same shall be taken as the latest revision (with all amendments issued thereto) as on the date of submission of the bid.
 - 1.3.** Apart from the IS Codes mentioned in particular in the various clauses of this specification, all other relevant codes related to specific job under consideration regarding quality, tests, testing and / or inspection procedures shall be applicable. Reference to some of the Codes in the various clauses of this specification does not limit or restrict the scope of applicability of other referred or relevant codes.
 - 1.4.** In case any variation / contradiction between the provision of IS Codes and this specification, the provision given in this specification shall be followed:
 - 1.5.** All materials shall be of standard quality and shall be procured from renowned sources / manufactures approved by the Engineer. It shall be the responsibility of the Tenderer, to get all materials / manufactures approved by the Engineer prior to procurement and placement of order.
 - 1.6.** Whenever called for by the Engineer, tests of all materials as specified by the relevant IS Codes shall be carried out by the Tenderer in an approved laboratory and test reports duly authenticated by the laboratory, shall be submitted to the Engineer for his approval. If so desired by the Engineer, tests shall be conducted in the presence of the Engineer or his authorized nominee.
 - 1.7.** Quality and acceptability of materials not covered under this specification shall be governed by the relevant IS codes. In case IS code is not available for the particular material, manufactures specifications shall be considered. The decision of the Engineer, in this regard, shall be final and binding on the Tenderer.

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- 1.8.** Whenever asked for, the Tenderer shall submit representative samples of materials to the Engineer for his inspection and approval. Approval of any sample does not necessarily exempt the Tenderer from submitting necessary test reports for the approved material, as per the specification / relevant IS Codes.
- 1.9.** The Tenderer shall submit manufacturer's test reports on quality and suitability of any material procured from them and their recommendation on storage, application, workmanship etc., for the intended use. Submission of manufacturer's test reports does not restrict the Engineer from asking fresh test results from an approved laboratory of the actual material supplied from an approved manufacture / source at any stage of execution of work.
- 1.10.** All costs relating to or arising out of carrying out the test and submission of test reports and or samples to the Engineer for his approval during the entire tenure of the work shall be borne by the Tenderer and included in the quoted rates.
- 1.11.** Materials for approval shall be separately stored and marked, as directed by the Engineer and shall not be used in the works till these are approved.
- 1.12.** All rejected materials shall be immediately removed from the site by the Tenderer at his own cost.

2. Materials

2.1. Water

- 2.1.1** Water used in construction for all civil & structural works shall be clean and free from injurious amount of oil, acids, alkalis, organic matters or other harmful substances which may be deleterious to concrete, masonry or steel. The pH value of water samples shall be not less than 6. Potable water shall be considered satisfactory. Underground water can also be used with the prior approval of the Engineer, if it meets all the requirements of IS: 456.
- 2.1.2** Tests on water samples shall be carried out in accordance with IS: 3025 and they shall fulfill all the guidelines and requirements given in IS: 456.
- 2.1.3** The Engineer may require the Tenderer to prove, that the concrete prepared with water, proposed to be used, shall not have average 28 days compressive strength lower than 95% of the strength of concrete prepared with distilled water.
- 2.1.4** The Engineer may require the Tenderer to get the water tested from an approved laboratory before starting the construction work and in case the water contains any oil / organic matter or an excess of acid, alkalis or any injurious amount of salts etc., beyond the permissible maximum limits given in IS: 456, the Engineer may refuse to permit its use. In case the water is supplied by Employer, the Tenderer shall get himself satisfied regarding its quality before using the same in his works at his own expenses. In case there is any change in source of water, water samples shall be tested again to meet the specified requirements. The water test must be conducted periodically at least once in 3 months or as directed by Engineer.
- 2.1.5** Water shall be stored in tin barrels, steel tanks or water – tight reservoirs made with bricks / stone or reinforced concrete. Bricks / stone masonry reservoirs shall have RCC base slab and shall be plastered inside, with 1 part of cement and 4 parts of sand and finished with neat cement punning. These reservoirs must be of sufficient capacity to meet the water requirement, at any stage of construction.
- 2.1.6** Water for curing shall be of same quality as used for concreting and masonry works. Sea water shall not be used for preparation of cement mortar, concrete as well as for curing of plain / reinforced concrete and masonry works. Sea water shall not be used for hydro testing and checking the leakage of liquid retaining structures also.

2.2. Aggregate

- 2.2.1** Coarse and fine aggregates for Civil and Structural works shall conform in all respects to IS: 383 (Specification for coarse and fine aggregates from natural sources for concrete). Aggregates shall be obtained from an approved source known to produce the same satisfactorily. Aggregates shall consist of naturally occurring (crushed or uncrushed) stones, gravel and sand or a combination thereof. These shall be chemically inert, hard, strong, dense durable, clean and free from veins, adherent coatings, injurious amount of alkalis, vegetable matter and other deleterious substances such as iron pyrites, coal, lignite, mica, shale, sea shells etc.
- 2.2.2** Source and type of aggregates shall be got approved by the Engineer prior to procurement. Change in source and type of aggregates, at later stage, shall not be generally permitted; but under specific circumstances, Engineer can allow a change in source and type of aggregate. The Tenderer shall produce necessary test certificates from approved laboratories regarding the quality and suitability of

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the proposed aggregates and submit fresh mix design for approval of the Engineer. Any such change, if permitted by the Engineer, shall be without any time and cost implication to Employer. Whenever there is any change in the source of material, and if the material is approved by Engineer with necessary test certificates from approved laboratory, mix design of concrete shall also be revised and approved. The concrete so approved should have the required workability with new source of materials and also the characteristic strength of the concrete. All design mixes must be as per IS: 456.

2.2.3 Aggregates which may chemically react with alkalis of cement or might cause corrosion of the reinforcement shall not be used. If so desired by the Engineer, the Tenderer shall carry out alkali reactivity tests and submit the results to him for approval.

2.2.4 The maximum quantities of deleterious materials in the aggregates as determined in accordance with IS: 2386-Part II (Method of Test for aggregates for concrete), shall not exceed the limits defined in IS: 383. No special test is required to prove the absence of such deleterious matters if the aggregates are from a known source with satisfactory prior data on the properties of concrete made with them. In case of newly developed quarry sites, the Tenderer shall submit necessary test results as per IS:383 and IS:2386 to the Engineer prior to his acceptance with the requirements given in IS:2430

2.2.5 Coarse and fine aggregates shall be batched separately. All-in-aggregate shall be used only where specifically permitted by the Engineer. Separate sieve analysis and grading curves shall be prepared by the Tenderer for any / all batches of coarse and fine aggregates, and submitted to the Engineer, whenever asked for, to ensure conformity with those submitted along with the mix design.

2.2.6 Whenever required by Engineer, the aggregate (coarse / fine) shall be washed and / or sieved by the Tenderer before use in the works to obtain clean and graded aggregate at no extra cost to Employer.

2.2.7 Aggregates not in conformity with the specifications shall be rejected and the Tenderer shall immediately remove them from the site of work.

2.3. Coarse Aggregate

2.3.1 Coarse aggregates are the aggregates, which are retained on 4.75mm IS Sieve. It shall have a specific gravity not less than 2.6 (saturated surface dry basis).

2.3.2 These may be obtained from crushed or uncrushed gravel or stone as per clause 2.2.1 and may be supplied as single sized or graded. The grading of the aggregates shall be as per IS: 383 or as required by the mix design, to obtain densest possible concrete. For this purpose, the Tenderer shall submit to the Engineer at least three sets of mix design and test results, each with different grading of coarse aggregates, proposed to be used. The Engineer may allow "All-in-aggregates" to be used provided they satisfy the requirements of IS: 383.

2.4. Fine Aggregate

2.4.1 Fine aggregates are the aggregates which pass through 4.75mm IS sieve but not more than ten percent (10%) pass through 150 micron IS sieve. These shall comply with the requirements of grading zones I, II and III of IS: 383. Fine aggregates conforming to grade zone IV shall not be used for reinforced concrete works.

2.4.2 Fine aggregates shall consist of material resulting from natural disintegration of rock and which has been deposited by streams or glacial agencies, or crushed stone sand or gravel sand. Sand from sea shores, creeks or riverbanks affected by tides, shall not be used for filling or concrete works.

2.4.3 Sampling and Testing

The Tenderer shall carry out all tests including mix designs of concrete, at his own expense, at the start of works as well as during any stage of construction as required by the Engineer. Test shall be carried out in accordance with IS: 516 – Methods of test for strength of concrete and IS: 2386 – Methods of test for aggregates for concrete. Testing shall be carried out from laboratories approved by the Engineer. The method of sampling shall be in accordance with the requirements given in IS: 2430.

2.4.4 Storage of Aggregate

Storage of all types of aggregates at site of works shall be at Tenderer's expense and risk and shall be stored as specified in IS: 4082. Aggregates shall in no case be stored near to the excavated earth or directly over ground surface.

The Tenderer shall maintain sufficient quantities of aggregates, near to the place of work, required for the continuity of the work. Each type and grade of aggregate shall be stored separately on hard, firm

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surface having adequate slope of drainage of water.

Aggregates delivered at site in wet condition or becoming wet due to rain or any other means, shall not be used for at least 24 hours. The Tenderer shall obtain prior approval of the Engineer for the use of such aggregates and shall adjust the water content in accordance with IS: 2386 to achieve the desired mix. In the absence of test results, and to allow variation in mass of aggregates and water content on account of moisture content, the Tenderer can make suitable adjustment in the masses as per IS: 456, for preparation of nominal mix concrete only.

2.5. Sand

2.5.1 Sand for Masonry Mortar

The sand shall consist of natural sand, crushed stone and or crushed gravel sand or a combination of any of these. The sand shall be hard durable, clean and free from adherent coatings and organic matter and shall not contain clay, silt and fine dust more than the amount specified in IS: 2116.

The sand shall not contain any harmful impurities such as iron pyrites, alkalis, salts, coal or other organic impurities, mica, shale or similar laminated materials, soft fragments, sea shells in such form or in such quantities as to affect adversely the hardening strength or durability of the mortar.

Unless found satisfactory as a result of further tests as may be specified by the Engineer, or unless evidence of such performance is offered which is satisfactory to him, the maximum quantities of clay, fine silt, fine dust and organic impurities in the sand when tested in accordance with IS: 2386, shall not be more than 5% by mass in natural sand, or crushed gravel sand or crushed stone sand. For organic impurities, when determined in accordance with IS: 2386 colour of the liquid shall be lighter than that indicated by the standard solution specified in IS: 2386.

2.5.2 Grading of sand

The particle size grading of sand for use in mortars shall be within the limits as specified below:

GRADING OF SAND FOR USE IN MASONRY MORTARS

IS SIEVE DESIGNATION IS : 460 (PART I)	PERCENTAGE (%) PASSING BY MASS	REF TO METHOD OF
4.75 mm	100	IS : 2386 (Part I)
2.36 mm	90 to 100	
1.18 mm	70 to 100	
600 micron	40 to 100	
300 micron	5 to 70	
150 micron	0 to 15	

In case of sand whose grading falls outside the specified limits due to excess or deficiency of coarse or fine particles, this shall be processed to comply with the standard by screening through a suitably sized sieve and / or blending with required quantities of suitable sizes of natural sand particles or crushed stone screenings which are by themselves unsuitable. Based on test results and in the light of practical experience with the use of local materials, deviation in grading of sand may be considered by the Engineer. The various sizes of particles of which the sand is composed shall be uniformly distributed the mass.

2.5.3 Sampling and Testing

The method of sampling shall be in accordance with IS: 2430. The amount of material required for each test shall be as specified in relevant parts of IS: 2386. Any test which the Engineer may require in connection with this shall be carried out in accordance with the relevant parts of IS: 2386

If further confirmation as to the satisfactory nature of the material is required, compressive test on cement mortar cubes (1:6) may be made in accordance with IS: 2250 using the supplied material in place of standard sand and the strength value so obtained shall be compared with that of another mortar made with a sand of acceptable and comparable quality.

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2.5.4 Sand for Filling

Sand for filling shall meet, the requirements IS: 383 and shall be natural sand, hard, strong, and free from any organic and deleterious materials. Any sand proposed for filling, shall be used only after it is approved by the Engineer. Sand obtained from sea shores, creeks or river banks affected by tides shall not be used for filling. Fine aggregate suitable for concreting works shall be suitable for filling also. No sand below grading zone-III as per IS-383 shall be allowed for filling.

2.6. Cement

Cement to be used for civil and structural works, shall be one of the following or in combination thereof. For plain and reinforced concrete works normally 43 grade ordinary Portland cement conforming to IS: 8112 shall be used. Specific requirement for any other type of cement shall be as shown in the drawings or as specified in contract or as directed by Engineer. All masonry and plaster work shall be with PPC or other blended cement as approved by Engineer.

Specification for Portland slag cement	IS: 455
Specification for Portland puzzolana cement	IS: 1489
Specification for Masonry cement	IS: 3466
Specification for 43 Grade Ordinary Portland cement	IS: 8112
Specification for 53 Grade Ordinary Portland cement	IS: 12269

2.6.1 Storage at Site

The storage of cement at the site of work shall be at Tenderer's expense and risk and shall meet the requirements of IS: 4082. The cement shall be stored above ground in a suitable weather tight buildings or godown and in such a manner as to permit easy access for proper inspection and also to prevent deterioration due to moisture. Apart from this; the cement so stacked should be replaced once in three months, top bag to bottom row and bottom to top to avoid clotting. Such cement in long stored condition shall be retested for properties.

All approved cement shall be arranged in batches with type, brand and date of receipt flagged on them. A maximum of eight bags shall be stacked one over the other. Cement bags shall be used in the same order as received from the manufacturer. The Tenderer shall maintain a register on day to day basis, giving the details of the receipt / consumption, source of supply and type of cement, etc. The register shall always be accessible to the Engineer for verification.

2.6.2 Test after Delivery

Each consignment of cement procured by Tenderer, shall after delivery at site and at the discretion of the Engineer, be subjected to any or all of the tests and analyses, required by the relevant Indian Standard Codes. The Tenderer shall carry out and bear the cost of all tests and analyses required to ensure quality of cement before using in actual works.

2.6.3 Rejection

The Engineer may reject at his discretion any cement, which has deteriorated owing to inadequate protection from moisture or due to induction of foreign matter or any other cause. Any cement which is considered defective shall not be used and shall be promptly removed from the site by the Tenderer.

2.7. Lime

2.7.1 General

Lime shall be stone lime and conform to the specification Building Limes – IS: 712, Lime putty may be prepared from hydrated lime or quicklime. Hydrated lime shall be mixed with water to form putty and stored with reasonable care to prevent evaporation for at least 24 hours before use.

Quick lime shall be slaked with enough water to make a cream, passed through a No. 10 sieve and then stored with reasonable care to prevent evaporation for at least 7 days before use. Quick lime or hydrated lime as instructed by the Engineer shall be used for masonry work. Hydrated lime will be supplied as hydrated lime and used for structural purposes. Fat lime will also be supplied as quick lime

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or hydrated lime as instructed by the Engineer-in-charge and used for the finishing coat in plastering, white washing etc. Field tests according to IS: 1624 shall be carried out from time to time to determine the soundness of lime.

2.7.2 Neeru

Shall be made of class 'C' lime (i.e., pure fat lime) as mentioned in IS: 712. It shall be slaked with fresh water and then sifted and reduced to a thick paste by grinding in a mill. Neeru thus prepared shall be kept moist until used and no more than what can be consumed in 15 days shall be prepared at a time.

2.7.3 Surkhi

Shall be made by grinding well burnt bricks, bricks bats, burnt clay balls etc. the quality shall conform to IS: 1344.

Brick bats, etc. shall be ground in a mechanical disintegrator to a fine powder passing through IS Sieve, No.9 (2.36mm) with a residue not exceeding 10% by weight.

Surkhi for Lime Surkhi plaster shall be ground to fine powder in a mortar mill to pass through IS Sieve of 150 micron (No. 100).

Surkhi shall be stored in a weather-proof shed on a brick – paved platform.

2.8. Steel

2.8.1 General

All steel bars, sections, plates and other miscellaneous steel materials. etc., shall be free from loose mill scales, rust as well as oil, mud, paint or other coatings. The materials, construction specifications such as dimensions, shape, weight, tolerances, testing, etc. for all materials covered under this section, shall conform to respective IS Standards.

2.8.2 Reinforcement Bars

Reinforcement bars, to be used for civil and structural works, shall be one of the following or in combination thereof. High strength Deformed Steel bars of grade Fe 415 conforming to IS: 1786 shall normally be used. Specific requirement for any other type of reinforcement bars shall be as shown in the drawings or as specified in Contract or as directed by the Engineer.

Specification for hard drawn steel wire fabric for concrete reinforcement	IS: 1566
Specification for high strength deformed steel bars and wires for concrete reinforcement	IS: 1786
Steel for general structural purposes (Grade A)	IS: 2062
Specification for high tensile steel bars used in pre-stressed concrete	IS: 2090
Specification for indented wire for pre-stressed concrete	IS: 6003
Specification for corrosion resistant steel	IS: 1786

2.8.3 Structural Steel

Structural steel to be used for general structural purposes shall be of Grade-A conforming to IS: 2062. Specific requirement for any other type of structural steel shall be as shown in drawings or as specified in the contract or as directed by the Engineer. Structural steel sections shall conform to following IS specifications.

Steel tubes for structural purposes	IS: 1161
Mild steel tubes, tubular and other wrought steel fittings	IS: 1239
Steel for general structural purposes (Grade A)	IS: 2062
Hollow steel sections for structural use	IS: 4923

2.8.4 Miscellaneous Steel Materials

Hexagonal head bolts screws & nuts of product grade C	IS: 1363
Cold formed light gauge structural steel sections	IS: 811
Technical supply conditions for threaded steel fasteners	IS: 1367
Plain washers	IS: 2016

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Steel wire ropes for general engineering purposes	IS: 2266
Thimbles for wire ropes	IS: 2315
Building grips	IS: 2361
Mild steel tubes, tubular and other wrought steel filling (for hand rail tubular sections)	IS: 1239
Drop forged sockets for wire ropes for general engineering purposes	IS: 2485
Steel chequered plates	IS: 3502
Hexagonal bolts and nuts (M42 to M150)	IS: 3138

2.8.5 Steel Windows & Doors

Steel windows and doors shall be fabricated out of steel sections as in IS: 226 and shall conform to IS: 1038. Unless otherwise specified the details of construction, etc. shall be as described under 'Specification'.

2.9. Bricks

Bricks shall subject to the following, generally comply with IS: 1077; the sizes, however, will be as locally available. Bricks shall be of the quality locally available, table moulded if so specified and if locally made, well burnt but not over burnt, have plane rectangular faces with parallel sides, and sharp, right angled edges, of compact and uniform texture, without cracks, chips, flaws stones and nodules. They shall not show efflorescence, either dry or subsequent to soaking in water and shall emit a clear ringing sound, on being struck, and not absorb water more than 15% by weight. The bricks shall also have compressive strength not less than as stipulated in the item specifications.

Common clay burnt bricks of no stipulated compressive strength shall generally be as specified in the previous paragraphs but be only ground moulded, may be slightly distorted and have slightly rounded edges. They shall have a compact and uniform texture and shall not absorb water more than 15% by weight and shall have a minimum compressive strength of 35kg / cm². The size of the bricks i.e., dimensions must be well within the tolerance allowed as per IS: 1077.

2.10. Stone

2.10.1 General

All stones used for masonry works shall conform to the requirements of following IS Codes:

Method of identification of natural buildings stones	IS:1123
Recommendations for dimensions and workmanship of natural building stones for masonry work	IS:1127
Recommendations for dressing of natural building stones	IS:1129

2.10.2 Quality of Stones

Stones shall be of approved quality, hard, dense, strong, sound, durable, clean and uniform in colour. They shall also be free from veins, adherent coatings, injurious amount of alkalis, vegetable matters and other deleterious substances such as iron pyrites, coal, lignite, mica, sea, shells etc. Unless otherwise approved, stones from one single quarry shall be used for any one work. The strength of stones should be adequate to carry the imposed load and shall meet all the requirements of IS: 1905, taking into account the appropriate crushing strength of stone and type of the mortar used. The percentage of water absorption, when tested in accordance with IS: 1124 shall not exceed 5 percent. Stones normally used, shall be small enough to be lifted and placed by hand. The length of the stone shall not exceed 3 times the height. Width of stone on base shall not be less than 150mm and in no case exceed 3/4th thickness of the wall. Height of the stone shall not be more than 300mm.

2.10.3 Unloading / Stacking

The stones shall be unloaded from the trucks to a site near to the place of work as defined in IS: 4082 and shall be stacked on a firm ground having adequate slope for drainage. The supply of stones shall be so arranged that as far as possible at least two day's requirements of stone are available at site at any time.

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2.11. Admixtures

2.11.1 General Requirements for Admixtures

All concrete admixtures shall in generally comply with the following Indian Standards unless otherwise stipulated in this specification

Specification for integral cement water proofing compounds	IS:2645
Specification for other admixtures for concrete	IS:9103

Generally admixtures shall have BIS certification marks. However, even in case of BIS certified admixtures, Engineer may require the Tenderer to carry out and submit any or all the tests (as specified in relevant IS Codes), from approved laboratories, over and above the manufacturer's certificate, before giving his final approval.

In case, admixtures certified by BIS are not available, the Tenderer shall submit to the Engineer the type and / or proprietary brand of the admixture from only reputed manufactures along with necessary test certificates from recognized and approved laboratories or any other document directed by Engineer for latter's final approval. In such cases, names of at least two manufacturers shall be submitted to the Engineer for his selection. In case both the names are rejected, the Tenderer shall submit a fresh list of two manufacturers for approval by the Engineer.

The Engineer may direct the Tenderer to submit test results as required by IS: 2645 or IS: 9103 for any admixture proposed to be used in the concrete in any approved laboratory at his discretion at any stage of the work. The cost of any / all tests required to satisfy the compliance with the specifications shall be borne by the Tenderer.

Prior approval of the Engineer shall be obtained while using water reducing admixtures in the concrete (PCC / RCC) or mortar. Other type of admixtures such as accelerating admixtures, retarding admixtures or air entraining admixtures, shall not be used unless specified on the design drawings or prior approval taken from the Head office. Once approved, utmost care shall be exercised at site by the Tenderer to maintain the consistency in the quality if admixture and the concrete / mortar so produced.

The suitability and effectiveness of any admixture shall be verified by trial with the designed concrete mixes using cement, aggregates together with any other materials to be actually used in the works as per the direction of Engineer, if two or more admixtures are to be used.

Simultaneously in the same concrete mix, the Tenderer must submit necessary test results from an approved laboratory to show their interaction and compatibility. Any / all tests specified in IS Codes shall be carried out only with the type of material and mix design, to be actually; used in the work site.

No admixture shall impair the durability of the concrete nor combine with the ingredients to form harmful compounds nor increase the risk of corrosion of reinforcement. Use of admixture shall not reduce the dry density of concrete. Once the proportion of admixture has been established, strict check shall be maintained not to alter the proportions of ingredients and water cement ratio of the design Mix during execution

The chloride contents in admixtures shall not exceed 2% by mass of the admixture or 0.03% by mass of the cement.

Admixtures which do not meet the requirements stipulated in this specification shall be rejected and shall not be used.

2.11.2 Water proofing compounds

Water proofing Compounds shall be mixed with only ordinary Portland cement of grade 43, conforming to IS: 269.

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The permeability of the specimen with the admixture shall be less than half of the permeability with similar specimen without the use these compounds. These compounds shall be used in such proportion as recommended by manufacturer but in no case it shall exceed 3% by weight of cement.

The initial setting time of the cement with the use of these compounds shall not be less than 30 minutes and final setting time shall not be more than 10 hours. Test shall be carried out in accordance with IS: 4031.

Compressive strength of specimen at 3 days shall not be less than 160kg / sqcm. nor 80% of the 3 days compressive strength of mortar cubes prepared with same cement and sand only, whichever is higher. Similarly compressive strength at 7 days shall not be less than 220kg / sqcm. nor less than 80% of the 7 days compressive strength prepared with the same cement and sand only, whichever is higher. The test to determine the compressive strength shall conform to IS: 4031.

2.12. PVC Pipes

PVC pipes shall conform to the requirements of IS: 4985.

2.13. Wood / Timber

Wood shall be of good quality, well seasoned and free from defects such as cracks, dead knots, sapwood etc. No individual hard and sound knot shall be more than 15 sqcm in size and the aggregate knot shall be more than 15 sqcm in size and the aggregate area of such knots shall not exceed 2% of the areas of the piece. The timber shall be fairly close grained having not less than 2 growth rings per cm. width in cross – section.

2.13.1 Hard wood /Jack wood

Hard wood shall be first class wood conforming to IS 4021 of good quality, well seasoned and free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 6 sqcm in size with no dimension more than 50mm and the aggregate area of such knots shall not be more than 1% of the area of the place. There shall not be less than 5 growth rings per cm. width in cross – section.

Timber required to be used for form work shall be fairly dry before use. It should maintain its shape during the use and even when it comes into contact with moisture from the concrete. Storage of wood/timber shall be as per the requirement of IS: 4082.

For proper identification and selection of suitable timber for form work, following codes shall be referred.

Classification of commercial timbers and their Zonal distribution	IS: 399
Specification for bullies for general purposes	IS: 3337
Specification for plywood for concrete shuttering	IS: 4990

2.13.2 Laminates

The Laminates are thin sheets of plywood and polymer derivatives all pressed together to form thick boards of 3mm upwards. The laminates may also be glued / pressed on to block boards, particle boards etc depending on the production methods and end use.

The following IS standards shall be referred to for products

Ply wood	IS: 303
Marine plywood	IS: 710
Decorative plywood	IS: 1328
Flush doors	IS: 2046
Laminates	IS: 2046
Shuttering plywood	IS: 4996
Laminates boards	IS: 12823

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For the physical and mechanical properties of these products are covered by these codes. The property of resistance to surface wear, to dry heat, water, impact, cracking, steam, etc., be ascertained for the given applications.

For carpentry applications the manufactures instruction shall be followed in storage, handling, cutting, edge treatment and for use of appropriate tools.

2.13.3 Treated Country Wood

Treated wood shall be of best quality Padauk wood / Salwood chemically treated and KILN seasoned as stipulated in IS: 401 and IS: 1141 respectively with latest amendments. For the chemical treatment the following chemicals to be mixed with water in the proportion of 6:12:16 (i.e. Boric Acid / Copper Sulphate / Sodium Dichromate respectively). The moisture content of the wood after treatment and seasoning shall be in the range of 14 to 16%

Before the wood work is fixed in position and earlier to application of primer, chloro pyrifos in a ratio of 1:20 (1 part of chemical and 20 parts of kerosene / turpentine) shall be applied in all faces as a wood preservative.

No individual hard and sound knot shall exceed 25 mm in diameter and the aggregate area of such knots shall not be more than 1% of the area of the place. There shall not be less than 5 growth rings per cm. width in cross sections.

2.14. Tiles and Stone Slabs

Floor Tiles

Plain cement tiles, chequered tiles, mosaic tiles, terrazzo tiles shall conform to IS: 1237, compacted by mechanical vibration and hydraulically pressed, using grey cement for neutral shades. They shall be of choice shade and shall have the desired pattern of chip distributions. The sizes of chips and proportions of chips to cement in Terrazzo or mosaic floor shall be as specified in IS: 1237. The sizes and thickness of tiles shall be as specified in item Specification. The tiles shall be tested for abrasion, transverse strength, water absorption and thickness of wearing surface.

Note: Normally tiles shall be produced from an approved factory, but the Tenderer may manufacture them at the site itself with prior express permission in writing of the Engineer who will satisfy themselves as to the adequacy and competence of the arrangements proposed to be made (by the Tenderer) for the purpose the Engineer may refuse to give the permission / cancel the permission given if the proposed arrangements / arrangements made are not satisfactory

2.14.1 Glazed Tiles

White or coloured glazed tile shall comply with IS: 777. They shall be from an approved manufacturer and shall be flat and true to shape, they shall be free from cracks, crazing, spots, chipped edges and corners. The glazing and colour shall be of uniform shade and unless otherwise specified the tiles shall be of 5mm minimum thickness.

2.14.2 Other Tiles

Burnt clay tiles for terracing, roofing and flooring, ceramic tiles, unglazed, vitreous, acid resisting, etc. shall all conform to the relevant IS Codes.

2.14.3 Ceramic Tiles

Tiles shall be of approved make and confirm to IS: 13630 all parts. They shall be flat and true to shape and free from blisters, crazing, chips, welts, crawling or other imperfections detracting from their appearances. The tiles shall be square in shape and of nominal size 300mm X 300mm. Thickness of tiles shall be 8mm. Permissible deviations in length, squareness, straightness of sides and surface flatness shall not be more than $\pm 0.5\%$ and that is thickness of $\pm 5.0\%$. For other types of ceramic tiles manufacturers specifications may be referred.

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2.14.4 Granite Tiles

Granite tiles shall be of approved shade and quality. They shall be of 10 to 23mm thick mirror polished and machine cut. The tiles to be used shall be as laid down in the drawing or as directed by the Engineer. The angles shall be right angles and all edges shall be straight and true.

2.14.5 Kota stone / Shahabad / Cuddapah

The slabs shall be of selected quality and shade, hard, sound, dense, homogenous in texture, free from cracks, decay, weathering and flaws. These shall be machine cut to the requisite size and thickness and chisel dressed underside. The slabs shall have the top (exposed) face polished before being brought to site. Before starting the work, the Tenderer shall get the samples of slabs approved by the Engineer.

2.14.6 Stone Cladding / Stone Veneering Work:

Stone lining using blocks / slabs up to 80 mm thick shall be treated as veneering work and lining of greater thickness as Masonry.

These when used for table tops and floors may be of specified surfaces of polished / rough / dressed.

Stone: Stone shall be of type specified. It shall be hard, sound, durable and tough, free from cracks decay and weathering and defects like cavities, cracks, flaws, sand holes, veins, patches of soft or loose materials, etc.

The stone shall be cut into slabs of required thickness along the planes parallel to the natural bed of stone.

2.14.7 Dressing

Every stone shall be cut to the required size and shape, so as to be free from waviness and to give truly vertical and horizontal joints. For the faces that are to remain exposed in the final position and the adjoining faces to a depth of 6mm shall be the fine chisel dressed so that when checked with 60cm straight edge, no point varies from it by more than 1mm. The top and bottom faces that are to form the bed joints shall be chisel dressed so that variation from 60cm straight edge at no point exceeds 3mm. Faces which are to form the vertical joints should be chisel dressed so that variation at any point with 60cm straight edge does not exceed 6mm. All angles and edges that are to remain exposed in the final position shall be true, square and free from chippings. A sample of dressed stone shall be prepared for approval of Engineer before starting the work. It shall be kept at the work site as a sample after being approved. The dressed slabs shall be of the thickness as specified, with permissible tolerance at 2mm.

2.14.8 Stone Cladding

Kotah stone / Cuddapah / Granite

The slabs shall be of selected quality, hard, sound, dense and homogeneous in texture free from cracks, decay, weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of the colour indicated in the drawings or as instructed by the Engineer.

The slabs shall have the top (exposed) face polished before being brought to site unless otherwise specified. The slabs shall conform to the size required. Before starting the work the Tenderer shall get the samples of slabs approved by the Engineer.

Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth so that a straight edge laid along the side of the stone shall be in full contact with it. Rough surfaces may be specified for this cladding as designed. The sides (edges) shall be table rubbed with coarse sand or machine rubbed. All angles and edges of the slab shall be true, square and free from chippings. Fixing/laying of the slabs shall be as per other stone claddings.

2.15. Fiber Reinforced Concrete (FRC) / Manhole Covers

Materials used in the manufacture of these manhole covers are high grade concrete, reinforcing bars and steel fibers mixed with concrete. Strengths suggested are M30 or more. The frame for the cover may be in steel fixed over the base or a steel lined concrete block. FRC is generally manufactured as pre-cast elements at a central factory under controlled conditions, using mechanical means of vibrations and / or pressure to consolidate the concrete.

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Manufacturing process and test results shall be as indicated and guaranteed by the manufacturer. These covers, like in CI covers are designed for light medium or heavy duty. The covers shall have hooking facilities for removal and replacing.

As in the case of CI man hole covers rates / costs are to be indicated and measured inclusive of the frame to remove the cover.

2.16. Paint

Primer coating of structural steel shall be ready mix paint of red oxide zinc chrome, conforming to IS: 2074.

Synthetic enamel to be used, for painting of structural steel, shall conform to IS: 2932. Primer / Enamel shall be tested as per the requirements of IS: 101.

2.17. Anti Termite Compounds

Chloro pyrifos emulsifiable concentrates (1%) conforming to IS: 8944 shall be used for treatment of soil for protection of buildings against attack by subterranean termites.

2.18. Polysulphide Sealants

All Polysulphide Sealants shall conform to IS: 12118 and be of approved make. Test conditions and requirements shall be as given in the above referred IS code.

2.19. Storage, Test and Rejection

i. Storage

The storage of all materials at site of work shall be at the Tenderer's expense and risk and shall be done as per the requirements given in IS: 4082. The Tenderer shall maintain the proper record of receipt / consumption. The records shall always be accessible to the Engineer for verification.

The reinforcement bars, structural steel sections and other miscellaneous steel materials etc, shall be stored in such a way as to avoid and prevent deterioration, corrosion, bending, twisting and wrapping. In case of any damage occurring to the material on account of faulty storage or negligence by the Tenderer, same shall be borne by the Tenderer himself.

ii. Test after Delivery

Materials supplied by Employer or Tenderer, shall, after delivery at site and at the discretion of Engineer, be subjected to any or all of the tests, required by the relevant IS Codes. The Tenderer shall carry out and bear the cost of such tests.

iii. Rejection

The Engineer may reject at his discretion any material, notwithstanding the manufacturer's certificate or failing to meet the requirements of relevant IS codes for testing of materials. He may similarly reject any material, which has deteriorated or corroded, etc. due to improper storage, handling or transport. Defective materials shall not be used and removed from the site by the Tenderer at his own expense.

3. Clearing of Site, Excavation, Earth Filling and Landscaping

3.1. General

Trenches, pits for foundations of walls, column footings, rafts, pile caps, plinth beams, water tanks, cess pits, etc. shall be excavated to the length, width and depth as shown or figured on the drawing or as may be directed by the Engineer. If excavation is done to length, width or depth greater than as shown or required, the extra work occasioned thereby shall be deemed to have been done at Tenderer's expense and no payment will be therefore due. Extra depth shall be brought up by plain cement concrete filling of 1: 4: 8 proportion and extra length and width filled in by rammed earth or murum, or if the Engineer thinks it necessary for the stability of the work by 1: 4: 8 cement concrete, as may be directed by him at the Tenderer's cost.

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Excavated material shall be used for filling in plinth, or the sides of the foundation blocks or trenches or spread on or near the site of work or elsewhere in the premises including watering, ramming and consolidating or carted away from site, if surplus, free of charge, as provided in the item specification.

The Tenderer shall at his own expense and without extra charge, make provision for supporting all utility services, lighting the trenches, pits, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water whether of subsoil or rain water including pumping at any stage of the work. Trenches and pits shall be kept free of water while masonry or concrete works are in progress and till the Engineer consider it necessary.

3.2. Excavation excluding / other than in Hard Rock

Excavation shall be carried out in any type of soil, murum (soft or hard), soft rock, boulders, old foundations, concrete, asphalt or stone paved surfaces, old masonry or concrete (plain or reinforced).

3.3. Soft Rock

This shall include rock, boulders, slag, chalk, slate, hard mica, achiat, laterite, etc., which are to be excavated with stray blasting / without blasting or could be excavated with picks, hammer, crow bars, wedges. This shall also include excavation in macadam and tarred roads and pavements. This shall also include rock boulders not bigger than 1m in any dimension and not more than 500mm in anyone of the other two dimensions. Rubble masonry to be dismantled will also be measured under this item.

3.4. Excavation in Hard Rock

Since the work being carried out within the City Limits only control blasting with small charges is permitted and the Contractors shall take necessary approval of the Employer before taking any blasting work duly indicating the procedure being adopted for the controlled blasting.

Rock which is in solid beds, which can only be removed either by blasting or by wedging or chiseling, shall be treated as hard rock. A boulder or detached rock measuring one cubic meter or more, shall also be treated as hard rock if the same cannot be removed without blasting, wedging or chiseling.

Where hard rock is met with and blasting operations are considered necessary, the Tenderer shall notify the Engineer of the same.

The Tenderer shall obtain license from District / Public authorities for carrying out blasting work as well as for obtaining, transporting and storing explosives as per 'Explosive Rules 1940' or as amended. He shall purchase the explosives, fuses, detonators, etc., only from a licensed dealer. He shall maintain the account of explosive material purchase and used by him. He shall be responsible for safe custody and proper accounting of explosive materials. The Engineer shall have access to check the store of explosives and accounts therefore.

Blasting shall normally be done with gun powder, Dynamite, Gelatin or any other explosive shall be use in special cases with written permission of the Engineer and District / Public authorities concerned under 'Explosives Rules'.

Blasting operations shall be carried out under the supervision of a responsible representative of the Tenderer during certain hours, preferably during lunch break as approved in writing by the Engineer. The representative shall be conversant with the rules for blasting operations.

Proper precautions for safety of persons shall be taken. Red flags shall be prominently displayed around the area to be blasted and all people on work except those who actually light the fuses shall be withdrawn to a safe distance of not less than 100 meters from the blast. Blasting shall not be done within 100m of an existing masonry or any other kind of structures unless special precautions are taken by heavy blanketing, etc.

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Where blasting is not practicable or is prohibited, excavation shall be done by wedging or chiseling and shall be restricted to the quantity required to enable the necessary foundations, etc. to be put in. In case, the dimensions of trenches, pits, exceed those shown in drawings or as directed by the Engineer, the excess quantity shall not be paid for. The item also covers bailing out subsoil or rainwater including pumping at any stage of the work, shoring, strutting, etc.

3.5. Earthwork excavation in general surface grading

Earthwork is to be done by excavation using mechanical equipment for cutting and leveling and transporting earth within the campus as directed, and in depths as directed at site.

The excavated earth shall be deposited within the campus as defined above, in layers of 15cm, consolidated and leveled. Excess earth if any shall be transported off the campus at Tenderer's risk and cost.

The levels taken, before and after cutting and leveling at intervals of 3-5m shall be the basis for excavation quantities and in assessing the surplus quantities general specifications for earthwork excavation and filling will be applicable for these items also except for the additional clauses stated above. Excavation with blasting / stray blasting is separately taken as an item.

3.6. Dismantling and Demolition

Specification covers the procedure and safety measures required for demolition and dismantling of masonry [Brick & Concrete (Plain & Reinforced), structural steel sheeted / un-sheeted] works.

Materials obtained from dismantling / demolition operations shall be the property of the Employer unless otherwise specified and kept in safe custody until handed over to the Engineer.

If it becomes necessary to disconnect any existing service such as electrical, piping, etc. during dismantling / demolition operation and where so required by the Engineer, suitable alternate arrangement shall be made by the Tenderer to maintain the continuity and proper functioning of the service line(s) at no extra cost of the Employer.

3.7. Specifications

Tenderer shall adhere to safe demolishing / dismantling of all stages of work to guard against accidents, safe / unsafe working procedures. Propping, under pinning shall be done for the safety of adjoining structures whose safety is likely to be affected before taking up the demolishing and dismantling work.

Enclosures / fencing, danger lights, etc. shall be provided as specified by the Engineer to prevent accidents. Pipes, fixtures, etc. located in the vicinity shall be protected by suitable means as directed by the Engineer during demolishing and dismantling operation. Measures shall be taken to avoid the dust nuisance

Dismantled elements / components shall not be dropped from a height or thrown from a distance so as to avoid damaging the same. Dismantling of elements (fixed by screws/ bolts/ hooks, etc) shall be done by taking out the fixtures with proper tools only. Such fixtures may be cut by sawing or flame cutting, in event of their being stuck up due to rusting etc. welds shall be removed by flame cutting. Tearing or ripping of elements shall not be resorted to under any condition.

3.8. Procedure

Work of demolishing & dismantling shall be carried out very carefully. Prior to start of work, the Tenderer shall prepare and submit the proposed scheme of demolishing & dismantling to the Engineer-in-Charge for his approval. Demolition of any structure shall be carried out in the reverse sequence followed at the time of its construction.

Dismantling shall be done in a systematic manner. All elements shall be carefully removed without causing any damage. Chipping of concrete/grout shall be done with precision by chiseling. The

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finished surfaces shall be made true to the requisite size and shape. Pockets / holes of specified size shall be made / cut by chiseling / drilling.

3.9. Cleaning & Stacking

Wherever directed, retrieved material such as bricks / stones, reinforcement bars, sheeting, etc. shall be separated out, cleaned and properly stacked.

3.10. Disposal

All unserviceable materials shall be disposed off as per the directions of the Engineer-in-charge-in charge

4. Earth Filling :

4.1. General :

Filling shall be done with good approved earth, murum, gravel, or quarry dust. It shall be free of salts, organic matter, black cotton soil or slushy earth and combustible material. All clods shall be broken thoroughly and properly.

4.2. Filling in Plinth /sides of foundation :

Shall be done in layers not exceeding 15cm, adequately watered and consolidated by ramming with iron or wooden rammers weighing 7 to 8 kg and having a base square/circular of 20cm side /diameter. When the filling reaches the finished levels, the surface shall be flooded with water for at least 24 hours, allowed to dry and then rammed and consolidated after making good any settlement in order to avoid such settlement at a later stage. Special care shall be taken to pack earth under plinth beams and column corners. Finished level of filling shall be kept to the slope intended to be given to the floor.

4.3. Filling in Outdoor portions and for site development :

Shall be done in layers of 15 to 30cm as may be specified in the item specification. Each layer shall be adequately watered. When filling reaches the required level the topmost layer shall be dressed to proper section, grade and camber and rolled by 8 ton power roller, adequately watered to aid compaction.

4.4. Compaction

Where compaction of 90% standard proctor density is called for such compaction shall be by mechanical means but the Tenderer may be permitted to adopt manual means only if the Engineer-in-charge finds that the desired compaction is achievable in the field.

For compacting each sand layer, water shall be sprayed over it to flood it and it shall be kept flooded for 24 hours to ensure maximum compaction. Vibro-compactors shall also be used if necessary to obtain the required degree of compaction. Any temporary works required to contain sand under flooded condition shall also be undertaken. The surface of the consolidated sand shall be dressed to required levels or slope.

After the compacted fill has reached the desired level, the surface shall be flooded with water for 24 hours, allowed to dry and then rammed and consolidated to avoid any settlement at a later date. The compacted surface shall be properly shaped, trimmed and consolidated to an even gradient or level. All soft spots shall be excavated filled and consolidated.

The degree of compaction of compacted fill in place will be subject to tests in accordance with relevant Indian Standards as desired by the Engineer-in-charge. As the work progress, the Tenderer shall provide the necessary facilities to make such tests. If any test indicates that the compaction achieved is less than the required as per design and functional requirements degree of compaction, the Engineer-in-charge may require all fill placed subsequent to the last successfully test to be removed and re-compacted by the Tenderer. Compaction procedure shall be amended as necessary to obtain satisfactory results.

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Filling in plinth and ground with earth brought from outside

- A. Filling shall be carried out with approved material. The material shall be free from clods, salts, sulphate, organic & other foreign material. All clods of earth shall be broken or removed. 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 and rubbish material shall be removed. The materials so removed shall be burnt or disposed off as directed by Engineer-in-charge. The Tenderer shall make necessary access roads to those areas and maintain the same, if such access road does not exist, at his cost
- B. If any material is rejected by Engineer-in-charge, the Tenderer shall remove the same forthwith from the site at no extra cost to Employer. Surplus fill material shall be disposed off by uniform spreading within the site as instructed by the Engineer-in-charge.
- C. The compaction shall be carried out as specified above.

4.5. Dry Rubble Packing :

Ground shall first be leveled up and thoroughly consolidated by means of heavy log hammers or from rams. Rubble of specified thickness shall then be laid and set with hand. It shall be consolidated by either by hand roller or wooden log hammers, water being freely used during consolidation. All hollows and interstices after consolidation shall be filled up with quarry spalls, stone chips, etc., and the packing blinded with stone grit, watered and consolidated by log hammer.

Rubble packing in road work shall be thoroughly consolidated by means of power roller of 8 ton capacity instead of log hammers and the surface shall be brought to proper grade and camber. After checking the level, grade and camber the surface will again be watered and rolled to receive road structure.

4.6. Leveling Course :

The ground shall be prepared as for Dry Rubble packing as above. The course shall be either plain cement concrete of lean mix or lime concrete which shall be proportioned as stipulated in the relevant item and mixed and placed in position, conforming to line and level shown on the drawing and compacted by approved means and cured adequately.

Lime concrete shall be prepared by mixing sand and slaked lime in proportions of three parts of sand and one part of lime and ground in a suitable mill and the mortar so prepared shall be added to six parts of brick bat passing through 50mm mesh, mixed well and placed in position and compacted by approved means, The concrete shall be cured adequately.

4.7. Sand filling in plinth/foundation

Filling shall be carried out in layers not exceeding 15cms and shall be compacted mechanically or by saturation to specified grade and level and to obtain 90% laboratory maximum dry density or as specified in schedule of rates.

Compaction by flooding may be accepted at the discretion of the Engineer-in-charge, provided the required compaction is achieved.

The Tenderer shall not commence filling in and around any work until it has been permitted by the Engineer-in-charge.

5. Landscaping works (Deleted)

6. Plain & Reinforced Cement Concrete :

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6.1. General :

Except where they are varied by the requirements of this specification the provisions of Indian Standard specifications, under IS-456 for plain and reinforced concrete and IS: 1786 for high strength deformed steel bars etc., for concrete reinforcement and other relevant ISS applicable together with the latest amendments shall be held to be incorporated in this specification. It shall be the intent of these specifications to ensure that all concrete placed at various locations of the job should be durable, strong enough to carry the design loads, should wear well and practically be impervious to water. It should be free from such defects as shrinkage, cracking and honeycombing.

6.2. Proportioning the Mix :

In directed by volume batching, controlled concrete, proportions of cement to fine and coarse aggregate shall be as specified in the respective items and shall be accurately measured as in Table 'A' 2.16. These proportions are based on the assumption that the aggregates are dry. If the aggregates are moist, allowance shall also be made for bulking in accordance with IS: 2386. Allowance shall also be made for surface water present in aggregate when computing water content. Surface water present shall be determined by one of the field methods described in IS: 2386 (Part III). In the absence of exact data, the amount of surface water may be estimated from the values given in Table 'B' 2.16.

6.3. Mixing :

Concrete of 1:2:4 or richer mix shall be mixed in an approved mechanical mixer. The mixer and mixing platform shall be suitably protected from wind and rain. Aggregates shall be accurately measured out in boxes of approved measures and mixed dry along with cement; water shall then be added in measured quantity and mixing shall be continued until there is uniform distribution of the materials and the mass is uniform in colour and consistency but in no case shall the mixing be done for less than 2 minutes.

When hand mixing is permitted with the approval of the Engineer-in-charge it shall be carried out on a watertight mixing platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. 10% extra cement must be added for hand mix at the cost of Tenderer if permitted for hand mix to obtained proper workability of strength.

6.4. Consistency :

Quantity of water for making reinforced concrete shall be sufficient to ensure that concrete laid in position shall be surrounded and properly grip all the reinforcement. The best consistency shall be that when the mix flows sluggishly without flattening itself out and without separation of coarse aggregate from the mortar. The degree of plasticity shall depend on the nature of the work and atmospheric temperature and whether the concrete is vibrated or hand compacted. The slumps obtained by the standard slump test carried out in accordance with the procedure laid down in IS: 1199 shall be adopted for different types of work.

6.5. Admixtures :

The use of admixtures such as retarders, super Plasticizers, accelerators may be allowed if approved by the structural consultant and his decision in this regard shall be final. In any case, admixtures shall before use be tested for compatibility with design requirements.

6.6. Other Chemicals :

A large number of concrete chemicals for internal/external application are available and may be deployed on case to case basis, on the approval of the Engineer-in-charge.

6.7. Transporting :

Concrete shall be conveyed from the place of mixing to the place of final deposit as rapidly as practicable by methods designed to prevent segregation or loss of any of the ingredients. If segregation does occur during transport, the concrete shall be remixed before being placed in situ. In no case, more than 30 minutes shall elapses between mixing and consolidation in position.

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6.8. Placing & compacting :

Concrete shall be placed in layers of suitable thickness or in strips and compacted before initial setting commences and should not be subsequently disturbed. Method of placing shall as far as possible be continuous and be such as to preclude segregation. Special care shall be taken in accordance with IS: 456 while laying concrete under extreme conditions of weather.

Transporting and depositing/placing concrete by pumps or other mechanical means such as buckets, chutes, conveyor, tremy etc., shall be with the approval of the Engineer-in-charge.

Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcements, embedded fixtures and spaded against corners of the form work by punning, ridding, mechanically vibrating or by any other approved means, taking adequate care to ensure that the layers of reinforcement are not disturbed/displaced. Chairs and supports shall be used in adequate numbers to allow labour to pass and cross without again disturbing/displacing reinforcement. In addition, form work shall be tapped lightly by using wooden mallets at the pouring head. The number and types of vibrators to be used shall be subject to the approval of the Engineer-in-charge and in general, immersion type vibrators when used shall have the desired amplitude and frequency depending on the mix design, sizes of the members and the gaps between reinforcing bars. External vibrators such as shutter or screed vibrators shall also be used whenever so directed.

The intensity and duration of vibration shall be sufficient to cause complete settlement and compaction without any stratification of successive layers or separation of ingredients or formation of laitance. Vibrator shall be inserted vertically in the concrete at points not more than 45cm apart and withdrawn very slowly when air bubbles no longer come on the surface. Over vibration or vibration of very wet mixes is harmful and should be avoided. Care shall be taken to utilize the vibrator only to compact the concrete and not to spread it. Sufficient number of reserve vibrators in good working condition shall be kept on hand at all times, so as to ensure that there is no slackening or interruption in compacting.

6.9. Controlled Concrete

6.9.1 Mix Design :

Where controlled concrete is specified the mix shall be designed to produce the grade of concrete with the required workability and characteristic strength not less than the appropriate value for each grade specified in IS 456. The procedure for the design shall be as prescribed in IS Code No: 10262.

6.9.2 Design Mix concrete

The mix shall be designed to produce the grade of concrete Having the required workability and characteristic strength not less than appropriate values given in the relevant specifications.

As long as the quality of materials does not change, a mix design done earlier shall be considered adequate for later work. However, incase the quality of materials change, the Engineer-in-charge may ask for a new design mix.

While designing the mix, the durability requirements as given in IS: 456 shall also be taken into account. However, the minimum specified cement content for concrete shall be:

M20	320 kg/cum
M25	360 kg/cum
M30	400 kg/cum

Using 43/53 grade OPC unless specified in the item of work. 43/53 grade OPC (IS: 8119) shall be used in all RCC works above ground level. PPC is preferred for use in masonry and plaster and for all works below ground level including in RCC: Unit cement content remaining at minimum indicated.

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Method of measurement unless otherwise stated in specification, shall be based on relevant IS specifications. Items of work/ materials specific to the locality shall be governed by the local PWD practices, unless it is explicit in tender documents.

6.9.3 Concrete Technologist :

When in any work the quantity of all concrete in reinforced cement concrete work is 400 cum. or more, the Tenderer shall engage a qualified and competent concrete technologist/consultant whose name shall be got approved by the Engineer-in-charge, whose duty shall be to supervise the reinforced cement concrete work right from the time, before commencement of the work, sampling of aggregate is done for designing mixes to the time when all tests ON CONCRETE WORK ARE COMPLETED. In other cases there shall be at the site a qualified civil Engineer-in-charge to carry out the work of the concrete technologist.

6.9.4 Testing Laboratory :

When similarly the quantity of all concrete in RCC work is 800 cum or more, the Tenderer shall establish a laboratory of his own at the site with all equipment, instruments and accessories and personnel necessary to carry out designing and testing concrete. In other cases the Tenderer shall get the designing - testing work done at approved laboratories in the city at his own cost.

6.9.5 Proportions :

It is the Tenderer's responsibility to have the necessary tests carried out at his cost, in his own laboratory and the necessary calculations made, in accordance with IS No:10262 to arrive at the best proportion by weight of aggregate and cement to produce concrete of the desired strength, submit the details to the Engineer-in-charge which shall be called the declared Proportions. If the proposal made by the Tenderer is not satisfactory to the Engineer-in-charge the test and calculations shall be redone by the Tenderer, at his cost, under the guidance of the Engineer-in-charge, and fresh Proportions established with the approval of the Engineer-in-charge. The minimum quantity of cement to be consumed shall as prescribed in I.S. code and in cases of short use of cement the Engineer-in-charge have the option to reject the concrete when the Tenderer shall remove and replace the concrete to specification or accept the concrete with the provisions and the conditions of contract operative. No deviation from declared proportions will be allowed without written authority from the Engineer-in-charge. The declared proportion may be altered to suit substantial variations in the quality of the aggregates collected at site, from time to time and every time an alteration becomes necessary the test and calculations shall be repeated. No approval for and no agreement to any declared proportion, by the Engineer-in-charge or other person shall relieve the Tenderer of his responsibility to produce in situ concrete of the desired quality and strength in accordance with the relevant IS Code.

6.9.6 Measurements of Ingredients :

Proportioning of the ingredients for each batch of concrete shall be carried out in an approved weigh batching machine, water being fed into the mixer from a calibrated tank provided with the means of adjusting the flow, due allowance being made for the weight of water carried by the coarse and fine aggregate which shall be periodically ascertained.

When the quantity of all concrete in reinforced cement concrete work is less than 400 cum. alternatively, the declared weight proportions may with the approval of the Engineer-in-charge be converted into equivalent volumetric proportion and mixing may be done in the usual manner adopted for nominal mixes.

6.9.7 Mixing, transporting, depositing, compaction, curing etc.,:

The specifications shall be as described earlier for plain and reinforced concrete. No concrete for RCC work shall be placed in position unless written authorization is obtained from the Engineer-in-charge. For all design mix concreting, mixing of concrete shall be done using weigh batching system.

6.9.8 Construction Joints:

Concreting shall be carried out end to end continuously as far as possible and when construction joints

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are totally unavoidable; they shall be located in predetermined positions approved by the Engineer-in-charge. The joints shall be kept at places where the shear force is the minimum and shall be straight and at right angles to the direction of main reinforcement. When the work is to be resumed on a surface which has hardened, such surface shall be roughened, swept clean, thoroughly wetted and covered with a 13mm thick layer of mortar composed of cement and sand in the same ratio as the cement and sand in the concrete mix. This 13mm layer of mortar shall be freshly mixed and placed immediately before the placing of fresh concrete.

Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristly brushes, care being taken to avoid dislodgement of particles of aggregate. The surface shall be thoroughly wetted and free water removed and then is coated with neat cement grout. In horizontal joints the first layer of fresh concrete to be placed on this surface shall not exceed 15cm thickness and shall be well rammed against the old work, particular attention being paid to corners.

6.9.9 Expansion Joints:

Expansion joints shall be provided where required as shown on the drawings or as directed by the Engineer-in-charge/Consultant. The joints shall be filled in with filler of approved quality and type.

6.10. Curing:

Concrete shall be carefully protected during the first stage of hardening, from harmful effects of excessive heat, dry winds, rain or running water. It shall be covered with a layer of sacking, sand, canvas, Hessian or similar absorbent material and kept constantly wet for ten days from the date of placing of concrete, alternatively the concrete being thoroughly wetted and covered by a layer of approved waterproof material which should be kept in contact with it, for seven days.

In the event curing by water is inefficient/ineffective the Engineer-in-charge may permit/may also enforce curing, on release of form work, by application of chemical sealants, but no extra charges are payable.

6.11. Form Work :

Form work shall include all temporary or permanent forms or moulds required for forming the concrete in situ together with all temporary construction required for their support. Form work shall conform to the shape, lines and dimensions as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently watertight to prevent loss of cement slurry from the concrete. Form work or centering shall be constructed of steel or timber, aluminex, FRP, Polypropylene etc., adequately designed to support the full weight of wet concrete without deflection and retain its form during laying, ramming and the setting of concrete. Timber used shall be of properly seasoned quality to avoid deformation when wetted.

6.11.1 All props shall be straight and of full height and no joints shall be permitted. Props, if in timber, shall be tied and braced with thin casurina post and or wooden battens and where additional staging is necessary care shall be taken to use props of bigger diameter with bracings at 4 or 5 levels. All props shall be supported on sole plates and double wedges. At the time of removing props these wedges shall be gently eased and not knocked out.

Proprietary systems of form work and scaffolding may also be deployed in which case manufacturers' instructions on erection; bracing and removal shall be strictly followed.

Forms shall be so constructed as to be removable in sections on designed sequence, without damaging the surface of concrete or disturbing other sections. Form work must be the case of complicated structures and/or on spans of more than 12M, the details of form work shall be properly worked out by the Tenderer and the scheme, setting and release, shall be got approved by the Engineer-in-charge, well in advance before concrete work is to be taken up. All rubbish, chippings, shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with non-staining mineral

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oil or any other approved material. Care shall be taken to see that oil or similar other such approved material is kept out of contact with the reinforcement.

All form work shall be removed without shock or vibration and shall be cased off carefully in order to allow the structure to take up its load gradually. Forms shall not be disturbed until concrete has adequately hardened to be able to take the superimposed load coming on it and in no circumstances shall forms be struck until the concrete reaches a strength of at least twice the stress to which the concrete may be subject to, at the time of striking.

In the normal circumstances (generally where temperatures are above 21 degrees centigrade) and where ordinary cement is used, forms may be struck after expiry of the following periods:

A	Walls, columns and vertical sides of the beams	48 hours or as may be directed by Engineer-in-Charge
B	Bottom of slabs up to 4.50 m span	7 days
C	Bottom of slab over 4.50 m span, bottom of beam and arch rib up to 6m span	14 days
D	Bottom of slab over 4.50 m span, bottom of beam and arch rib over 6m span	21 days or as revises in IS: 456-2000

However this period may be increased or decreased at the discretion of Engineer-in-charge. Special care shall be taken while striking the centering of cantilevered slabs, canopies, portal frames, folded plate construction, for which period for striking centering shall be as determined by the Engineer-in-charge.

If directed, forms shall be given an upward camber to ensure that the beams do not show any sag.

Surfaces that become exposed on removal of forms shall be carefully examined and any fins, burrs, projection etc., that there detected shall be removed. Honeycombing of minor nature, over limited areas may be finished neatly with cement mortar 1:2 only on being so permitted and as directed by the Engineer-in-charge.

Any work showing signs of damage through premature or careless removal of centering or shuttering, shall be reconstructed by the Tenderer at his own cost.

In any case no concrete work shall be finished, plastered or made good ("touched up" as it is loosely called) in any form unless and until the Engineer-in-charge inspect and pass the surface for such finishing, plastering or making good.

6.12. Strength :

Normal Concrete mixed in the proportions desired shall have compressive strengths after placing, of not less than the following:

Sl.No.	Concrete(Mix Nominal)	Minimum Compressive strength at 7 days	Minimum Compressive strength at 28days
1	1:1:2	175Kg/sq.cm,	250Kg/sq.cm.
2	1:1 ½:3	140kg/sq cm	200Kg/sq cm
3	1:2:4	105Kg/sq cm	150kg/sq cm

6.13. Tests :

Tests on concrete shall be carried out in accordance with IS-456 and other ISS applicable. The frequency of works test shall be such as may be ordered by the Engineer-in-charge and subject to such orders, for every 150cum a batch of 6 cubes shall be made for every sample and 3 of them tested after 7 days and the remaining cubes after 28 days. The criteria for acceptance of concrete as conforming to the specified proportion/grade of concrete shall be in accordance with IS: 456 and the Tenderer shall entirely re-do rejected work at his own cost. Strength on 28 days shall alone be considered for

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acceptance.

The Tenderer shall arrange to carry out the tests in accordance with the relevant Indian Standard specifications in an approved laboratory and the test reports in original submitted to Engineer-in-charge. The entire cost of testing shall be borne by the Tenderer.

6.14. Steel Reinforcement :

Reinforcement shall be accurately fabricated, placed and adequately maintained in position as shown on drawings or as directed by the Engineer-in-charge. All finished bars shall be free from cracks, surface flaws, and laminations, jagged and imperfect edges. Cement mortar blocks adequately compacted and as dense as the parent concrete holding them, and well cured shall be used to give requisite cover as shown on the drawing or as directed and all intersections of bars shall be firmly tied with binding wire of 18 gauge double strand. Commercially available plastic or other cover blocks may also be used. Reinforcement shall be bent in accordance with the procedure stipulated in IS: 2502 and will not be straightened in such manner that will injure the material.

All reinforcement shall immediately before placing in concrete, be thoroughly cleaned of loose mill scale, loose rust, oil and grease or other deleterious matter that would destroy or reduce bond.

Reinforcement in reinforced concrete members shall not be connected by welding or coupling except in accordance with the relevant ISS and with the previous approval of the Engineer-in-charge. Cold worked HSD bars shall not be welded at random even for tack unless approved by the Engineer-in-charge. Overlaps and joints shall be staggered and located at points along the span where neither shear nor bending moment is maximum.

Bars and rods projecting out of concrete and exposed to weather shall, unless completely enclosed/covered by virtue of suitable provision in the schedule of quantities, be protected, free of any charge, by a thick coat of cement slurry .

6.15. Cover:

Reinforcement shall have cover as shown on the R.C.C. drawings and where not specified the thickness of cover shall be as follows.

- At each end of reinforcing bar not less than 25mm nor less than twice the diameter of such rod or bar.
- For a longitudinal reinforcing bar in a column not less than 40mm, nor less than the diameter of such rod or bar. In the case of columns of minimum dimension of 20cm or under, whose reinforcing bars do not exceed 13mm, the cover of 25mm may be adopted.
- For longitudinal reinforcing bar in a beam, not less than 25mm, nor less than the diameter of such rod or bar.
- For tensile, compressive, shear or other reinforcement in a slab, not less than 13mm nor less than the diameter of such reinforcement and
- For any other reinforcement, not less than 13mm nor less than the diameter of such reinforcement. (For Cover blocks see earlier).

6.16. TABLE 'A' (For nominal mix)

No.	Nominal Mix	Qty. of Aggregate required for 50 Kg of cement in cum.		Qty. of Water required for 50 Kg of cement	
		Fine	Coarse	Vibrated	Un-Vibrated
				(For Dry Aggregates)	
1	1:1:2	0.035	0.070	22 Liter.	27 Liter.
2	1:1 ½ : 3	0.052	0.106	23 Liter.	30 Liter.
3	1:2:4	0.070	0.138	27 Liter.	32 Liter.
4	1:3:6	0.105	0.210	28 Liter.	34 Liter.
5	1:4:8	0.150	0.280	-	45 Liter.

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6.17. TABLE 'B'

N o	Aggregate	Approximate Qty. of Surface Water in Liter. / Cum
1	Very Wet Sand	120
2	Moderately Wet Sand	80
3	Moist Sand	40
4	Moist Gravel or Crushed Rock	20 to 40
Coarser the aggregate, lesser the water it will carry.		

SNo	Type of work	Slumps	
		When Vibrated	When Not Vibrated
1	Mass Concrete in RCC Foundation, Retaining Walls and Road Slabs.	2.5 Cm.	5 Cm.
2	Beams, Slabs, Columns with simple reinforcement	Cm. To 5 Cm.	5 Cm. To 10 Cm.
3	Thin Sections with congested reinforcement	5 Cm. To 10 Cm.	10 Cm. To 15 Cm.

Note: Should conditions governing slump and workability point to advisability of an increased slump, the change shall only be done by decreasing the amount of aggregate and not by increasing the amount of water.

6.18. Pre-cast Concrete Jali

- The jali shall be of specified grade reinforced with 1.6mm mild steel wire unless otherwise specified.
- Fixing: The jali shall be set in position true to plumb and level before joints sills and soffits of the openings are plastered. It shall then be properly grouted with cement mortar 1:3 (1 cement: 3 coarse sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered embedding the jali uniformly on all sides.
- Measurements: the jali shall be measured for its gross superficial area. The length and breath shall not be less than that specified.
- Rate : the rate shall be inclusive of materials and labour involved in all the operations described above except plastering of jambs, sills and soffits, which will be paid for under relevant items of plastering

6.19. Pre-cast Concrete

Pre-cast concrete shall comply with IS 456 and with the following requirements:

All pre-cast units shall be cast on suitable bed or platform with firm foundation and free from wind. The Tenderer shall be responsible for the accuracy of the level or shape of the bed or platform. A suitable serial number and the date of casting shall be impressed or painted on each unit. Side shutters shall not be struck in less than 24 hours after depositing concrete and no pre-cast unit shall be lifted until the concrete reaches strength of at least twice the stress to which the concrete may be subjected to at the time of lifting.

The lifting and removal of pre-cast units shall be undertaken without causing shock, vibration or undue bending stresses to or in the units. Before lifting and removal takes place Tenderer shall satisfy Engineer-in-charge or his representative that the methods he proposes to adopt for these operations

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shall not over stress or otherwise affect seriously the strength of the pre-cast units. The reinforced side of the units shall be distinctly marked.

All pre-cast work shall be protected from the direct rays of the sun for at least 7 days after casting and during; that period each unit shall be kept constantly watered or preferably be completely immersed in water if the size of the unit so permits, otherwise curing practice shall be followed

Slots, openings or holes, pockets etc. shall be provided in the concrete work in the drawings or as directed by Engineer-in-charge. Any deviation from the approved drawings shall be made good by the Tenderer at his own expense. Without damaging any other work sleeves, bolts, inserts, etc. shall also be provided in concrete work where so specified.

7. Masonry Works

7.1. Brick Masonry Works;

7.1.1 Scope

This specification establishes the materials, dressing, laying, joining curing, workmanship etc. for brick masonry works. Brick masonry shall also comply with all the requirements of IS: 2212.

7.1.2 General Requirements

Materials: Refer materials specification no 2.9

Cement Mortar

Cement mortar shall meet the requirements of IS: 2250 and shall be prepared by mixing cement and sand by volume. Proportion of cement and sand shall be 1:6 (1 part of cement and 6 parts of sand), or as directed by the Engineer-in-charge / shown on the drawing, for brick masonry of one brick thickness or more, while 1:4 cement mortar (1 part of cement and 4 parts of sand) shall be used for brick masonry of half brick thickness. The sand being used for mortar shall be sieved. The mortar shall be used as soon as possible after mixing and before it has begun to set and in any case within initial setting time of cement after water is added to the dry mixture. Mortar unused for more than initial setting of cement, shall be rejected and removed from the site of work.

Proportioning

The unit of measurement for cement shall be a bag of cement weighing 50 kg and this shall be taken as 0.035 cubic m. Sand shall be measured in boxes of suitable size on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulkage.

Mixing

The mixing of mortar shall be done in a mechanical mixer operated manually or by power. The Engineer-in-charge may, however, permit hand-mixing as a special case, taking into account the magnitude nature and location of work. The Tenderer shall take the prior permission of Engineer-in-charge, in writing, for using hand-mixing before the commencement of work.

Mixing in Mechanical Mixer

Cement and Sand in specified proportions, by volume, shall be thoroughly mixed dry in a mixer. Water shall then be added gradually and wet mixing continued for at least one minute. Care shall be taken not to add more water than that which shall bring the mortar to the consistency of stiff paste. Wet mix from the mixer shall be unloaded on water-tight masonry platform, made adjacent to the mixer. Platform shall be at least 150 mm above the leveled ground to avoid contact of surrounding earth with the mix. Size of the platform shall be such that it shall extend at least 300 mm around the loaded wet mix area. Wet mix, so prepared, shall be utilized within initial setting time (thirty (30) minutes for ordinary Portland cement conforming to IS: 269 after addition of water. Mixer shall be cleaned with water each time before suspending the work.

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7.1.3 Construction Procedure

Soaking of Bricks

Bricks shall be soaked in water before use for a period that is sufficient for the water to just penetrate the whole depth of bricks as well as to remove dirt, dust and sand. Proper soaking of bricks shall prevent the suction of water from the wet mortar as otherwise mortar will dry out soon and crumble before attaining any strength. The bricks shall not be too wet at the time of use as they are likely to slip on mortar bed and there will be difficulty in achieving the plumb ness of wall as well as proper adhesion of bricks to mortar.

The period of soaking shall be determined at site by a field test by immersing the bricks in water for different periods and then breaking the bricks to find the extent of water penetration. The least period that corresponds to complete soaking, will be the one, to be allowed for in the construction work.

The soaked bricks shall be removed from the tank, sufficient early, so that at the time of laying, they are skin dry. The soaked bricks shall be stacked over a clean place, wooden planks or masonry platforms to avoid earth, dirt being smeared on them.

7.1.4 Laying

Brick Work (One or more brick thickness)

Brick work (One or more brick thickness) shall be laid in English Bond unless otherwise specified. Half or cut bricks shall not be used except when needed to complete the bond. In no case the defective bricks shall be used.

A layer of average thickness of 10mm of cement mortar shall be spread on full width over a suitable length of lower course or the concrete surface. In order to check and achieve uniformity in masonry, the thickness of bed joints shall be such that four courses and three joints taken consecutively shall measure equal to four times the actual thickness of the brick plus 30 mm. Each brick with frog upward shall be properly bedded and set in position by gently tapping with handle of trowel or wooden mallet. Its inside faces shall be buttered with mortar before the next brick is laid and pressed against it. After completion of the course, all vertical joints shall be filled from top with mortar.

All brick courses shall be taken up truly plumb; if battered is to be truly maintained. All courses shall be laid truly horizontal and vertical joints shall be truly vertical. The level and vertically of work in walls shall be checked up at every one meter interval.

The masonry walls of structures shall be carried up progressively, leaving no part one meter lower than the other. If this cannot be adhered to, the brick work shall be raked back according to bond (and not left toothed) at an angle not more than 45 degrees but racking back shall not start within 60 centimeters of a corner. In all cases returns, buttresses, counter forts, pillars etc., shall be built up carefully course by course, and properly bonded with the main walls.

The brick work shall be raised not more than fourteen (14) courses per day.

At the junction of any two walls, the bricks shall at each alternate course, be carried into each of the respective walls so as to thoroughly unite the work.

The courses at the top of plinth and sills, at the top of the wall just below the soffit of the roof beam and at the top of the parapet, shall be laid with bricks on edge. Brick on edge course shall be so arranged as to tightly fit under the soffit of the roof beam or roof slab, restricting the mortar layer thickness up to 12 mm, however, any gap between the finished brick work and soffit of roof slab / beam shall be suitably sealed with manhole of 13 cm wide of approved quality leaving the equal gap on either side and then sealed with the mortar over chicken mesh as instructed by Engineer-in-charge.

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Brick Work (Half brick thickness)

For brick walls of half brick thickness, all courses shall be laid with stretches. Wall shall be reinforced with 2 numbers 6mm diameter mild steel reinforcement bars, shall be straightened and thoroughly cleaned. Half the mortar thickness for the bedding joint shall be laid first and mild steel reinforcement, one on each face of the wall, shall be embedded, keeping a side cover of 12mm mortar. Subsequently, the other half of the mortar thickness shall be laid over the reinforcement covering it fully.

The reinforcement bars shall be carried at least 150 mm into the adjoining walls or RCC columns. In case the adjoining wall being of half brick thickness, the length of bars shall be achieved by bending the bars in plan. During casting of reinforced concrete columns, 6mm diameter M.S. reinforcing bar shall be placed at every fourth course of brick masonry. At the junction of two walls, the brick shall, at each alternate course, be carried into each of the respective walls so as to thoroughly unite the work. The brick masonry work shall not be raised more than 14 courses per day.

Brick course under the soffit of beam or slab, shall be laid by restricting the mortar thickness to 12 mm. However, any gap between the finished brick work and soffits of slab / beam shall be suitably sealed with the thermocole of 8cm wide of approved quality leaving the equal gap on either side and then sealed with the mortar over chicken mesh as instructed by Engineer-in-charge.

7.1.5 Circular Brick Work

The detailed specification for brick work covered under 7.4.1 shall apply, in so far as these are applicable. Bricks forming skew backs shall be dressed or cut so as to give proper radial bearing. Defects in dressing of brick shall not be covered up by extravagant use of mortar, nor shall the use of chips etc., be permitted.

The circular brick work shall be carried up from both ends simultaneously and keyed in the centre. The bricks shall be flushed with mortar and well pressed into their positions so as to squeeze out a part of their mortar and leave the joints thin and compact. All joints shall be full of mortar and thickness of joints shall be between 5 mm and 15 mm.

7.1.6 Jointing

Joints shall be restricted to a width of 10mm with brickwork of any classification. All bed joints shall be normal to the pressure upon them i.e. horizontal in vertical walls, radial in circular brick masonry and at right angles to the face in the battered retaining walls. The vertical joints in alternate courses shall come directly one over the other and shall be truly vertical. Care shall be taken that all the joints are full of mortar, well flushed up. In case no pointing is to be done, cement mortar shall be neatly struck as the work proceeds. The joints in face which are to be plastered or pointed shall be squarely raked out to a depth of 12mm while the mortar is still green. The rake joints shall be brushed to remove loose particles. After the day's work, the faces of brick work shall be cleaned on the same day with wire brush and all mortar droppings removed.

7.1.7 Curing

Green work shall be protected from rain or any other running water or accumulated water from any source, by suitable means. Masonry work, as it progresses, shall be kept thoroughly wet by sprinkling water at regular intervals, on all faces. Curing shall be done after 24 hours of completion of day's work and shall be done for at least 10 days after completion. Proper watering cans with spray nozzles, rubber or PVC pipes shall be used for this purpose.

7.1.8 Staging / Scaffolding

Staging / Scaffolding shall be properly planned and designed by the Tenderer. Use of only steel tubes is permitted for staging / scaffolding. Design of staging / scaffolding shall be submitted for approval of the Engineer-in-charge, before commencement of work.

Single scaffolding having one set of vertical support, shall be used and other end of the horizontal scaffolding member shall rest in a hole provided in the headed course. The support shall be sound and strongly clamped with the horizontal pieces over which the scaffolding planks shall be fixed. The holes left in the masonry work for supporting the scaffolding shall be filled and made good with plain

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cement concrete of grade 1:3:6 during plastering. Suitable access shall be provided to the working platform area. The scaffolding shall be strong enough to withstand all loads likely to come upon it and shall also meet the requirements specified in IS: 2750.

Double scaffolding shall be provided for pillars less than one meter in width or for the first class masonry or for a building having more than two storied.

The following measures shall also be considered during erection of the scaffolding / staging.

- a. Sufficient sills or underpinnings, in addition to base plates, shall be provided, particularly, where scaffoldings are erected on soft grounds.
- b. Adjustable bases to compensate for uneven ground shall be used.
- c. Proper anchoring of the scaffolding / staging at reasonable intervals shall be provided in each direction with the main structure wherever available.
- d. Horizontal braces shall be provided to prevent the scaffolding from rocking.
- e. Diagonal braces shall be provided continuously from bottom to top between two adjacent rows of uprights.
- f. The scaffolding / staging shall be checked at every stage for plumb line.
- g. Wherever the scaffolding / staging are found to be out of plumb line, it shall be dismantled and re-erected afresh. Efforts shall not be made to bring it in line with a physical force.
- h. All nuts and bolts shall be the clamps / couplings are firmly tightened to avoid slippage.
- i. Erection work of a scaffolding / staging, under no circumstance shall be left totally to semiskilled or skilled workmen and shall be carried out under the supervision of Tenderer's technically qualified civil Engineer-in-charge.

7.1.9 Embedment of Fixtures

All fixtures, pipes, conduits, holdfasts of doors and windows etc. required to be built in walls, shall be embedded in plain cement concrete block of grade 1:3:6, at the required positions, as the work proceeds, unless otherwise specified.

Honey Comb Brick Work

The brick honeycomb work shall be done with specified class of brick, laid in specified mortar. All joints and edges shall be struck flush to give an even surface.

The thickness of the brick honeycomb work shall be half-brick only, unless otherwise specified. Openings shall be equal and alternate with half brick laid with a bearing of 2cm on either side.

Measurements

The length and height shall be measured correct to a cm. Area shall be calculated in square m correct to two places of decimal. Honey comb openings shall not be deducted.

7.2. Stone Masonry

7.2.1 Scope

Stone masonry work shall comply with all the requirements of IS: 1597 Part I (Rubble Stone Masonry) IS: 3620 (Laterite Stone Masonry) IS: 2185 Part I and IS: 2572 (Concrete Block Masonry)

7.2.2 Rubble stone masonry

Materials

Refer specification for Materials vide specification no.2.10

Cement Mortar

Refer 7.1.2 under Brick Masonry Works

Construction Procedure

All stones shall be wetted before use. Each stone shall be placed close to the stones already laid so that the thickness of the mortar joints at the face is not more than 20mm. Face stones shall be

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arranged suitably to stagger the vertical joints and long vertical joints shall be avoided. Stones for hearting or interior filling shall be hammered down with wooden mallet into the position firmly bedded in mortar. Chips or sprawls of stones may be used for filling of interstices between the adjacent stones in heartening and these shall not exceed 20% of the quantity of stone masonry. To form a bond between successive courses plum stones projecting vertically by about 15 to 20cm shall be firmly embedded in the heartening at the interval of about one meter in every course. No hollow space shall be left anywhere in the masonry.

The masonry work in wall shall be carried up true to plumb or to specified batter.

Random rubble masonry shall be brought to the level courses at plinth, window sills, lintel and roof levels. Leveling shall be done with concrete comprising of one part of the mortar as used for masonry and two parts of graded stone aggregate of 20mm nominal size.

The masonry in structure shall be carried uniformly. Where the masonry of one part is to be delayed, the work shall be raked back at an angle not steeper than 45°.

Bond stones

Bond or through stones running right through the thickness of walls, shall be provided in walls up to 60cm thick and in case of walls above 60cm thickness, a set of two or more bond stones overlapping each other by at least 15cm shall be provided in a line from face of the wall to the back.

For all thickness of such walls, a set of two or more bond stones overlapping each other by at least 15cm shall be provided.

Length of each such bond stone shall not be less than two-third of the thickness of the wall.

Where bond stones of suitable lengths are not available pre-cast cement concrete block of 1:3:6 mix (1 cement: 3 coarse sand: 6 graded stone aggregate 20mm nominal size) of cross section not less than 225 square centimeters and length equal to the thickness of wall shall be used in lieu of bond stones. (This shall be applicable only in masonry below ground level and where masonry above ground level is finally required to be plastered).

At least one bond stone or a set of bond stones shall be provided for every 0.5 sqm of the area of wall surface. All bond stones shall be marked suitably with paint as directed by the Engineer-in-charge.

Quoin and Jamb stones

The quoin and jamb stones shall be of selected stones neatly dressed with hammer or chisel to form the required angle. Quoin stones shall not be less than 0.01 cum in volume. Height of quoins and jamb stones shall not be less than 15cm. Quoins shall be laid header and stretcher alternatively.

Joints

Stones shall be so laid that all joints are fully packed with mortar and chips. Face joints shall not be more than 20mm thick.

The joints shall be struck flush and finished at the time of lying when plastering or pointing is not to be done. For the surfaces to be plastered or pointed, the joints shall be raked to a minimum depth of 20mm when the mortar is still green.

Scaffolding

Single scaffolding having one set of vertical support shall be allowed. The supports shall be sound and strong, tied together by horizontal pieces, over which the scaffolding planks shall be fixed. The inner end of the horizontal scaffolding member may rest in a hole provided in the masonry. Such holes, however, shall not be allowed in pillars under one meter in width or near the skew back of arches. The holes left in masonry work for supporting scaffolding shall be filled and made good with cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 stone aggregate 20mm nominal size).

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Curing

Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. In case of masonry with fat lime mortar curing shall commence two days after laying of masonry and shall continue for at least seven days thereafter.

Protection

Green work shall be protected from rain by suitable covering. The work shall also be suitably protected from damages, mortar dropping and rain during construction.

Measurements

- a. The length, height and thickness shall be measured correct to a cm. The thickness of wall shall be measured at joints excluding the bushing. Only specified dimension shall be allowed; anything extra shall be ignored. Quantity shall be calculated in cum nearest to two places of decimal.
- b. The work under the following categories shall be measured separately.
 - i. From foundation to plinth level (level one) (a) work in or under water and or liquid mud and or (b) work in or under foul positions
 - ii. From plinth level (level one) to top level of Compound wall.
- c. No deduction shall be made nor extra payment made for the following:
 - i. Ends of dissimilar materials (that is posts, girders, rafters purlins, trusses, corbels, steps etc.), up to 0.1 sqm in section.
 - ii. Openings each up to 0.1 sqm in area. In calculating the area of openings, any separate lintels or sills shall be included along with the size of opening but the end portions of the lintels shall be excluded and the extra width or rebated reveals, if any, shall also be excluded.
 - iii. Wall plates and bed plates and bearing of chajjas and the like, where the thickness does not exceed 10cm and the bearing does not extend over the full thickness of the wall.

Note: The bearing of floor and roof shall be deducted from wall masonry.

- iv. Drain holes and recesses for cement concrete blocks to embed hold fasts for doors, windows, etc.,
- v. Building in masonry, iron fixture, pipes up to 300mm diameter, hold fasts of doors and windows etc.,
- vi. Forming chases in masonry each up to section of 350 sqcm Masonry (excluding fixing brick work) in chimney breasts with smoke or air flues not exceeding 20 sq.dm (0.20 sqm) in sectional area shall be measured as solid and no extra payment shall be made for pargetting and coring such flues. Where flues exceed 20 sq.dm (0.20 sqm) sectional area, deduction shall be made for the same and pargetting and coring flues shall be measured in running m stating size of flues and paid for separately. Aperture for fire place shall be deducted and no extra payment made for splaying of jambs and throating.
- d. Apertures for fire places shall not be deducted and extra labour shall not be measured for splaying of jambs, throating and making arch to support the opening.
- e. Square or Rectangular Pillars: These shall be measured as walls, but extra payment shall be allowed for stone work in square or rectangular pillars over the rate for stone work in walls. Rectangular pillar shall mean a detached masonry support rectangular in section, such that its breadth does not exceed two and a half times the thickness.
- f. Tapered walls shall be measured net, as per actual dimensions and paid for as other walls.
- g. Curved masonry: Stone masonry curved on plan to a mean radius exceeding 6 m shall be measured and included with general stone work. Stone work circular on plan to a mean radius

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not exceeding 6 m shall be measured separately and shall include all cuttings and waste and templates. It shall be measured as the mean length of the wall.

7.3. Laterite Stone Masonry - deleted

7.4. Solid concrete block masonry

Solid concrete blocks - shall conform to the requirements of IS: 2185. Specification for hollow and solid concrete blocks except with regard to the mix of cement concrete and sizes of aggregates which shall be as indicated. Solid blocks shall be sound, free from cracks, broken edges, honey combing and other defects that would interfere with the proper placing of block or impair the strength or performance of construction.

Dimensions and Tolerances

Concrete masonry building units shall be made in sizes and shapes to fit different construction needs. They include stretcher, corner, double corner or pier, jamb, header, bull nose, and partition block and concrete floor units.

Concrete block-hollow (open or closed cavity) or solid shall be referred to by its nominal dimensions.

The nominal dimensions of concrete block shall be as follows:

Length 400, 500 or 600mm
Height 200 or 100mm
Width 50, 75, 100, 150, 200, 250 or 300mm

In addition, block shall be manufactured in half lengths of 200, 250 or 300mm to correspond to the full lengths.

The maximum variation in the length of the units shall be not more than +5mm and maximum variation in height and width of unit, not more than +3mm.

Classification

Solid concrete blocks shall conform to Grade -D - The solid concrete blocks are used as load bearing units and shall have a block density not less than 1800 kg/cum. These shall be manufactured for minimum average compressive strengths of 4.0 and 5.0 N/sqmm respectively (See Table 3).

Physical requirements

Compressive strength - The average crushing strength of eight blocks, when determined in accordance with IS:2185 shall be not less than as specified in table given below:

Table 3

Physical Requirements

Type	Grade	Density of Block Kg/mm3	Min. Av. Comp. Strength N / mm2	Min. strength N/ mm2
Solid Load Bearing Units	D (5.0) D (4.0)	Not Less Than 1800	5.0 4.0	4.0 3.2

- Drying Shrinkage - The drying shrinkage of the blocks average of three blocks), when unrestrained, shall be determined in accordance with IS:2185 and shall not be exceed 0.1 per cent.
- Moisture movement - The moisture movement (average of three blocks) when determined in the manner described in IS: 2185, shall not exceed 0.09 per cent.
- Water Absorption - The water absorption (average of three blocks) when determined in the manner described in IS:2185 shall be not more than 10 percent by mass.

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- d. Face shells and webs shall increase in thickness from the bottom to the top of the unit. Depending upon the core moulds used, the face shells and webs shall be flared and tapered or straight tapered, the former providing a wider surface for mortar. The thickness of the face shell and web shall be not less than the values given in Table below:

Table 4
Minimum Face Shell and Web Thickness

Nominal Block Width	Face Thickness Minimum	Shell Thickness of Web Minimum	Total Web Thickness per course in any 200 mm length of walling min.
100 or Less	25	25	25
Over 100 to 150	25	25	30
Over 150 to 200	30	25	30
Over 200	35	30	38

- a. Subject to the tolerances specified in 3.2.7.2 and the provisions of (g) The face of masonry units shall be flat and rectangular, opposite face shall be parallel and all arises shall be square. The bedding surfaces shall be at right angles to the faces of the blocks
- b. Blocks with special faces shall be manufactured and supplied as directed by the Engineer-in-charge.

Curing and Drying

The blocks shall be cured in an immersion tank or in a curing yard and shall be kept continuously moist for at least 14 days. When the blocks are cured in an immersion tank, the water of tank shall be changed at least every four days.

After curing, the blocks shall be dried in shade before being used on the work. They shall be stacked with voids horizontal to facilitate through passage of air. The blocks shall be allowed to complete their initial shrinkage before they are laid in wall.

Construction of masonry

For single storied buildings, the hollows of blocks in foundation and basement masonry shall be filled up with sand and only the top foundation course shall be of solid blocks. But for two or more storied buildings, solid concrete blocks shall be used in foundation courses, plinth and basement walls, unless otherwise indicated. If hollow blocks are used, their hollows shall be filled up with cement concrete 1:3:6 using 12.5mm nominal size aggregates.

Wetting of blocks

Blocks need not be wetted before or during laying in the walls. In case the climate condition so require, the top and the sides of the blocks may only be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of the required bond with the mortar.

Laying

Blocks shall be laid in mortar, as indicated and thoroughly bedded in mortar, spread over the entire top surface of the previous course of blocks to a uniform layer of not less than 10mm and not more than 12mm in thickness. All courses shall be laid truly horizontal and all vertical joints made truly vertical. Blocks shall break joints with those above and below for not less than quarter of their length. Pre-cast half length closers (and not cut from full size blocks) shall be used. For battered faces, bedding shall be at right angles to the face unless otherwise directed. Care shall be taken during construction to see that edges of blocks are not damaged.

Provision for door and window frames

A course of solid concrete block masonry shall be provided under door and window openings (or a 10cm thick pre-cast concrete sill block under windows) and the solid course shall extend for at least

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20cm beyond the opening on either side. For jambs of very large doors and windows either solid unit are used, or the hollows shall be filled in with concrete of mix 1:3:6, using 12.5mm nominal size aggregates.

Provisions for roof

The course immediately below the roof slab shall be built with solid blocks. The top of the roof course shall be finished smooth with a layer of cement and coarse sand mortar 1:3, 10mm thick and covered with a thick coat of white wash or crude oil, to ensure free movement of slab.

Intersecting Walls

When two walls meet or intersect and the courses are to be laid up at the same time, a true masonry bond between at least 50% of the units at the intersection is necessary. When such intersecting walls are laid up separately, pockets with 20mm maximum vertical spacing shall be left in the first wall laid. The corresponding course of the second wall shall be built into these pockets.

Piers

The top course of block in the pier shall be built in solid blocks. Hollow concrete block shall not be used for isolated piers, unless their hollows are specified to be filled with cement concrete.

Fixtures, fitting, etc., shall be built into the masonry in cement and coarse sand mortar 1:3 while laying the blocks where possible. Holdfasts shall be built into the joints of the masonry during laying.

Holes, chases, sleeves, openings, etc., of the required size and shape shall be formed in the masonry with special blocks while laying, for fixing pipes, service lines, passage of water etc. After service lines, pipes etc., are fixed, voids left, in any shall be filled up with cement concrete 1:3:6 (1 cement, 3 coarse sand: 6 stone aggregate 20mm nominal size) and neatly finished.

Finishes

Rendering shall not be done to the walls when walls are wet. Joints for plastering or pointing as specified shall be raked to a depth of 12mm. Joints on internal faces, unless otherwise indicated, shall be raked for plastering. If the internal faces of masonry are not to be plastered the joints shall be finished flush as the work proceeds or pointed flush where so indicated.

8. WOOD WORKS

8.1. General :

Reference shall be made to the following Indian standards:

IS 2202 Part-I	Specifications for wooden flush door shutters (solid core type) plywood face panels.
IS 2202 Part _ II	Specification for wooden flush door shutters (Solid core type) practice board and hard board face panels.
IS 1003 Part – I	Specification for Timber paneled and glazed shutters – Door shutters
IS 3087	Specification for wooden particles boards (medium density) for general purposes.
IS 3097	Specification for veneered particles board
IS 848	Specification for synthetic Resin Adhesives for plywood (Phenolic and cemins plastic)
IS 205	Specification for non ferrous metal butt hinges
IS 2338	Code of Practice for finishing of wood and wood based materials (Part I & Part II)
IS 1341	Specification for steel butt hinges
IS 4021	Specification for timber door, window and ventilator frames
IS 303	Specification for plywood for general purposes

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IS 281	Specification for Aldrops
IS 204	Specification for Tower bolt
IS 208	Specification for door handles
IS 1823	Specification for door stoppers
IS 2209	Specification for Mortice locks
IS 3847	Specification for mortice night latches
IS 5899	Specification for bathroom latches
IS 7196	Specification for hold fasts
IS 3564	Specification for door closers

8.2. Material

8.2.1 Timber

Hard Wood

Hard wood shall be first class wood conforming to IS 4021 of good quality, well seasoned and free from defects such as dead knots, cracks, sapwood etc. No individual hard and sound knot shall exceed 6 sqcm in size with no dimension more than 50mm and the aggregate area of such knots shall not be more than 1% of the area of the piece.

There shall not be less than 5 growth rings per cm width in cross-sections.

Sal wood

Sal is heavier, harder, stronger, more shock resistance than teak. Its heart wood is a naturally durable wood, and usually remains immune to attack by white ants and fungi for a long period, while its sapwood is very perishable and should not be used. Well dried Sal is not a really easy wood to saw and work. It is a rough constructional wood than a carpentry timber. No individual hard and sound knot shall exceed 25mm in diameter and the aggregate area of all the knots shall not exceed 1% of the area of the piece

It can be used for a variety of purposes, such as for beams, rafters, flooring, piles, bridging, tool handles, picker arms and tent pegs, etc.

Moisture content in timber

The maximum permissible percentage of moisture content for well seasoned timber shall be as per IS 287

Workmanship of wood work

Workmanship for wood and joinery shall be as per IS 1200 and IS 4021

Painting / Polishing of wood work

Painting / Polishing of wood work shall be in accordance with material specification no.10

8.3. Wooden door / window frame

Wooden door / window frame shall be made of specified wood as per item description and shall be in accordance with detailed drawings.

The wooden members of the frame shall be planed smooth and accurate to the full dimension. Rebates, rounding, moulding etc. shall be done before the members are jointed into frames.

Joints in the frame work shall be perfect with square edges and shall be pinned with hard wood / bamboo pins of 10 to 15mm diameter.

Wood work shall be painted / polished or otherwise treated as specified. All exposed portions shall be coated with wood primer and concealed surface by bituminous paints as per material specification no. 10.

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Before any surface treatment is applied, the wood work shall be got approved by the Engineer-in-charge. The frames shall be fixed only after acceptance by the Engineer-in-charge.

8.4. Shutters

8.4.1 Flush Shutters

Flush door shutters shall have to be specified make door / or equivalent to conform manufactures specifications. Thickness and type of shutters shall be as specified. The shutters shall have a solid core and may be of decorative or non-decorative (paintable) as per IS 2202 (Part IS :). Thickness and type of shutter shall be specified. Lipping shall be done with battens of first class hard wood or as specified and of depth not less than 25mm and provided internally on all edges of shutters. Hinges shall be as specified in Bill of quantities.

Workmanship

All the four edged of the door shutter shall be square. The shutter shall be free from twist or warp in its plane. In case of double shutters, the meeting of the shutters shall be rebated by one third the thickness of shutter. The rebating shall be splayed.

The shutter then shall be veneered whenever required by gluing approved shade and textured commercial type 0.5mm thick veneering conforming to class IS: of IS 303.

The veneering shall be done by gluing the veneer with BWP type, phenol formaldehyde synthetic resin conforming to IS :848 by hot press process on the shutter. Workmanship and finished of the veneering shall conform to IS :303

The exposed surfaces of the lipping of the edges shall be as directed by Engineer-in-charge.

The shutter shall be fixed to the door frame, by means of hinges @ minimum three hinges per lead, maximum spacing of hinges being 600 mm or as per drawing with suitable sized screws.

The shutter when fitted to the frame shall satisfy all operational aspects of the door like smooth movement, proper closing against the door frame, etc.,

In the alternative, flush door of country wood frame treated with chemical impregnation and mechanical kiln dried to 10-12% moisture content and core filled with web form of hexagonal cells made out of composite material of Lingo cellulose fibers (for internal use); filled with water resistant low density fiber board (for external use) and provided with rails and styles of not less than 50mm in suitable locations for fixing locks, etc.

8.4.2 Paneled Shutters

Materials shall be as specified in 8.2.1.

Paneled or glazed shutters for doors, windows, ventilators and cupboards shall be constructed in the form of timber frame work of stiles and rails with panel inserts of timber, plywood, block board, veneered particle board, fiber board wire gauge or sheet glass, the shutters, single or multi-paneled as shown in the drawings or as directed by the project thickness of shutters shall be as specified. All members of the shutter shall be straight without any warp or bow and shall have smooth well planed face at right angles to each other.

Any warp or bow shall not exceed 1.5mm the right angle for the shutter shall be checked by measuring the diagonals and the difference between the two diagonals should not be more than ± 3 mm.

Frame work

Timber for stiles and rails shall be of the same species and shall be sawn in the directions of grains sawing shall be truly straight and square. The timber shall be planned smooth and accurate to the required dimensions. The stiles and rails shall be joined to each other by plain or haunched mortice and

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tenon joints and the rails shall be inserted 25mm short of the width of stiles. The bottom rails shall have double tenon joints and for other rails single tenon joints shall be provided. The lock rails of door shutter shall have its centre line at a height of 800mm from the bottom of the shutters unless otherwise specified. The thickness of each tenon shall be approximately one-third the finished thickness of the members and the width of each tenon shall not exceed three times its thickness.

Paneling

The panel inserts shall be either framed into the grooved or housed in the rebate of stiles and rails. Timber, plywood, hardboard and particle board panels shall be fixed only with grooves. The depth of the groove shall be 12mm and its width shall accommodate the panel inserts such that the faces are closely fitted to the sides of the groove. Panel inserts shall be framed into the grooves of stiles and rails to the full depth of the groove leaving on space of 1.5 mm. Width and depth of the rebate shall be equal to half of the thickness of stiles and rails. Glass panels, asbestos panels wire gauge panels and penal inserts of cupboards shutters shall be housed in the rebates of stiles and rails. For all paneled door, I.S. 1003 to be followed.

Timber panels:

Timber panels shall be preferably made of timber of large width, the minimum width and thickness of the panel shall be 150mm and 15mm respectively, unless otherwise specified. When made from more than one piece, the pieces shall be jointed with a continues tongued and grooves joint glued together and reinforced with headless nails at regular intervals not exceeding 100mm. Depth and thickness of such joint shall be equal to one-third of thickness of panel. The panels shall be designed such that no single panel exceeds 0.5 sqm in area. The grains of timber panels shall run along the longer dimensions of the panels. All panels shall be of the same species of timber unless otherwise specified.

Glass panels

(If any) Glass Paneling (Glazing) shall be done with float glass of ordinary quality as specified. Glazing in the shutters of doors, windows and ventilators at bath, WC and lavatories shall be provided with frosted glass the weight of which shall not be less than 10 kg/sqm. Frosted glass shall be fixed with frosted face on the inside. Glass panels shall be fixed by providing a thin layer of putty conforming to IS: 419 applied between glass pane and all along the length of the rebate and also between glass panes and wooden beading. Glass shall be free from flaws, scratches, cracks, bubbles.

8.4.3 Particle Board flush shutter - deleted

8.4.4 Medium density fiber board panel shutter – deleted.

8.4.5 Fly mesh shutter for door and window - deleted

8.5. Steel doors, windows, ventilators, rolling shutters & M.S. Grills etc.,
Steel used in the manufacturer of rolled steel sections shall not have more than 0.060 per cent of sulphur and 0.065 per cent of phosphorous. The carbon content shall not exceed 0.30 percent and shall be of weldable quality. In all other respects, the rolled steel sections shall conform to I.S. 226 and I.S.1977. All steel doors, windows and ventilator must be as per I.S. 1038.

Frames shall be square and flat. Both the fixed and operable frames shall be constructed of sections which have been cut to length, mitred and electrically welded at corners. Sub-dividing bar units shall be tenoned and riveted into the frames. All frames shall have the corners welded to true right angles and welds shall be neatly cleaned off. Couplings, mullions, transom as directed by Engineer-in-charges.

Outer frames shall be provided with fixing holes centrally in the web of the sections and fixing screws and lugs shall be used for fixing the frame to masonry. Mastic cement shall be used for making the joints watertight.

Hinges shall be strong of projecting type. If directed friction type hinges shall be used in which case

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windows shall not be fitted with peg stays.

Projecting type hinged shutter shall be fitted with bronze or oxidized brass peg stays, 30cm long with pegs and brackets welded/riveted to the frame.

All windows shall be provided with handles of oxidized brass or bronze, as may be specified.

Top hung ventilators shall be fixed with plain hinges riveted/ welded to the fixed frame. Oxidized brass or bronze peg stay 30 cm long as in windows shall be provided.

Centre hung ventilators shall be hung on two pairs of brass of leaded tin bronze cup pivots riveted to the inner and outer frames of the ventilators to permit the ventilator to swing through an angle of approximately 85 degrees. The opening positions of the ventilator shall be so balanced as to keep it open at any desired angle under normal weather conditions. A bronze spring catch shall be fitted in the centre of the top bar of the ventilator for operation of the ventilator. This spring catch shall be secured to the frame with brass screws and shall close into a mild steel malleable iron catch plate riveted or welded to outside of the outer ventilator frame bar. A brass cord pulley wheel on mild steel or malleable iron brackets shall be provided along with cord eye.

The windows and ventilators shall be painted. All the steel surfaces shall be thoroughly cleaned free of rust, scale or dirt and mill scale by picking or phosphating and before erection painted with one coat of approved primer and after erection with two finishing coats of synthetic name paint of approved shade and quality.

Glazing of specified thickness shall be provided on the outside of frames and unless otherwise specified, metal beadings of approved shape and section shall be used for fixing glasses. Special metal sash putty of approved make shall be used, if directed.

8.6. Glazing

Glazing shall be glass of approved specially selected quality and thickness as specified and unless otherwise directed it shall be provided on the exterior with metal beading.

8.7. Pre-cast reinforced concrete door and window frames

Manufacture of pre-cast reinforced concrete door and window frames is described here. These will conform to IS: 6523 in all respects unless otherwise specified. Frames shall be manufactured in an approved factory with all necessary arrangements for fixing hinges or hinges fixed at position as specified with hole for receiving tower bolt, sliding bolt etc., as specified.

8.7.1 Shape and dimensions

Pre-cast reinforced concrete door and window frames shall be 60 x 100mm or 70mm x 75mm in cross section for single shutter and 60 x 120mm for double shutter door, cross section general conforming to architects drawings. Where specified, suitable groove for receiving wall plaster shall be provided.

The overall sizes (width and height) shall be as per drawing or as specified.

8.7.2 Materials

The materials used for manufacturing of the frames shall comply with standards given in Table I of IS: 6523

8.7.3 Aggregate

The aggregate used shall be of well graded mixture of clean coarse and fine aggregates. The nominal size of coarse aggregate shall not exceed 10mm.

8.7.4 Concrete

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Mix of concrete shall be as specified or as directed by the Engineer-in-charge. But the mix shall not be weaker than M 20 controlled mix and shall be suitable for producing a dense concrete without voids after proper vibration.

There shall be a minimum of three bars of 6mm. The longitudinal reinforcement for each vertical or horizontal member shall be one piece and shall be firmly held by 3mm diameter ties spaced at not more than 300mm centre to centre.

The longitudinal reinforcement shall have a maximum cover of 12mm or twice the diameter of main bar, whichever is higher.

8.7.5 Casting

The entire frame may be cast complete in one piece or each of the vertical and horizontal members of the frame may be cast separately to be assembled into the complete frame at site. When the frame is cast in separate parts, one of the reinforcing bars of the vertical members of the frame shall be kept projecting so as to tenon into the corresponding hole in the horizontal member. The holes in the horizontal member for taking the projecting reinforcement from the vertical members shall be slightly larger than the bar diameter to facilitate easy insertion of the projecting bar. After assembly at site, the holes shall be grouted with cement slurry of 1 part of cement and 2 parts of coarse sand.

8.7.6 Mould

The mould for casting shall preferably be of steel to ensure better surface finish of the cast frame. Provision shall be made in the mould to accommodate fixing devices for hinges and the hold fasts. Where specified, suitable rebates may also be provided to act as plaster groove.

8.7.7 Protection and Curing

After casting in moulds, during setting and in first stage of hardening the concrete shall be protected from shocks, running or surface water and the harmful effect of frost, sunshine drying winds and cold. The concrete shall be cured for at least 7 days unless special curing methods are adopted which shall conform to IS: 6523

The frames shall be matured before testing or dispatch for the following periods:

Type of cement used	Period
Ordinary Portland cement, Portland blast furnace slag cement	28 days
Portland pozzolana cement	
Rapid hardening cement (to be used with approval of Engineer-in-charge)	14 days

The frames after maturing shall have sufficient strength to prevent damage when handled.

8.7.8 Arrangements for fixing of hinges to frames

Suitable arrangements for fixing hinges shall be provided in the frame by one of the following methods as directed:

Hardwood fixture: Hardwood blocks of well seasoned and suitable timber 150mm long, 45 to 50mm x 30 to 40mm in cross section, one block for each of the hinge, shall be fixed in position with 6mm mild steel bolts, nuts and washers, after the frame has been cast, cured and matured. After tightening the nuts, the bolt heads and the nuts shall be suitably covered with hard wood fillets, finished flush with concrete surfaces of the frame.

Hinge directly attached to frame: L type flap hinge may be attached directly to the frame with the help of 6mm diameter mild steel bolts and nuts.

Hinge welded to frame: The hinge may be welded to 3mm thick mild steel flat embedded in a frame.

8.7.9 Arrangements for door and window fixtures

Suitable arrangements shall be provided in the frame for receiving tower bolts, sliding bolts and other door and window fixtures as indicated.

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8.7.10 Fasteners

Arrangements for fixing the frames with holdfasts or metallic fasteners shall be provided in vertical members of frames as specified. In case of door frame, there will be 3 numbers holdfasts and in case of window, there will be 2 numbers holdfasts on each vertical member in contact with the opening where the frame is to be fixed. Holes to accommodate 10mm diameter bolts to be fixed to holdfasts and the nuts shall be left at appropriate locations.

8.7.11 Erection

When a three piece frame is used, the vertical members shall be held in position with top member placed over them, the whole frame plumbed and firmly supported till the concrete around the holdfasts in the masonry has properly set and hardened. Cement and coarse sand mortar slurry 1:2 shall be used in grouting the joints between the vertical and horizontal members of door frame. Incase where four members are used, the bottom member shall be first placed in position and other erected on this base.

8.8. Hardware Fittings

All hardware fittings and fixtures shall be made with structural properties to sustain safety and withstand strains and stresses to which they are normally subjected to such as opening and closing, wind pressure etc. The fittings shall generally conform to relevant specifications.

They shall be made true, clean, straight, with sharply defined profiles and unless otherwise shown or specified, with true smooth surfaces and edges, free from defects, screw holes shall be counter sunk to suit the head of wood screws.

The metal shall be treated with finish as specified in the Bill of Quantities.

8.9. Bath and toilet doors:

PVC doors for bathrooms and toilet are made from sizes as per drawing for main outer frame and shutter shall be made from multi chamber hollow plastic section 20mm thick and shutter outer frame shall be of extruded plastic section DWUF 302 (24mm x 59mm) with hardware fittings as per the colour approved.

Alternatively Formica/Decolam laminated 30cm wide from the bottom over one side plastic coated flush door also to be considered – for external doors.

For internal doors – do- as above but the laminated sheet will be of both sides.

8.10. Fixing of glass louvers in wood / steel frame ventilators

In wooden frames angular grooves will be made as shown in the drawing and glass. Louvers will be fixed at the same angle. The glass shall be rigidly fixed with by fitting the gaps in the grooves by putty etc., and all around wooden heading shall be nailed. In addition 2/3 numbers of 12mm M.S. bars will be run through frame to frame horizontally.

For steel frame:

As above and the glass louvers will be fixed in the U shaped MS channels riveted to the steel main frame and frame painted with an anticorrosive primer.

8.11. Providing and Fixing Meter Box Cupboard on Wall

The frame shall be of specified size and class of wood. It shall be fixed with 2 no. of holdfasts and the same may be grouted with CC 1:2:4 blocks of size 230x230x300. The shutter shall be of 19mm thick nova teak. A slit shall be provided in the shutter as directed by the Engineer-in-charge 3mm thick glass shall be fixed in the slit. Architrave shall be provided as directed by the Engineer-in-charge. Fixtures as specified shall be provided. The shutter, frame and the architrave shall be painted with 3 coats of ISI approved enamel paint.

8.12. Balustrade and hand rails in staircase

The M.S. railing to detail in staircase and landing shall be fixed along outer edges of the flights and

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landings with M.S. square bars and flats of specified size as per drawing and neatly welded. The top hard rail over the top flat of the baluster may be of wood of approved quality or G.I. pipes or hollow box section as specified in the drawing which will be screwed or fitted rigidly as per the direction of Engineer-in-charge-in charge.

9. Flooring

9.1. Flooring, Skirting, Dado & Stone Veneering

All Flooring, skirting, dado, stone veneering etc., shall be executed strictly as per relevant Specification and in workmanlike manner.

9.2. Granolithic flooring :

Selection of materials, method of mixing, placing and compacting shall generally conform to the specifications under plain and reinforced cement concrete described earlier. A stiff mix consistent with workability shall be used.

9.2.1 Preparation of surface :

Before the operation for laying is started the surface of base concrete shall be thoroughly cleaned of all dirt, loose particles, caked mortar droppings and laitance if any by scrubbing with coir or steel wire brush, where the concrete has hardened so much that roughening of surface by wire brush is not possible, the surface shall be roughened by chipping or hacking at close intervals. The surface shall then be cleaned with water and kept wet for 12 hours, surplus water being removed by mopping before the topping is laid.

9.2.2 Laying :

The screed strips shall be fixed over the base concrete dividing it into suitable panels. Before placing the concrete for topping, neat cement slurry shall be thoroughly brushed into the prepared surface of the base concrete just ahead of the finish. Concrete of the specified proportion and thickness shall be laid in alternate panels to required level and slope and thoroughly tamped. The cement concrete flooring must be as per the standard practice of Karnataka PWD Schedule under flooring items and as directed by Engineer-in-charge in-charge.

9.2.3 Finishing the surface:

After the concrete has been fully compacted it shall be finished by toweling or floating with neat cement rendering. Finishing operations shall start shortly after the compaction of concrete and the surface shall be trowel led three times at intervals so as to produce a uniform and hard surface. The satisfactory resistance to wear of the flooring depends largely upon the care with which toweling is carried out. The time interval allowed between successive towelings is very important.

Immediately after placing cement rendering, only just sufficient toweling shall be done to give a level surface. Excessive toweling in the earlier stages shall be avoided as this tends to bring a layer rich in cement to the surface, sometime after the first toweling, the duration depending upon the temperature, atmospheric conditions and the rate of set of cement used, the surface shall be retrowelled to close any pores in the surface and to bring to surface excess water in concrete or laitance which shall be removed. No dry cement shall be used directly on the surface to absorb moisture or to stiffen the mix. The final toweling shall be done before the concrete has become too hard but at such a time that considerable pressure is required to make any impression on the surface.

When instead of 1:2:3 or 1:2-1/2:3-1/2 mix, 1:2:4 mix is specified, the topping shall be rendered with 1:1 cement mortar instead of cement only.

If directed by the Engineer-in-charge, approved mineral pigment shall be added to the rendering to obtain desired colour and shade to the flooring at no extra cost, unless otherwise provided for in the schedule of quantities.

The floor shall be machine polished as per Engineer-in-charge's instructions, if so specified in the schedule of quantities.

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Wherever patent stone flooring is used as a finishing on roof the joints shall be filled with an approved bitumastic filler in workmanlike manner.

9.2.4 Ironite topping:

Instead of finishing the top with rendering coat of 1:1 cement mortar, the flooring shall in this case be finished with 12mm ironite topping. Unless otherwise specified, one part of ironite and four parts of ordinary cement by weight shall be mixed dry thoroughly. This dry mixture shall be mixed with stone grit 6mm (1/4") and down size or otherwise directed in the ratio of 1:2 by volume and well turned over. Just enough water shall be added to this dry mix and the thoroughly mixed composition shall be laid and compacted to uniform thickness of 12mm. After initial set has started the surface shall be finished as directed.

9.3. Plain and colored cement tile, marble mosaic and Terrazzo tile-flooring:

The tiles shall conform to IS: 1237, having the colour approved by the Engineer-in-charge and the rate shall include provision of border tiles and tiles of different colours in pattern if directed, the mosaic topping of lighter shade tiles shall be made of white cement with an approved shade pigment and neutral shade tiles shall be of gray cement with an approved shade pigment. The type of tiles shall be as specified in respective items.

The sub-grade shall be thoroughly wetted after cleaning it off of 'all dirt, laitance and loose material. A bed of lime mortar consisting of one part of lime and two parts of sand shall be laid and properly leveled to an average thickness of 20mm and the surface shall be kept slightly rough to form a satisfactory key for tiles. Neat cement paste of honey like consistency shall be spread over mortar bed, over such area at a time as would accommodate about 20 tiles. Tiles which had been soaked in water for 15 minutes and allowed to dry for the same duration shall then be fixed with a thin coat of cement paste at the back of each tile, which shall be then gently tapped with a wooden mallet till it is properly bedded and is level with adjoining tiles. Joints shall be fine and as imperceptible as possible.

After the tiles have been laid in a room or a day's fixing work is completed, surplus cement grout that may have come out of the joints will be wiped off gently and the joints cleaned. Thin slurry of coloured cement matching the colour of tiles shall be spread over and rubbed so as to seal even the thinnest joints between the tiles and make the floor surface impervious. The flooring shall be cured for 7 days. The tiles shall then be polished and finished according to IS: 1443.

9.4. Dado, Skirting and Risers:

Tiles shall conform to IS: 1237 and shall be of approved design. The tiles shall be fixed with neat cement grout on a backing coat consisting of 1:4 cement sand plaster, 12mm thick. The top and bottom junctions of tiles shall be rounded off neatly as directed. The joints shall be filled with matching coloured cement slurry of matching shade. The surfaces shall be kept wet for 7 days and then polished with carborundum stone of different grades to obtain smooth surface and fine polish.

9.5. Shahabad/Tandur/Cuddapah Stone flooring:

The floor shall be either with rough or machine cut and machine polished stones as specified in respective items of specified thickness and of approved quality and size, free from cracks and flakes and uniform in colour, with straight edges. The sides of machine cut and machine polished stones shall have perfect right angles and smooth surface. The stone slabs shall be laid and finished as described under plain cement or coloured tiles on bedding of 1:2 lime mortar of 20mm thickness. This finished stone surface thus laid shall then be polished to the required degree as approved by the Engineer-in-charge.

9.6. In dado, skirting, risers etc.:

Stone slabs shall be laid on a backing plaster of cement mortar 1:4, 12mm thick and finished as described under plain and coloured cement tile dado.

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9.7. White glazed tiles in flooring and dado:

White glazed tiles from an approved manufacturer conforming to IS: 777 shall be used. They shall be of specified size and thickness. All specials viz., covers, internal and external angles, corners, beads, etc., shall be used wherever directed. Under layer of specified thickness and mortar of stipulated proportion shall be laid as described in marble mosaic flooring. Tiles shall be washed clean and set in cement grout, each tile being gently tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern. After the tiles have been laid, surplus cement grout shall be cleaned off.

The joints shall be cleared with a wire brush or trowel to a depth of 5mm (3/16") and all dust and loose mortar removed. Joints shall, then be flush pointed with white cement. The floor shall be kept wet for seven days. After curing, the surface shall be washed with mild hydrochloric acid and clean water. The finished floor shall not sound hollow when tapped with a wooden mallet.

Polished or tool finished granite/malad/sand stone:

The facia stone/slab shall conform to the specifications under "Materials" and it shall be erected as shown on the drawing or as directed by Engineer-in-charge.

The stone or stone slab shall be of size as shown on the drawing or as directed by the Engineer-in-charge. The exposed faces, full beds and joints shall be dressed/finished as directed. The joints shall be cut square to the face and shall be at right angles to each other or as directed. The facing shall be fixed in cement mortar truly in plumb and in perfect plane, straight or curved as shown on the drawing, the bed being fully flushed with mortar. The joints shall be exactly vertical and horizontal. The thickness of joint shall not exceed 1mm to 1.5mm for machine polished/fine tooled/close punched and chisel dressed work. The stones shall break joints for about half the height of the course. Courses shall be as shown on the drawing or as directed. The gap between the facing stone and the wall shall be filled with either 1:2:4 concrete or 1:2 cement mortar. Wrought iron/ copper pins and holdfasts shall be used wherever directed; lead caulking shall be used for fixing holdfasts. The surface shall be protected from sun and rain, and cured for ten days.

The face shall be finished as specified or as directed after filling the joints with matching shade cement/ cement mortar of 1:1 proportion mixed with approved water proofing material.

The rate shall include cost for double scaffolding.

9.8. Providing and laying 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-in-charge. 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.

The flooring should be laid on a base as specified in schedule item. 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 grey cement as approved by the Engineer-in-charge. The tiles shall be cleaned after the work is complete.

This shall be measured in sqm. The rate quoted for flooring and dado work shall be inclusive of angles and corner pieces, cutting tiles for water points, such away that the point is in the junction of four tiles, electrical points etc.

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9.9. Providing and laying polished green Kota stone flooring:

Stones shall be of approved quality, size and uniform thickness, edges shall be chisel dressed and the top surfaces shall be machine polished with joints running true and parallel from side to side. Stones shall be laid on a bed of cement or lime mortar. The pattern of the flooring shall be as per the architects drawing. Thickness of mortar bedding shall be as specified in the item specification. The stone slabs shall be thoroughly wetted with clean water. Neat cement shall be spread over the mortar bed and the slabs shall be placed one by one, keeping in check the level and line of the flooring. The slabs are then gently tapped with wooden mallet till it is firmly and properly bedded. There should be no voids left. The joints should not be more than 2mm thick. The joints should be struck smooth. If specified terrazzo filling of specified thickness shall be done in the joints between the Kota stone slabs. The floor should be kept covered with damp sand or water for a week. Slabs should be of sizes as specified. The stone shall be machine polished and then cleaned with oxalic acid. If the Tenderer is asked to mop the floor with kerosene and water by the Engineer-in-charge, the same shall be done without any extra cost. This shall be carried out daily at least for 10 times for 7 days.

9.9.1 Providing and laying Kota stone in skirting and dado:

The stone shall be of required sizes and the thickness shall be as mentioned in the item specification. The stones shall be pre-polished and machine cut. The stone's edges shall be dressed fine true, straight and at right angles to each other. The stones shall be fixed over cement mortar bed 1:4 (1 cement: 4 coarse sand). The joints are filled with ordinary cement and its hand and wax polished. The joint between the top of skirting/dado and plaster shall be finished properly. The joints in the flooring shall be continued in the skirting/dado also. The work shall be cured properly.

9.10. Granite slab over kitchen counter:

Granite slab shall be of jet black shade and of approved quality. They shall be of 18mm thick machine cut and mirror polished. They shall be laid over RCC slab. The angles shall be right angles and all edges shall be straight and true. Joints shall be permitted when the length is more than 2 m. Number of joints in each direction shall not be more than one number of every 2m length beyond the initial 2 m length. No joints shall be permitted in the direction of width.

Mortar bed shall be of cement mortar. The mortar will be of ration 1:4 (1 cement and 4 coarse sand). After properly cleaning and wetting the base, the mortar shall be evenly and smoothly spread over the base by the use of screed battens. The average thickness of the mortar bed shall be 20mm. The granite slab shall be wetted before placing in position and leveled. The joints shall be paper thin joint. Joints shall be treated with white cement mixed with matching pigment. The exposed edges of the granite slab shall be rounded/edge polished as shown in drawing.

The facia shall also be of the same quality, but of 10 mm thick as the slab over the counter and fixed with brass clips and adhesive over a base mortar of 12mm thick in cement mortar 1:3 (1 cement 3 coarse sand) the joints shall be paper thin. The slab and the facia shall be rubbed clean and polished with steel wool to give a smooth and shining surface. The slab over the counter and tiles facia shall be measured individually in sqm.

10. TERRACING

10.1. Lime Terracing

The roof slab shall be cleaned of all foreign material and parent slab exposed by chipping off laitance and cleaned with water and kept wet for at least six hours.

Two parts of well slaked lime obtained from an approved source and two parts of surkhi and seven parts of well burnt red brick bats 50mm down grade or in the proportion (if) specified in the item shall be mixed dry by turning over the ingredients several times. Water shall then be added in measured quantities and mixing continued until the mass is uniform in colour and consistency. The concrete shall be laid to specified grade and thickness and beaten in approved manner with suitable wooden beaters for a minimum period of seven days, employing daily 2 1/2 beaters for every 10 sqm. of

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area, adding lime water mixed with extracts of kadukkai, bel and jaggery, as required to improve the water proofing quality of the surface, which shall be kept wet and the beating continued till the concrete has been thoroughly compacted and the surface becomes hard, making the wooden beater rebound with a metallic sound. A coat of thick lime slurry mixed with crude or mustard oil shall then be rubbed well and uniformly into the surface.

The surface shall then be covered with straw and kept wet for at least four weeks. A ghundy curving of about 10cm radius shall be formed at the junction of the roof and the parapet as directed during the beating of the lime terracing. The top edge of this ghundy at its junction with the parapet shall be protected by brick or concrete over sailing course and finished with a drip mould along the underside as directed. No separate payment shall be made for the over sailing course unless separate provision has been made in the bill of quantities.

10.2. Clay Terracing

The roofs shall be paved with tile bricks laid flat and grouted with cement mortar.

10.2.1 Tile bricks: The bricks of 4cm height shall be moulded without frogs. Where modular tiles are not freely available in the market, the tile bricks of F.P.S. thickness 44mm (1-3/4") shall be used unless otherwise specified.

10.2.2 Cement mortar: The cement mortar shall be of 1:3 mix and of fine sand unless otherwise specified in the description of the item

10.2.3 Preparing the surfaces: The surface shall be hacked, roughened and cleaned of all dust and other foreign matter. It shall then be wetted before applying the mortar

10.2.4 Paving and Grouting: Cement mortar shall be spread in 12mm layer over the surface evenly and to required slope. Tile bricks which has been soaked as in brickwork in water for at least an hour before hand shall then be laid open jointed and flat on the mortar and lightly pressed, and set to plane surface true to sloped etc., using a trowel and wooden straight edge. The tile bricks shall be laid with their longitudinal lines of joints truly parallel and horizontal and at right angles to the slopping edges of the roof.

Transverse joints in alternate rows should come directly in line with one another. Transverse joints in adjacent courses shall not break joints by less than 5cm. As soon as the paving is done, the open joints shall be grouted with cement mortar 1:3 (1 cement: 3 fine sand) cement used for grouting mortar shall be mixed with 2% (by unit of cement) waterproofing compound conforming to IS: 2645. Care shall be taken to see that no joints are left unfilled or inadequately filled. The joints shall be finished flush with the brick surface.

10.2.5 Curing: The tile paving shall be cured for at least 7 days during which period it shall be suitably protected from damage.

10.3. Damp proof Course:

Shall consist of 1:1 ½:3 plain cement concrete with approved water proofing material such as 'CICO' or 'IMPERMO' added 3% by weight of cement of specified thickness. Edges of damp proof course shall be straight, even and vertical. Side shuttering shall consist of wooden or steel forms and shall be strong and properly fixed so that the course does not get disturbed during compaction and mortar or cement slurry does not leak through. When forms are struck the surface should be smooth without any honey combing. The surface shall be kept wet for seven days.

Before commencing the superstructure work, the top of the damp proof course shall be cleaned thoroughly and dried. Blown type bitumen shall then be applied uniformly on the surface and side of the concrete coming in contact with flooring on the inside shall also be painted with bitumen.

Instead of concrete, Shahabad, Tandur or granite stone of specified thickness and full width in

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one piece may also be used. Stones shall be set in 1:3 cement mortar mixed with approved waterproofing material. After curing, the surface shall be treated with hot bitumen as specified above.

10.4. Water Proofing Treatment:

Unless otherwise specified, the Tenderer shall carry out water proofing treatment of basements, terraces and water retaining structure through a reputed firm having expertise in the line and whose name is approved by the architect. The Tenderer shall also furnish full details of such treatment to the Engineer-in-charge and provide all information/proof regarding the effectiveness, etc., about the treatment when called upon to do so.

All such treatment shall be guaranteed in the form approved by the employer for a minimum period of ten years. Any defects/leakage noticed during the guarantee period shall be rectified free of cost by the Tenderer including reinstating the surface to its original condition and finish.

Water proofing of sunk portions of floor slabs for baths, WC and kitchen moories, etc., in residential buildings, unless otherwise specified, shall be done as specified in the schedule and shall generally consist of:

- i. A coat of hot bitumen, minimum 6mm thick screeded with stone grit;
- ii. Minimum 20mm thick cement plaster in cement mortar 1:3 with approved waterproofing cement compound as per manufacturer's specifications. The plaster shall be cured by ponding for seven days.

The rate for the above treatment shall include cost for drying and cleaning surfaces free of dust etc., and wiping with kerosene before application of bitumen. The vertical faces and returns shall also be treated similarly. The actual area treated including vertical faces and returns shall be measured and paid for.

11. Plastering and Pointing

11.1. Materials: Cement, sand, water and combinations shall conform to material specifications given in 2.6, 2.4 and 2.1.

11.2. Workmanship

11.2.1 Preparation of background surface:

The surface shall be cleaned off all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surfaces shall be roughened by wire brushing or hacking for non-hard and hard surfaces respectively. Projections on surface shall be trimmed wherever necessary to get even surfaces. Incase of brick/stone masonry, raking of joints shall be carried out wherever necessary. The masonry shall be allowed to dry out for sufficient period before carrying out the plaster work; the masonry shall not be soaked but only damped evenly thereafter before applying the plaster.

Incuse of concrete work, projecting burrs of mortar formed due to the gaps of joints in shuttering shall be removed. Such surface shall be scrubbed clean with wire brushes. The surface shall be pock marked with a pointed tool at spacing of not more than 50mm centers, the pocks being made not less than 3mm deep to ensure a proper key for the plaster. The surface shall be washed off and cleaned of all oil, grease etc., and well wetted before the plaster is applied.

11.2.2 Sequence of Operations

For external plaster, the plastering operations shall be started from the top floor and carried downwards. For internal plaster, the plastering may be started wherever the building frame, roofing, and brickwork are ready.

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The surface to be plastered, shall first be prepared as described in Preparation of background surface in clause 9.2.1

The first underlay shall then be applied to ceilings. After the ceiling plaster is complete and scaffolding for the same removed, plastering on wall shall be started.

After a suitable time interval as detailed under various types of plaster in subsequent paras, depending upon the type of mortar, the secondary layers if required shall be applied. After a further suitable time interval as detailed under various type of plaster in subsequent paras, the finishing coat shall be applied first to the ceiling and then to the walls.

Plastering of cornices, decorative features, etc., shall be completed before the finishing coat is applied. Unless otherwise specified corners and edges shall be rounded off to a radius of 25mm, such rounding off shall be completes along with the finishing coat to prevent any joint marks showing out later.

11.2.3 Scaffolding/staging

Scaffolding/staging for plastering/pointing shall be as per Specification for Brick masonry, clauses 7.1.8

11.2.4 Damage rectification

Any cracks, damages, any part of work which sound hollow when tapped or found damaged or defective otherwise shall be cut out in rectangular shape and redone as directed by Engineer-in-charge.

11.3. Plain Cement Plaster

11.3.1 Preparation of Mortars: The mortars of specified mix shall be used as per the specifications of 'Cement Mortar' described 7.1.2.

11.3.2 Application of Plaster

One layer plaster work

To ensure even specified thickness, plaster of 150mm x 150mm shall be first applied horizontally and vertically at not more than 2 meter interval over the entire surface to serve as gauges. The surface of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall be brought to true surface by working with 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 a trowel or wooden float to obtain a smooth texture. Excessive toweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical, horizontal and shall be carefully finished. Rounding or chamfering of corners, arises, junctions etc., shall be carried out with proper templates to the size required.

In suspending the work, 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 clean and wetted before plastering the adjoining area. Plastering work shall be closed on the border of the wall and nearer than 150mm to any corners or arises and shall not be closed on the body of the features such as plaster bands, cornices nor at the corners or arises.

Two layer plaster work

- a. First or under layer: The first or underlay of the specified thickness shall be applied as described in clause no.8.3.2. Before the first coat hardens, surface of it shall be beaten up by edges of wooden tapers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon weather conditions. The surface shall not be allowed to dry during this period.
- b. Second or finishing layer: The second layer shall be complete to the specified thickness in the same manner as for first layer

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Curing: Curing shall be started 24 hours after finishing the plaster. The plaster shall be kept wet for a period of 7 days. During this period, the plaster shall be suitably protected from all damages at the Tenderer's expense by such means as approved by the Engineer-in-charge. The date of execution of plastering shall be marked on the plastering to ensure the proper duration of curing.

11.4. Sand face plaster

11.4.1 Preparation of mortar

The mortar of specified mix shall be used as per the specifications of cement mortar/described in clause no.7.1.2.

Application of Plaster

Sand face plaster shall consist of 13mm thick (1 cement: 4 coarse sand by volume) under layer and 7mm thick (1 cement: 2 coarse sand by volume) top layer. Application of plaster shall be as described in two coat plaster work in clause no. 11.3.2.

The surface of the sand face plaster shall be finished rough with sponge or as directed by the Engineer-in-charge.

Curing: Curing shall be as described in clause 11.3.2.

11.4.2 Exposed aggregate finish plaster

Preparation of mortar

The mortar of specified mix shall be used as per the specifications of cement mortar described (in clause no.3.1.2) White and coloured marble chips shall be of 6mm to 12mm size out of Makrana/Ambaji, grade 1 or Dongri Chittor Brown/Rajnagar/ Abu green grade-1 quality. Marble dust shall be obtained from crushing hard marble stone; it shall not be less than 1.0.

Application of Plaster

Exposed aggregate finish plaster shall consist of 12mm thick plain cement plaster under layer (1 cement: 4 coarse sand by volume) finished rough and 20mm thick top layer (Under layer shall be applied in accordance with 'One layer plaster work' described in clause no.8.3.2)

Top layer shall be 20mm thick admixture of white cement and grey cement (mix ratio 1:1 by volume) mixed with white/coloured marble chips/pebbles of 6mm to 12mm nominal size as per item description. Mix ratio shall be 1 cement: 1 marble chips/pebbles by volume. Marble dust @ 15% by volume shall be added to the admixture. The pebbles to be used shall be well washed and drained. The admixture shall be thrown wet on the under layer while it is still plastic using strong whipping motion at right angles to the face of the wall. One coat of neat cement slurry @ 2.75 kg cement per square meter of area shall be applied on to the under layer to receive the top layer. The whole plastering laid in panels as per drawing with 12mm x 20mm grooves in between formed by holding removable wooden batons of 12mm x 25mm size over the under layer.

The top layer admixture pressed flat over the under layer filling uncovered parts by hand, so that the finished surface represents a homogeneous surface. Loose mortar etc., on the top surface shall be cleaned/removed by brushing/washing/spraying with water jet after initial setting of mortar.

11.4.3 Curing: Curing shall be as described in clause no.11.3.2.

11.5. Pointing

Pointing shall be of the type specified such as flush, cut or weather struck, raised and cut etc.,

11.5.1 Preparation of base surface: The joints shall be raked to such a depth that the minimum depth of the new mortar measured from either the sunk surface of the finished pointing or from the edge of the brick shall be less than 20mm.

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- 11.5.2** Mortar: Mortar shall be in accordance with the specifications of cement mortar described in clause no.7.1.2.
- 11.5.3** Application of mortar and finishing
The mortar shall be pressed into the raked out joints with a pointing trowel according to the type of pointing specified, the mortar shall be spread over the corner edges or surfaces of the masonry. The pointing shall then be finished with the pointed tool. The superfluous mortar shall be cut off from the edges.
- 11.6.** Flush pointing
The mortar shall be pressed into joints and shall be finished off flush and leveled. The edges shall be neatly trimmed with trowel and straight edges.
- 11.7.** Cut or Weather struck pointing
The mortar shall first be pressed into joints, the top of the horizontal joints shall then be neatly pressed back by about 15mm with the pointing tool so that the joint is sloping from top to bottom. The vertical joint shall also be similarly pointed. The junctions of vertical joints with the horizontal joints shall be at true right angles incase of brick and coursed rubble masonry.
- 11.8.** Raised and cut pointing
This type of pointing shall project from the wall facing with its edges cut parallel so as to have a uniformly raised band about 6mm and width 10mm more as directed. The pointing shall be finished to a smooth but hard surface.
- 11.9.** Curing: Curing shall be as described in clause no. 11.3.2.
- 11.10.** Plastering
Thickness of the plaster shall be the minimum thickness at any point on a surface and shall be exclusive of the key i.e. grooves or open joints in masonry. No extra payment shall be allowed for extra thickness of plaster done by Tenderer, drip moulds, rounding of edges making grooves, etc.
All plastering/pointing shall be measured in square meters unless otherwise specified, length, breadth / height shall be measured correct to 0.1 meters. Soffits of stairs shall be measured as plastering on ceiling. Ceiling with projected beams shall be measured over beams and plastered side of beam shall be measured and added on ceiling.
- 11.11.** Deductions and additions shall be made in the following manner:
No deductions shall be made for ends of joists, beams, posts, openings not exceeding 0.5 sqm area and no addition shall be made for reveals, jambs, soffits etc., of these openings mortar finish to plaster around ends of joists, beams, posts etc.,
Deductions for openings exceeding 0.5 sqm but not exceeding 3 sqm each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc., of these openings.
- When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deduction shall be made from the plaster or pointing on the side of frame for door, window etc., on which width of reveals is lesser, but no deduction shall be made on the other side. Where widths of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made.
 - When only one face is plastered, full deduction shall be made from plaster if width of reveal on plastered side is lesser. But if widths of reveal on both sides are equal or more on un-plastered side, no deduction shall be made.
 - In case of openings of area above 3 sqm each, deduction shall be made for openings but jambs, soffits and sills shall be measured.
- 11.12.** Pointing
Pointing shall be measured in square meter
- 11.13.** Providing And Fixing Chicken Wire Mesh

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The wire mesh shall be of 24 gauge and it shall be fixed with nails at the junction of brick masonry and RCC elements. The chicken wire mesh shall not sag in between the nails. This shall be done before the application of plaster.

11.14. Providing and applying rough cast plaster

This shall be carried out in two layers. The base plaster shall be of 22mm thick and of specified proportion of CM. It shall be roughened to receive the top layer. The top layer shall be 7 mm thick. It shall be of 3 parts cement, 6 parts coarse sand & 4 parts of 6mm to 10mm single. Or crushed stone aggregate. The plaster shall be cured at least for 7 days.

11.15. Providing and applying water proof cement plaster:

The plaster shall be of specified thickness and of mortar proportions. The Tenderer shall use approved waterproofing admixture made by reputed manufacturer in the mortar for plaster work. The quantity to be used shall be in accordance with the manufacturer's instructions, however subjected to the approval of the Engineer-in-charge. The use of calcium chloride shall be prohibited unless specifically allowed by the Engineer-in-charge and shall conform to IS: 2645. The plaster shall be cured at least for 7 days.

12. White Washing, Colour Washing, Distempering, Painting And Polishing

12.1. General

Reference shall be made to the following Indian Standards:

IS: 6278	Code of practice for white washing and colour washing.
IS: 2395	Code of practice for painting concrete, masonry and plaster surfaces.
IS: 712	Specification for building limes.
IS: 55	Specification for Ultramarine blue for paints.
IS: 63	Specification for whitening for paint and putty.
IS: 427	Distemper (dry) colour as required.
IS: 428	Distemper (Oil bound) colour as required.
IS: 5411	Specification for plastic emulsion paint for interior use.
IS: 2338	Code of practice for finishing of wood and wood (Part I, II) Based Materials
IS: 5410	Cement paint, colour as required.
IS: 2524	Code of practice for painting non ferrous metals in buildings
IS: 384	Brushes, paints and varnishes, flat.
IS: 486	Brushes, sash, tool for paints and varnishes
IS: 110	Ready mixed paint, brushing, grey filler enamels for use over primers.
IS: 426	Paste filler for colour coats.
IS: 345	Wood filler, transparent liquid
IS: 3585	Ready mixed paint, aluminum brushing priming water resistant for woodwork.
IS: 426	Paste filler for colour coats.
IS: 106	Ready mixed paint, brushing, priming for enamels, for use on metals.

All materials required for the execution of painting work shall be obtained direct from approved manufacturers and shall be brought to the site in makers drums, keys etc., with seals unbroken.

If in case of ready mixed paints, thinning if necessary the brand of thinner shall be as per recommendations of the manufacturer.

Paint shall be applied by brushing or spraying. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer. During painting, every time after the paint has been worked out of the brush bristles, the bristles shall be opened up by striking the brush suitably.

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Spray machine used may be of high pressure type or low pressure depending on the nature and location of work. After work, the brushes shall be completely cleaned off paint and shall be hung in a thinner if intended to be used afterwards. The spray guns shall be cleaned thoroughly after every break in work. The paint containers, when not used shall be kept close and free from air.

After the finishing of work, the adjacent surfaces not intended to be washed/ distempered/ painted/ polished, shall be thoroughly cleaned of all paint patches and shall be finished in accordance with surface finishing of such surfaces.

- 12.2.** White washing
White washing in general shall conform to IS: 6278

12.2.1 Workmanship

Scaffolding: Wherever scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be white/ colour washed. For white washing of ceiling, proper stage scaffolding shall be erected.

Preparation of surfaces: The surface shall be thoroughly cleaned of all dirt, dust, mortar dropping and other foreign matter before white wash is to be applied.

All holes, cracks, patches etc., not exceeding 0.1 sqm in area shall be made good with material similar to that of the surface. Surface affected by efflorescence, moss, fungi, algae, lichen etc., shall be treated in accordance with IS: 2395.

Preparation of white wash: Pre-prepared lime wash like "Janata-Cem" may be used with prior approval of the Engineer-in-charge.

Application: White wash shall be applied with brush to the specified number of coats. The operation for each coat shall consist of stroke of the brush from the top to down wards, another from the down to upwards over the first stroke, similarly one stroke horizontally from right and another stroke from the left. Each coat shall be allowed to dry before the next coat is applied.

The white washing on ceiling should be done prior to that on walls.

Protective measures: Surfaces of doors, windows, floors, etc., which are not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

- 12.3.** Oil bound distempering

12.3.1 Workmanship

Scaffolding: Same as in clause no. 12.2.1.

Preparation of surface: Pre surface shall be thoroughly brushed free from dust, grease, mortar dropping, other foreign matter and shall be made smooth by sand papering up to the satisfaction of Engineer-in-charge and unevenness shall be made good by applying putty made of plaster of Paris mixed with water including filling up the undulation and then sand papering the same after it is dry.

Primer coat: The primer coat shall be alkali resistant primer or distemper primer and shall be of the same manufacture as oil bound distemper.

If the wall surface plaster has not dried completely, alkali resistant primer otherwise distemper primer shall be applied. The mixture of alkali resistant primer shall be prepared as per approved manufacturer's instructions.

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The application of primer coat shall be in accordance with 12.2.1.

Preparation of oil bound distemper: The distemper shall conform to IS: 428 and shall be diluted with water or any other prescribed thinner recommended by the manufacturer.

Application of distemper: After the priming coat has dried for at least 48 hours, the surface shall be lightly sand papered and dusted off avoiding rubbing off of the priming coat.

Prepared distemper shall then be applied in minimum two coats with proper distemper brushes in horizontal strokes immediately followed by vertical ones which together shall constitute one coat. The subsequent coats shall be applied only after the previous coat has dried. The finished surface shall be even and uniform without patches, marks, distemper drops etc., the application of a coat in each room shall be finished in one operation. After each days work, brushes shall be thoroughly washed in hot water and hung down to dry.

Protective measure: Same as in clause in 12.2.1.

12.4. Waterproof cement paint

12.4.1 Workmanship

Scaffolding: Same as in clause no.12.2.1.

Preparation of surface: Preparation of surface shall in general be in accordance with clause no.10.2.1.2 except that any unevenness shall be made good by applying putty made of plaster of Paris mixed with water including filling up the undulation and then sand papering the same after it is dry.

Primer coat: The primer coat of cement primer of same manufacture as the cement paint shall be applied as in clause 12.2.1

Preparation of paint: Waterproof cement paint of approved make shall be mixed with water and stirred to obtain a thick paste which shall then be diluted to brush able consistency. The proportion of mixture shall be as manufacturer's recommendation. The paint shall be mixed in such quantity which can be used up within an hour of mixing to avoid setting and thickening of the paint.

Application of paint: The surface shall be treated with minimum two coats of waterproof cement paint. No less than 24 hours shall be allowed between two coats and the subsequent coats shall be applied only after the preceding coat has become hard to resist marking by subsequent brushing.

The finished surface shall be even and uniform in shade without patches brush marks, paint drops etc., Cement paints shall be applied with a brush with relatively short stiff hog of fiber bristles.

Curing: Curing shall be started after the paint has hardened. Curing shall be done by sprinkling with water two or three times a day. This shall be done between coats and for at least two days following the final coat.

Protective measure: Same as in clause in 12.2.1.

12.5. Acrylic emulsion painting

12.5.1 Workmanship

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Scaffolding: Same as in clause 12.2.1.

Preparation of surface: Same as in clause 12.2.1 under specification of oil bound distempering

Preparation of mix: Plastic emulsion paint shall conform to IS: 5411 (Part-1) and shall be of approved shade. Preparation of mix shall be as per manufacturer's instructions.

Application of paint: The paint mix shall be continuously stirred while applying for maintaining uniform consistency. Number of coats shall be as per item description. The painting shall be laid evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area with paint, brushing the surface hard at first, then brushing alternately in opposite direction 2/3 times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks, no hair marks no clogging of paint puddles shall be permitted. The full process of crossing and laying off will constitute one coat.

The paint shall be applied by means of brush or roller.

Before starting painting with plastic emulsion paint, the prepared surface shall be treated with two coats of primer consisting of cement primer, whitening and plastic emulsion paint shall start only after the preceding coat has become sufficiently hard to resist brush marking. Subsequent coats of plastic emulsion paint shall also be started after the preceding coat is dried by evaporation of water content.

The surface on finishing shall present a flat, velvety smooth finish, even and uniform shade without patches, marks, paint drops etc.,

Precautions

- i. Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush. Old brushes, if used shall be completely dried of turpentine/oil paints by washing in warm soap water.
- ii. No oil base putties shall be used in filling cracks/holes.
- iii. Washing of painted surface shall not be done within 3-4 weeks of application.

Protective measures: Same as in clause 12.2.1.

12.6. Painting wood and wood based material

Synthetic enamel paint: It shall be confirmed to IS: 2932 of approved brand and colour shall be used.

12.6.1 Preparation of surface: Preparation of surface shall conform to IS: 2338(Part-1) in general. All woodwork shall be dry and free from any foreign matter. Nails shall be punched well below the surface. The surface shall be smoothened off with abrasive paper used across the grain prior to painting with the grain prior to the staining. Any knots, resinous, or bluish sap wood, cutting out of which is not justified shall be covered with red lead conforming to IS:103

Plywood and block board shall be treated in the same manner as for wood work.

Particle boards surface shall be filled with a thin brush able filler and finished as for solid wood.

12.6.2 Priming: Priming shall be in accordance with IS: 2338 (Part I and II). Dirt or any other extraneous material on the surface shall be removed and the priming shall be applied by brushing.

Priming shall be done on all exposed and unexposed surfaces. Unless specific otherwise all joinery work intended to be painted shall receive at least 2 coats of primer.

Type of primer shall be in accordance with Table-1 and Table-2 of IS: 2338 (Part-II)

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- 12.6.3** Stopping and filling: Stopping and filling shall be done after priming. Stopping shall be made to the consistency of stiff paste and shall be used to fill holes and cracks. Filler shall be used to level up slight irregularities of the surface. Filler shall be applied with a putty knife and subsequently rubbed down to a level surface with abrasive paper.

The filler coat shall be allowed to fully flatten and harden before subsequent coat is applied.

- 12.6.4** Application of Under coat: Under coat shall be applied after the surface has been primed, stopped and filled, and rubbed down to a smooth surface. Under coat may be brushed or sprayed. After drying the coat shall be carefully rubbed down and wiped clean before the next coat is applied.

The type of under coat shall be depending upon the finishing and in accordance with Table-1 and Table-2 of IS: 2338 (Part- II)

- 12.6.5** Finishing: The finishing paint shall be as specified in the item description and shall be applied either by the brush or by spraying.

Reference shall be made to the Table-1 and Table-2 of IS: 2338 (Part-II)

- 12.6.6** Application of clear finishes
For the application of clear finishes, the following procedures shall generally be adopted in accordance with IS:2338 (Part-I)

- i. Filling
- ii. Staining
- iii. Sealing
- iv. Finishing

Filling: Fillers shall be applied to prevent the excessive penetration of the finish to the surface for obtaining a smooth finish. Fillers shall be conforming to IS: 345

Fillers shall be heavily applied to the wood surface by hand, using hessian or jute rag across the grain. It shall be rubbed when still wet to get better penetration. After 5-10 minutes it shall be wiped off by hand across the grain followed by a light wipe with the grain. The filled surface shall be dried preferably over night and smoothened with abrasive paper.

Staining

- a. Spirit Stains: Spirit stains are solutions of spirit soluble dyes in industrial methylated spirit.
- b. Oil stains: Oil stains are solutions of oil soluble dyes in linseed oil, but, usually consist of insoluble, semi-transparent pigments ground in linseed oil and thinned with turpentine or other solvent.
- c. Preparation of wood for staining: Surface intended for staining shall be kept scrupulously clean and free from greasy finger marks. It shall be prepared by careful smoothening with fine abrasive paper used in the direction of the grain.

Small cracks/nail holes shall be stopped with plastic wood/fine plaster of paris. The stopping shall be rubbed down with fine abrasive paper when hard and touched with a thinned knotting before staining. Incase of oil staining stopping shall be done after staining using tinted putty or wood filler.

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- d. Application of stains: Stains shall be applied by brushing, and wiping or by spraying. The stain shall be so thinned that it can be applied fairly, liberally without over staining and overlapping.

Sealing : A suitable sealer shall be applied on the filled and sanded surface to prevent absorption by the wood of the succeeding coats of finish and to seal stain and filler and thus preclude their bleeding into the finish coat.

Sealer may be sprayed on taking care not to flood the surface and it shall be allowed to dry hard.

When fully dry the surface shall be sanded taking care not to cut through at corners and edges. Dust shall be blown off and surface wiped with a clean rag.

Finishing: The stained surface shall be varnished, wax-polished or French polished as required after it is dried.

12.6.7 Varnishing

Varnishing of wood and wood based material shall be in accordance with IS:2338 (Part-I). Surfaces to be varnished shall be prepared to produce a smooth, dry and matt surface and all dust and dirt shall be removed from the surface.

The varnish shall be applied liberally with a brush and spread evenly over a portion of the surface with short light strokes to avoid frothing. It shall be allowed to flow out while the next section is being laid in. Excess varnish shall be scrapped out of the brush and then the first section be crossed, re-crossed and laid off lightly. The varnish, once it has begun to set, shall not be retouched in case of any mistake, the varnish shall be removed and the work shall be started afresh.

Where two coats of varnish are applied, the first coat shall be a hard drying under coating or flattening varnish which shall be allowed to dry hard and then be flattened down before applying the finishing coat. Sufficient time shall be allowed in between two coats.

When flat varnishing is used for finishing, a preparatory coat of hard drying undercoating or flattening varnish shall first be applied and shall be allowed to harden thoroughly. It shall then be lightly rubbed down before the flat varnish is applied. On larger areas, the flat varnish shall be applied rapidly, and the edges of each patch applied shall not be allowed to set, but shall be followed up whilst in free working conditions.

12.6.8 French Polish

French polish shall conform to IS: 348. Suitable pigments shall be added to get the required colour.

The surface to be french polished shall be rubbed down to smoothness with sand paper and shall be well dusted. Pores in the surface shall be filled up with fillers.

A pad of woollen cloth covered by a fine cloth shall be used to apply the finish. The pad shall be moistened with polish and rubbed hard on the surface in a series of overlapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil may be used on the face of the pad for the purpose. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off, the pad shall be covered with a fresh piece of clean fine cloth, slightly damped with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

12.7. Painting of steel and other metal surface

12.7.1 General: Reference shall be made to the following Indian Standards IS:2524, IS:1447

12.7.2 Preparation of surface

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The surface, before painting shall be cleaned of all rust, scale, dirt and other foreign matter with wire brushes, steel wool, scrappers, sand paper etc., The surface shall then be wiped finally with mineral turpentine which shall then be removed of grease etc., The surface then shall be allowed to dry. In case of GI surface, surface so prepared shall be treated with Mordant solution (5 liters for about 100 sqm) by rubbing the solution generously with brush. After about half an hour, the surface if required shall be retouched and washed down thoroughly with clean cold water and allowed to dry.

12.7.3 Application of priming and paints

Approved quality primer and paint in specified no. of coats shall be applied as per manufacturer's recommendations either by brushing or spraying. Each subsequent coat shall be applied only after the preceding coat is dried.

Measurement and rate (where painting is not included in the relevant description of item in the bills of quantities)

All work shall be measured in areas. Areas shall be worked out to the nearest 0.01 sqm and all dimensions to the nearest 0.01 meter.

Deductions shall be made in accordance with IS specification For Method of measurements

The equivalent area will be worked out in accordance with IS: 1200. The rate shall include the cost of all materials, labour, scaffolding, protective measures etc., and all works involved in specification. The rate shall also include if not mentioned otherwise, conveyance, delivery, handling, unloading, storing etc.

13. Miscellaneous

13.1. Barbed wire fencing – RCC posts

These specifications define the materials and construction aspects of barbed wire fencing with RCC posts.

13.1.1 Materials : RCC posts and struts shall be as below

All posts and struts shall be of standard size, the length of posts being 1.8m or as specified and that of struts being minimum of 2.0m. These shall be cast in cement concrete 1:2:4 (1cement : 2 coarse sand : 4 graded stone aggregate 12.5mm nominal size) reinforced with 6mm diameter mild steel bars as directed and finished smooth with cement mortar 1:2 (1 cement : 2 fine sand). The specifications for RCC work shall apply. The posts and struts shall be free from cracks, twists and such other defects GI staples on wooden plugs or 6mm barbing will be provided as directed by Engineer-in-charge while casting the posts. Barbed wire shall be as per IS.278. The spacing of posts shall be as specified in drawings or as directed by the Engineer-in-charge to suit the dimensions of the area to be fenced. Every 15th, last but one end post and corner posts shall be strutted on both sides and end posts on one side only.

13.1.2 Fixing of posts and struts:

Pits 45 x 45cm and 75cm deep or as directed shall first be excavated true to line and level to receive the posts. In the case of struts, pits 70 x 45 x 75cm deep or as directed shall be excavated to suit the inclination of the strut so that it is surrounded by concrete by not less than 15cm at any point. The pits shall be filled with a layer of 15cm thick cement concrete 1:3:6 (1 cement :3 fine sand : 6 graded stone aggregate 40 nominal size). The posts and struts shall then be placed in the pits, the posts projecting 1.2m or to the specified height above ground, true to line and position. The cement concrete 1:3:6 shall be filled in up to 15cm for posts and 25cm for struts below ground level at the base of the concrete so that the posts are embedded in the cement concrete block of size 45 x 45 x 60cm and strut in block of size 70 x 45 x 50cm. The concrete in foundations shall be watered for at least 7 days shall be filled up with excavated earth and the surplus earth disposed off as directed by the Engineer-in-charge.

13.1.3 Fixing Barbed wire:

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The barbed wire shall be stretched and fixed in specified number of rows and two diagonals. The bottom row shall be 14cm above ground and the rest at 12.5cm center to center. The diagonals shall be stretched between adjacent posts from top wire of one post to the bottom wire of the second post. The diagonal wires shall be interwoven with horizontal wires by fixing the Odd-rows of wires, then the diagonal cross wires and lastly the even rows of wires. The barbed wire shall be held to the RCC posts by means of GI staples fixed to wooden plugs or GI bindings wire tied to 6mm barbing fixed while casting the posts. Turn buckles and straining bolts shall be used at the end posts, if so specified.

13.2. Barbed wire fencing - mild steel angle posts over masonry compound walls

These specifications define the materials and construction aspects of barbed wire fencing with MS angle posts. MS angle shall be 50 x 50 x 6mm or as specified, conform to IS:1852 where 2 angles are specified for a single support. It shall be welded continuously and fixed on masonry walls as specified. The barbed wire shall be as per IS:278. The fixing of barbed wire shall be as per cl.14.1.6. The wire shall be held by tearing holes of 10mm diameter in the post and tied with GI wire.

13.3. Chain link fencing

Fencing shall be provided as per BOQ and drawings and includes the following Item of works:-

- a. Providing specified gauge and shapes of mesh woven galvanized chain link fencing, fixed with 6 mm diameter bar on each angle iron columns duly clamped and hooked with 6 mm diameter 'J' bolts, nuts, washers etc.
- b. Providing, stretching and fixing of three rows of 3mm diameter GI wire to woven chain link fencing.
- c. Painting MS bar with 2 coats of primer and 2 coats of aluminum paint of approved make and shade as per our specification.
- d. Item includes Angle Iron, or concrete poles, earth work, foundation concrete and masonry work etc. as shown in drawing / described in BOQ
- e. Measurements shall be for running meter of work completed.

13.4. Ferro Cement Water Tank

The ferro cement is made up of 8 SWG 100 x100 weld mesh formed to shape of tank and covered by two layers of 25mm size 22 SWG chicken mesh as the skeleton fixed with couplers for inlet / outlet overflow / scour pipes of 25mm diameter at appropriate locations. The skeleton is coated over with cement mortar 1:2 (1 cement : 2 fine sand) added with 3% waterproofing admixtures like cico and finished in layer to line and level. The walls and base shall be integral and the cover movable as one or two pieces. The base shall have additional layer of weld mesh as above with suitable anchorage with the shell. The tank shall be painted inside with anti-fungal paint. Overflow and vent connections shall be provided with mosquito proof wire mesh couplings, the cost shall include all items and fixing. The price quoted shall be for unit of tank inclusive of all reinforcement mesh fixtures, supports and all finishes except decorative painting. The skeleton in mesh may be made elsewhere but casting of tank shall be on the terrace at the final location. Transporting the casted tank is not suggested and is to be avoided.

13.5. Road Signs

13.5.1 Name Board Fixing : The name board post of standard design shown in figure shall be firmly fixed in ground to a depth of 75 cm. The side filling shall be thoroughly watered and consolidated. Boards shown in figures shall be firmly fixed in ground in cement concrete 1:3:6 (1 cement; 3 fine sand; 6 graded stone aggregate 40 mm nominal size) which will be paid for separately.

13.5.2 Painting: Exposed surface above ground shall be painted with white zinc paint in two or more coats over a coat of primer, as for new work.

13.6. Reinforced Earth :

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This is done generally for retaining cohesive soils by a composite wall consisting of a façade in concrete, back ties in concrete of corrosion resistant steel or polypropylene net or stirrups and filled up cohesive soil.

13.6.1 Materials :

The façade may be concrete blocks or reinforced concrete panels in inter-locked shapes. The ties backwards will be in lengths depending on the height of all. Cohesive soils shall be gravel with clay content consolidated in layers after spreading the ties.

13.6.2 Designs : The retaining wall is expected to derive its gravity from the composite action of the façade, ties and back fill.

- The façade itself may be continuous or by open concrete grids inter-locked with ties in pre-cast concrete.
- The design details shall be strictly according to the drawings supplied.

13.6.3 Terracotta Jali

The jali shall be set in position true to plum and level before the joints sills and soffits of the openings are plastered. It shall then be properly grouted with cement mortar 1:3 (1 cement : 3 coarse sand) sand rechecked for levels. Finally the jambs, sills and soffits shall be plastered embedding the jali uniformly on all sides.

The jali shall be measured for its gross superficial area. The length and breadth shall be measured correct to a cm.

The rate shall be inclusive of materials and labour involved in all the operations described above except plastering of jambs, sills and soffits, which will be paid for under relevant items of plastering.

13.7. Anchors in Rock:

13.7.1 Rock anchors in building construction are employed to attach the foundation on to the sheet rock encountered on the surface or at shallow depth. The components of this work are:

- Drilling of vertical holes into the rock
- Providing suitable anchor rods in steel, preferable of high strength
- Using a non-shrink grout into the gap between the hole and the inserted rod.

13.7.2 The holes to be driven are preferably of 35-45-50 mm diameter into which bars of 20 / 25 / 28 mm are inserted and grouted.

Alternatively the bars are driven into the holes filled with fresh grout. The bars down the hole shall be of length of 30 to 50 diameters of bars and the free end shall have bent ends of mechanical fixtures for anchoring into the foundation concrete which will follow. The measurements shall be taken per each hole driven, inclusive of grout and anchor bars.

13.8. Interlock Concrete Pavers:

Supplying and laying interlock concrete pavers as per approved vendor list with M 40 grade concrete blocks, with minimum thickness of 80mm and providing minimum 50mm thick sand cushion below the pavers as sub base, sand filling between the pavers and compacting the same as per directions of Engineer-in-charge / Manufactures specification.

- The specification for production of paver blocks as per BS 6717 – part I (for M50 grade) (i.e. 49 N/mm²) For M40 – Average of samples ≥ 40 Mpa (39 N/ mm²) Interpolated from code standards.

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No individual paver's compression strength $\leq 32\text{Mpa}$ (31.40 mm²) with relevant slope factors adapted as per BS 617 – Part I or different thickness to arrive at correct compressive strength.

$$\text{i.e. C.C.S} = \frac{\text{Load x Relevant shape factor}}{\text{Surface area of pavers}}$$

- Laying: As per Bs 6717 – Part – III

13.9. Setting of Mangalore Tiles over Concretes in sloped Surface

The Mangalore tiles shall be of thickness 20 mm, pressed and fired. Extruded tiles are not acceptable. Absorption of water by tiles shall not be less than 19%

Clean and brush the slope surface and spread cement mortar 1:3 to predetermined levels. Set in tiles on this mortar pressed hard and using a wooden mallet, such that the mortar fills and bonds with serrations at the bottom of the tile. Filling in the joints by mortar should be done from behind. Ridge and border tiles shall be laid wherever necessary.

The tiles shall set from eave upwards, taking care to avoid spillage of mortar on the set tiles. The measurement will be for the exposed surface area. The tile so laid shall be cured for at least 7 days.

13.10. Applying two coats of bitumen 80/100 over D.P.C – at plinth level

13.10.1 Preparing the surface

The surface shall be cleaned with wire brushed and cotton or gunny cloth. All loose materials and scale shall be removed and the surface further cleaned with a piece of cloth lightly soaked in kerosene oil

13.10.2 Painting with Bitumen

The prepared surface shall be painted with petroleum bitumen of penetration 80/100 of approved quality at 17 kg per 10 sqm impregnated with a coat of coarse sand at 60 cu. Decimeter per 10 sqm the bitumen shall be heated to the required temperature as per specifications of the manufactures.

13.11. Plinth protection and kerb stone around the building:

The plinth protection slab shall be of pre-cast with C.C. 1:3:6 of approved size and thick using 12mm down grade metal laid over consolidated river sand filling of 15cm depth with proper slope and the joints neatly fitted with C.M. 1:3.

-Do- as above for kerb stone of minimum 7.5 cm thick and size as specified with the top edge of the kerb stone flush with plinth protection slab and fixed neatly with C.M. 1:3 as per the direction of the Engineer-in-charge-in charge .

13.12. Sandtex matt paint:

Same specification as that of cement paint but with sandtex matt paint finish of approved make quality and colour.

13.13. Man hole cover

Cast iron frames are to be provided by the Tenderer and bedded in cement mortar on the brick work or cement concrete with splayed fillet all around and in such position that the top may be 13mm above the original surface of the road. The covers are to be placed in position and the hole left neat and dry.

Cover shall be cast iron heavy duty circular pattern. They shall be coated with bituminous paint.

13.14. Soil stabilization:

Soil stabilization may be carried out wherever required with the approval of Engineer-in-charge-in charge by installing sand and lime piles of specified diameter with approved grid and depth. The sand plus lime will be of dry mortar mixed with the proportions of 2 parts of lime and one part of river sand

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filled in the bore stage by stage and well consolidated. The size and spacing of the driven hole shall be as prescribed in the item.

13.15. Under –Reamed pile

It shall be confirm to IS-2911 (part III). Under reamed piles are of bored cast-in-situ piles having one or more bulbs by suitably enlarging the bore hole for the pile stem. These piles are provided to a certain depth as per soil strata to avoid undesirable effect of seasonal moisture changes which will affect the subsoil in foundation. It is further capable of taking care of downward, upward and lateral loads and movements in foundation below ground level. The necessary mechanical devices must be used for the bore as well as scooping out the earth for the required diameter and length as specified. The concrete mix and water cement ratio will be so controlled taking into consideration the subsoil water level also. When the ground consist of expansive soils (black cotton soil), the bulb of under-reamed pile provided anchorage against uplift due to swelling pressure.

13.15.1 Design Considerations

1. In deep deposits of expansive soil the minimum length of piles shall be 3.5m below ground level
2. The diameter of under-reamed bulbs may vary from 2 to 3 times stem diameter
3. For piles up to 30cm diameter the spacing of bulbs should not exceed 1.5 times the diameter of bulb. For piles of diameter greater than 30cm spacing can be reduced to 1.25 times the stem diameter

13.16. Brick jelly concrete 1:4:8 – over roof:

The sunken portion of toilet in first floor is treated as follows before sanitary fittings are embedded. The internal portion of the R.C. sunken floor must be plastered with C.M. 1:3 mixed with water proofing compound CICO or Impermo as approved by the Engineer-in-charge-in charge at the rate of 3% by wt of cement. Then brick jelly lime concrete of 1:4:8 (using approved broken brick jelly of 25mm down grade to be laid in the toilet fillings of first floor sunken slab.

13.17. Bore well:

The location of bore well will be selected as per ground-water survey. The location so selected has to serve the purpose of water supply as per design. The sinking of bore well up to the required depth by mechanical arrangements using pressure hose, heavy type hollow drilling rods including chisel headed rotary to penetrate into the rock also. After reaching the required depth, the yield test as per standard practice using V notch etc., must be done for minimum 24hrs continuously to find out the quantum of water. Based on the sub soil strata to avoid sliding/collapsing of sub soil in the bore hole, casing of required depth by using P.V.C./M.S. slotted pipe with necessary net around the pipe to avoid silt coming in sides may also be used to suit the diameter of bore. The water so obtained after the yield test must also be tested in the laboratory for the suitability of drinking purpose.

Sinking bore well up to required depth by mechanical arrangements including casing pipe to the depth directed by Engineer-in-charge-in charge. The bore well cap also to be provided. In order to have the bore well at the appropriate locations for getting water, geological survey also to be done in the initial stage.

14. Road Work - Deleted

15. Storm Water Drainage - Deleted

16. Specification for Sanitary and Water Supply Works

16.1. Scope of Work: The contract shall generally include the following services.

- i. Installation of sanitary ware, fixtures and faucets and toiletries
- ii. Installation of soil, waste and vent and rain water pipe work
- iii. Installation of internal hot and cold water supply distribution network.

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- iv. Installation of overhead water storage tanks including making connections with the pipe work and construction of tank supporting structure.
- v. Laying of underground drainage system including construction of manholes, gully chambers and all other related appurtenances up to building manholes.

The Tenderer shall include for the supply, delivering, installation, connection, commissioning and testing of all materials and equipments to provide a complete sanitary plumbing, sewerage, water supply installation as described hereunder:

16.2. General:

16.2.1 Statutory Regulations and Approvals

All sanitary and water supply works shall be carried out only by those Tenderers who are licensed by the concerned local authorities to execute this type of work.

It shall be the responsibility of the Tenderer to comply with the regulations as laid down by the local authorities. The Tenderer shall also be responsible for obtaining all the statutory approvals / certificates (Form C & D etc.) for the work from the concerned local authorities, including necessary Liaison with concerned local authorities at his own cost and these certificates shall be handed over to the Engineer-in-charge at the completion of the Contract.

It shall also be the responsibility of the Tenderer to get the sewerage and water supply connections from the concerned authorities. However, the Employer will bear all the statutory expenditure.

16.2.2 Site Conditions:

It is assumed that before tendering, the Tenderer would have visited the site and familiarized himself with all local conditions and means of transportation and communications. No claim, of whatsoever nature, would be entertained at a later date on account of the Tenderer's ignorance of the local conditions.

16.2.3 Standard and Codes of Practice

The work shall be carried out as per the enclosed specifications of work and the construction drawings to be issued from time to time. These specifications shall be read in conjunction with latest version of the National Building Code and relevant IS codes of practice and standards as issued by ISI (all with the latest amendments).

Latest editions shall always be consulted.

IS : 458	Pre-cast concrete pipes (with & without reinforcement)
IS : 651	Salt glazed stoneware pipes and fittings
IS : 771	Glazed fire clay sanitary appliances
IS: 772	General requirements for enamelled cast iron sanitary appliances.
IS: 774	Flushing cistern for water closets and urinals (Valve less Siphonic type).
IS : 775	Cast iron brackets and supports for wash basins and sinks.
IS : 778	Copper alloy gate, globe and check for water works purpose.
IS : 780	Sluice valves for water works purposes.
IS : 781	Cast copper alloy screw down bin taps and stop valves for water services.
IS : 782	Caulking lead
IS: 783	Code of practice for laying of concrete pipes.
IS : 784	Pre-stressed concrete pipes
IS : 1171	Ferromanganese
IS : 1172	Code of basic requirements for water supply drainage and sanitation.
IS : 1200	Methods of measurement of building and civil Engineer-in-charge of works.
IS: 1230	Cast iron rainwater pipes and fittings.
IS: 1239	Mild steel tubes and mild steel tubular and other wrought steel pipe fittings.
IS: 1536	centrifugally cast (Spun) iron pressure pipes for water, gas and sewage.
IS : 1537	Vertically cast iron pressure pipe for water, gas and sewage.

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IS : 1538	Cast iron fittings for pressure pipe for water, gas and sewage.
IS : 1626	Asbestos cement building pipes, gutters and fittings (spigot and socket types).
IS : 1703	Copper alloy float valves for water supply fittings.
IS : 1726	Cast iron manhole covers and frames intended for use in drainage works.
IS : 1729	Sand cast iron spigot and socket soil waste and ventilating pipes, fittings and accessories.
IS : 1742	Code of practice for building drainage.
IS : 1916	Steel cylinder pipe with concrete lining and coating
IS : 2064	Code of practice for selection, installation & maintenance of sanitary appliances.
IS : 2065	Code of practice for water supply in building.
IS : 2470	Code of practice for installation for septic tank.
IS : 2527	Code of practice for fixing rain water gutters and down pipes for roof drainage.
IS : 2548	Plastic seats and covers for water closet.
IS : 3076	Low density polyethylene pipes for potable water supplies.
IS : 3114	Code of practice for laying of CI pipes.
IS : 3486	Cast iron spigot and socket drain pipes.
IS : 3589	Seamless or electrically welded steel pipe for water, gas and sewage.
IS : 3989	Centrifugally cast (spun) iron spigot and socket soil waste and ventilating pipe, fittings and accessories.
IS : 4111	Code of practice for ancillary structures in sewerage system
IS : 4127	Code of practice for laying of glazed stoneware pipes.
IS : 4984	Specification for high density polyethylene pipes for potable water supplies, sewage and industrial effluents.
IS : 5219	Cast copper alloy traps.
(Part – I)	
IS : 5329	Code of practice for sanitary pipe work above ground for buildings.
IS : 5961	Specification for cast iron gratings for drainage purposes.

16.2.4 Workmanship: All the work shall be carried out in a workmanship like manner as per the best practices of the trade.

16.2.5 Material Statements, Samples and Shop Drawings:
After the award of the contract, the Tenderer shall make and submit a statement (in duplicate) mentioning the make and the quality of the materials and equipment he proposes to supply. The statement shall be supported by the relevant catalogues / literature of the manufacturers. It shall also be the responsibility of the Tenderer to submit without any extra charge the sample as of material / equipment as and when asked by the Engineer-in-charge. The sample shall be submitted to the Engineer-in-charge within thirty days of the award of the contract. The Tenderer shall use only those materials / equipment for which the approval from the Employer has been obtained. If the Tenderer wishes to use an alternative make due to non - availability of the approved one, he should take the prior approval of the Employer. Under such situations, the Tenderer shall show such promptness as not to hamper the progress of the work.

The Tenderer shall submit for Employer approval, the shop drawing of all the custom-built equipment, including fire fighting system and pumping system, he proposes to install.

16.2.6 Work and Time schedule:
The Tenderer shall prepare a work and time schedule in a format approved by Engineer-in-charge. The schedule shall be submitted to the Engineer-in-charge within thirty days of the award of the contract. It shall indicate the expected date of commencement and completion of each item of work. The chart shall also indicate the scheduling of samples, shop drawings and approvals. In addition to this, the Tenderer shall also furnish to the Engineer-in-charge fortnightly progress reports indicating percentages completion of each item of work.

16.2.7 Plumbing Drawings:
The plumbing drawings issued from time to time to the Tenderer are diagrammatic but shall be followed as closely as actual construction and work will permit. Any deviation from the drawings

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required to conform to the building construction shall be made by the Tenderer at his own expenses. The architectural drawings shall take precedence over the services drawings as far as the civil and other trade works are concerned.

16.2.8 Discrepancies in the Drawings:

Should there be any discrepancy due to incomplete description, ambiguity or omission in the drawings and other documents relating to this Contract found by the Tenderer either before starting the work or during execution or after completion, the same shall be immediately brought to the attention of the Engineer-in-charge and his decision would be final and binding on the Tenderer.

16.2.9 Materials:

All materials to be supplied by the Tenderer shall be new and as per relevant IS code. All packed items shall arrive at site in original packing only. Any items found defective or damaged shall be replaced by the Tenderer at his own expense.

16.2.10 Storage of Materials:

All the materials brought to the site shall be stored and stacked in a proper manner. The materials requiring protection from the Sun and rain shall be kept inside the temporary structures to be erected at site by the Tenderer. The Tenderer shall also follow the manufacturer's instructions for storage and stacking the materials.

The storage facilities are to be created by the Tenderer at his own expense.

16.2.11 Instruments for Measurement and Testing:

The Tenderer shall provide, free of cost, all equipment, instruments, labour and all other allied assistance by the Engineer-in-charge or his representatives for measurement and testing of the works.

16.2.12 Co-ordination with other Trades:

The Tenderer shall be responsible for co-coordinating this work with works of other trades sufficiently ahead of time to avoid unnecessary hold-ups. Hangers, sleeves, recesses etc. shall be left in time as the work proceeds.

16.2.13 Site Dairy:

The Tenderer shall maintain a Site Dairy, in which daily progress of the work and number of workers engaged shall be recorded. The site dairy shall also be used by the Engineer-in-charge for writing his comments / instructions.

16.2.14 Up-keep of the Site:

It shall be the responsibility of the Tenderer to clear away, from time to time, all debris and excess material generated by the activities of his workers.

16.2.15 Protection:

All work shall be adequately protected, to the satisfaction of the Engineer-in-charge so that the whole work is free from the damage throughout the period of construction up to the time of handing over.

Special care must be taken to prevent damage and scratching of all fittings and fixtures. Tool marks on exposed fixtures shall not be accepted. Protective paper on fixtures shall be removed with hot water only at the final completion of the work.

Before handing over the work, the Tenderer shall clean all elements of the complete installation, remove plasters, splashes, stickers, rust, stains and all other foreign matter and leave every part in acceptable condition and ready for use to the satisfaction of the Engineer-in-charge.

16.3. Sewerage:

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16.3.1 Excavation Alignment and Grading:

The sewers are to be laid to alignment and gradients shown on the drawings but subject to such modifications as shall be ordered by the Engineer-in-charge from time to time to meet the requirements of the works. No deviations from the lines, depths of cutting or gradients of sewers shown on the plans and sections shall be permitted except by the express direction of the Engineer-in-charge.

16.3.2 Excavation in Tunnels:

The excavation for sewers and works shall be open cutting unless the permission of the Engineer-in-charge for the ground to be tunneled is obtained. Where sewers have to be constructed along narrow passages, the Engineer-in-charge may order the excavation to be made partly in open cut and partly in tunnel and in such cases the excavated soil shall be removed at once, so as not to block up the passage and shall be brought back later on for refilling of the trenches or tunnels.

16.3.3 Opening out Trenches:

In excavating trenches, etc. the soling, road metalling, pavement, kerbing and turf etc. is to be placed on one side and preserved for reinstatement after filling back the trenches.

Before any road metal is replaced, it shall be carefully shifted. The surface of all trenches and holes shall be restored and maintained to the satisfaction of the Engineer-in-charge and of the owners of the roads or the property transversed and the Tenderer shall not cut or break any live fence or trees in the line of the proposed works but shall tunnel under them, unless the Engineer-in-charge shall order to the contrary.

The Tenderer shall group up and clear the surface over the trenches and other excavation of all trees, stumps, roots and all other encumbrances affecting execution of the work and shall remove them from the site as approved by the Engineer-in-charge.

16.3.4 Obstruction of Roads:

The Tenderer shall not occupy or obstruct by his operation more than one half of the width of any road or street, and if insufficient space is left for public and private transit he shall remove the materials excavated and bring them back again when the trench is required to be refilled. The Tenderer shall obtain the consent of the Engineer-in-charge before closing any roads to vehicular traffic. The footpaths must be kept clear at all times.

16.3.5 Removal of Filth:

All night soil, filth or any other offensive matter met with during the execution of the works, immediately after it is taken out of any trench, sewer or cesspool, shall not be deposited upon the surface or any street or where it is likely to be nuisance or passed into any sewer or drain but shall be at once put into carts and removed to a suitable place to be provided by the Tenderer.

16.3.6 Excavation to be taken to Proper Details:

The trenches shall be excavated to such a depth that the sewers shall rest on concrete as per specifications and drawings so that the inverts may be at the levels given on the sections. In bad ground, the Engineer-in-charge may order the Tenderer to excavate to a greater depth than that shown on the drawings and to fill up the excavation to the level of the sewer with concrete, broken stone gravel or other materials. Any such extra excavation, if ordered by the Engineer-in-charge, shall be extra as per provisions in the Contract conditions, but if the Tenderer should excavate the trench to a greater depth than is required as per drawings without a specific order to that effect of the Engineer-in-charge, the extra depth shall have to be filled up with concrete at the Tenderer's own costs to the satisfaction of the Engineer-in-charge.

16.3.7 Refilling:

After the sewer or other work has been laid and proved to be water - tight the trench or other excavations shall be refilled. Utmost care shall be taken in doing, this so that no damage shall be caused to the sewer and other permanent work. The filling in the trenches and up to 75 cm above the crown of the sewer shall consist of the finest selected materials placed carefully in 15cm layers and flooded and consolidated. After this has been laid, the trench and the other excavation shall be filled

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carefully in 150mm layers with materials taken from the excavation each layer being watered for proper consolidation unless the Engineer-in-charge shall otherwise direct.

16.3.8 Tenderer to Restore Settlements and Damages:

The Tenderer shall, at his own expense, make good promptly during the whole period of the works are in hand, any settlements that may occur in the surfaces of roads, berms, footpaths, gardens, open spaces etc. whether public or private, caused by his trenches or his other excavations and he shall be liable for any accidents caused thereby. He shall also, at his own expense, repair and make good any damage done to buildings and other property. If in the opinion of the Engineer-in-charge, the Tenderer fails to make good such work/ property, the Engineer-in-charge shall be at liberty to get the work done by other means and the expenses thereof shall be paid by the Tenderer or deducted from any money that may be or become due to him or recovered from him in any other manner according to the conditions of the contract.

16.3.9 Disposal of Surplus soil:

The Tenderer shall at his own expense, provide places for disposal of all surplus materials not required to be used on the works. As soon as each trench is refilled, the surplus soil shall be immediately removed, the surface properly dressed and restored and roadways and sides left clear.

16.3.10 Timbering of Sewer Trenches:

The Tenderer shall at all times support efficiently and effectively the sides of the sewer trenches and other excavations by suitable timbering, piling and sheeting and they shall be close timbered in loose or sandy strata and below the surface of the subsoil water level, without any extra cost.

All timbering, sheeting and piling with their wallings and supports shall be of adequate dimensions and strength and fully braced and strutted so that no risk of collapse or subsidence of the walls of the trench shall take place. The Tenderer shall be held responsible and accountable for the sufficiency of all timbering, bracing, sheeting and piling used for, all damage to persons and property resulting from the improper quality, strength, placing and maintaining or removing of the same.

16.3.11 Shoring of Buildings:

17. The Tenderer shall shore up all buildings, walls and other structures, the stability of which is liable to be endangered by the execution of the work and shall be fully responsible for all the damages to persons or property resulting from any accident to any of such buildings.

17.1.1 Removal of Water from Sewer

The Tenderer shall at all times, during the progress of work, keep the trenches and excavations free from water which shall be disposed of by him in a manner as will neither cause injury to the public health nor to the public or private property not to the work completed or in progress nor to the surface of any roads or streets, nor cause any interference with the use of them same by the public.

17.1.2 Excess Excavation:

If any excavation is carried out at any point or points to a greater width than the specified cross section of the sewer with its envelope the same shall be filled with concrete by the Tenderer at his own expense to the satisfaction of the Engineer-in-charge.

17.1.3 Width of Trenches:

Unless specified otherwise by the Engineer-in-charge, the width at bottom of trenches for pipes of different diameters laid at different depths shall be as given below:

- a. For all diameters, up to an average depth 120 cm, width of trench in cm = diameter of pipe + 30 cm.
- b. For all diameters for depth above 120cm, width of trench in cm = diameter of pipe + 40 cm; and
- c. Notwithstanding (a) and (b), the total width of trench at the top should not be less than 75 cm, for depths exceeding 90 cm.

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17.2. Reinforced Cement Concrete Pipes

17.2.1 Specifications:

Wherever specified for sewerage, the RCC pipes shall be centrifugally spun type conforming to IS: 498 with latest amendments. The pipe shall be straight with uniform bore throughout. Cracked or warped pipe shall not be allowed to be used.

17.2.2 Laying:

All pipes shall be laid on a bed of 15 cm thick cement concrete 1:5:10 mix or as specified, projecting on each side of the pipe to the full width of the trench. The pipes with their crown level at 1.20m depth and less from ground shall be covered with 15cm thick cement concrete 1:5:10 mix above the crown of the pipe and sloped off to meet the outer of the base concrete to give a minimum thickness of 15cm around the pipe. Pipes laid at a depth greater than 1.2m at crown shall be concreted at the sides up to the level of the center of the pipe tangentially.

Pipes shall be laid true to line and grade as specified. Laying of pipe shall proceed upgrade of a slope.

17.2.3 Jointing: Joints shall be of the rigid type:

- a. Spigot and socket joint: The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in the correct position. The joint shall then be made with a stiff mixture of cement mortar 1:2 mix (1 cement: 2 fine sand), which shall be properly caulked. The spigots and sockets shall be thoroughly wet before the joints are made.
- b. Collar Joint: The two adjoining pipes shall be butted against each other and correctly adjusted. The collar shall then be slipped over the joint so as to cover both the pipes equally. The space around the joint shall be filled with a stiff mixture of cement mortar 1:2 (1 cement: 2 fine sand) and properly caulked.

17.3. Salt Glazed Stoneware Pipes

17.3.1 Specifications:

Wherever specified for drainage / sewer lines, salt glazed stoneware pipes shall be used. These pipes shall be of first quality, straight, free from any roughness inside or outside and conforming to IS: 651 with latest amendments.

17.3.2 Laying:

The pipes shall be laid on a bed of 150 mm thick cement concrete 1:5:10 mix or as specified, with sockets leading uphill and should rest on solid and even foundations for the full length of the barrel. Socket holes shall be formed in the foundation sufficiently deep to allow the pipes jointer room to work right round the pipes and as short as practicable to admit the socket and allow the joint to be made.

If the bottom of the trench consists of rock or very hard ground that cannot be easily excavated to a smooth surface, the pipes shall be laid on concrete cradles to ensure even bearing.

The pipes with their crown level at 1.2m depth and less from finished ground level shall be surrounded with 15 cm thick cement concrete 1:5:10 mix all around pipes laid at a depth greater than 1.2m at crown shall be concreted at the sides up to the level of the center of the pipe and slopped up from the edges to meet the pipe tangentially.

Tarred gasket of hemp yarn soaked in thick cement slurry shall first be placed round the spigot of each pipe and the spigot then shall be slipped home well into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and the gasket caulked home so as to fill not more than 1/4th of the total depth of the socket.

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The remaining depth of the socket shall then be filled with a stiff mixture of cement mortar 1:1 (1 cement: 1 fine sand) When the socket is thus filled, a fillet shall be formed round the joint with a trowel forming an angle of 45 degrees with the barrel of the pipe.

17.4. Cast Iron Pipes

17.4.1 Specifications:

Wherever specified, the cast pipes for drainage shall be either centrifugally cast spun pipes conforming to IS: 3989 or sand cast type conforming to IS: 1729 with latest amendments. Generally all drainage lines passing under the buildings, floors, roads with heavy traffic and in exposed position above ground or like situations shall be in cast iron.

17.4.2 Laying and Jointing:

All excavation work for laying cast iron drainage pipes shall be done as described in Section 3.1. Jointing shall be done as described in Sub-section 15.8.2 hereunder after.

All drainage lines passing under buildings, floors and roads, in exposed horizontal positions above ground, shall be cast iron pipes. Pipes shall be sand cast conforming to Class 'A' IS: 1537 or centrifugal spun cast iron pipes Class LA conforming to IS: 1536.

These shall be free from cracks and other flaws. The interior of pipes and fittings shall be clean and smooth and painted inside and outside with Dr. Angus Smith's solution or other approved anti-corrosive paint.

The access door fittings shall be of proper design so as not to form any cavities in which filth may accumulate. Doors shall be provided with 3 mm. (1/8") rubber insertions packing and when closed and bolted they shall be watertight.

17.5. PVC pipes

17.5.1 Rigid P V C Pipes

Wherever specified, the rigid PVC pipes for underground drainage, cold water services both external and internal soil waste piping system shall conform to IS 4985 revised in all respects. Fittings used shall be of the same make as that of PVC pipes. Joints wherever required shall be made by solvent welding.

17.5.2 U P V C Pipes

U V stabilized UPVC main water pipes shall conform to IS 13592 Type A with minimum thickness of 1.8 mm & Rubber Ring shall conform to IS 5382.

Fittings for UPVC main water pipes viz., Couplers, Tees, Bends, Junction Reducer, etc. shall conform to DIN 19534 or ISO 3663 with minimum thickness of 1.8 mm.

U V stabilized UPVC soil & vent pipes shall conform to IS: 13592 Type B with minimum thickness of 3.2 mm & V shaped rubber ring to IS 5382.

Fittings for UPVC soil & vent pipes viz., Floor Traps, Bends, Tees, V junction, Reducers, etc. shall conform to DIN 19534 or ISO 3663 with minimum thickness of 3.2mm.

Soil, Waste and Vent Pipes

17.6. Cast Iron Pipes and Fittings

17.6.1 Specifications

Cast iron pipes fittings conforming to IS : 1729 shall be used for soil, waste and vent pipes, pipes and

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fittings with irregular bore, blow holes and other manufacturing defects shall not be allowed to be used for work. All fittings shall be of the degree specified or as required at site.

17.6.2 Jointing

The spigot of the pipe shall be placed inside the socket and gasket caulked home. The interior of the socket and exterior of the spigots shall be thoroughly cleaned and dried. The spigot end shall be inserted into the socket right up to the back of the socket and carefully centered by two or three laps of treated spun Yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket to leave the depth for lead as specified in the table below. Molten pig lead shall then be poured into the joint filling the same in one pouring. The lead shall be caulked by proper tools to make it even all around. The pig lead shall conform to IS: 782 with latest amendments. The depths of lead required for joints in various sizes of cast iron pipes are:

Nominal Diameter (mm)	Depth of lead (mm)
50	25
75	25
100	25
150	38

17.7. Holder Bat Clamps:

All pipes shall be fixed 25mm clear off the wall with M.S. Holder bat clamps. Holder bat clamps shall be of a standard design fabricated from M.S. galvanized flat 32 x 1.5mm thick and 12mm diameter M.S. bar and 6mm nuts and bolts. Holder bat clamps shall be fixed in cement concrete (1:2:4) blocks 100 x 100 x 100mm.

17.7.1 Stays:

The terminal vent part of all soil, waste and vent pipes shall be supported with M.S. stays. The stays shall be minimum one meter long of 10 mm diameter M.S. bar. One end of stay shall be bent for embedding in the wall in cement concrete block of size 20 x 10 cm in 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size) The concrete shall be finished to match the surrounding surface.

17.8. Traps:

17.8.1 General

The entry of foul air to the building should be prevented by suitable traps, properly situated. Traps should always be of a self-cleaning pattern. A trap, which is not an integral part of an appliance, should be directly attached to its outlet and the pipe bore should be uniform throughout and have a smooth surface.

Traps for use in domestic waste installations and all other traps should be conveniently accessible and provided with cleaning eyes or other means of cleaning.

The size of the trap shall be as per the internal diameter of waste pipe of the appliances to which is attached. Minimum internal diameters for various waste appliances are as given in the following table.

Item	Diameter (mm)
Drinking fountains	25
Wash basins	30
Domestic sinks and baths	40
Shower bath trays	40
Domestic bath tubs	50
Hotel and canteen sinks	50

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Urinals:

Stall Urinals (with not more than 1.20m of channel drainage)	50
Lip Urinals	40
Floor traps (outlet diameter)	65

17.8.2 Floor Traps:

Floor traps shall be cast iron deep seal type P or S traps with a minimum seal of 50mm. They shall be with or without vent. All traps shall be set in cement concrete block 1:2:4 mix without additional cost.

Urinal traps shall be provided with CP brass dowel grating. Traps shall be provided with suitable extension pieces where required, with chromium plated grating to flush with the floor without any extra cost.

17.9. Installation of Soil, Waste and Ventilation Pipe Work

17.9.1 Gradient: The gradient of a horizontal branch should not be flatter than 1 in 50 and not steeper than 1 in 10.

17.9.2 Pipe Work: The pipe work in branch connections should always be arranged to allow free drainage of the system. Connections to main or branch pipes should be so arranged as to prevent cross flow from one appliance to another. Connections should be made with an easy sweep in the direction of flow.

17.9.3 Joint: All joints in pipe work and all pipe work to appliances should be made in such a manner as to be airtight and water-tight and to remain so during use.

17.9.4 Bends: Bends should be of long radius where practicable. In the case of bends in the bottom most pipes, they should necessarily be of long radius and should preferably be made of 135 degree (1/8) bends.

17.9.5 Access: Ample provisions should be made for access to all pipe work and embedding of joints in walls should be avoided as far as possible. All tee and cross pieces shall be with access doors. Wherever instructed by the Engineer-in-charge, the bends with access doors shall also be provided. The bottom most pipe of every soil and waste stack shall be provided with an excess piece of a height not more than 30cm from the finished ground level.

17.9.6 Soil Pipes: Soil pipes, whether inside or outside the building shall not be connected with any rain water pipe and there shall not be any trap in such soil pipe or between it and any drain with which it is connected.

17.9.7 Ventilating Pipe:

- Ventilating pipe should be so installed that water cannot be retained in them. They should be fixed vertically. Whenever possible, horizontal runs should be avoided. Ventilating pipe shall be carried to such a height and in such a position as to afford by means of open end of such pipe or vent shaft, a safe outlet for foul air with the least possible nuisance.
- The upper end of the main ventilating pipe may be continued to the open air above roof level as separate pipe or it may joint the MSP and / or MWP above the floor level of the highest appliance. Its lower end may be carried down to join the drain at a point where air relief may always be maintained.
- Branch ventilating pipes should be connected to the top of the BSP and BWP between 75mm and 450mm from the crown of the trap.
- The ventilating pipe shall always be taken to a point 150cm above the level of the eaves or flat roof or terrace parapet whichever is higher or the top of any window within a horizontal distance

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of 3 cm. The least dimension shall be taken as a minimum and local conditions shall be taken into account. The upper end of every ventilating pipe shall be protected by means of a cowl.

17.9.8 Concrete Encasing:

All soil and waste pipes below ground floor fills and in walls chases (but not in open ducts) shall be supported and covered with 50mm cement concrete 1:3:6 in bed and all around without any extra cost. Encasement of such pipes shall be done after testing of pipes.

17.9.9 Painting:

All pipes in ducts and exposed position shall be painted with minimum three coats of paint of approved shade and quality. Pipes under floor or in chases need not be painted.

17.10. Rain Water Pipe:

UV stabilized UPVC Pipes for the conveyance of rainwater from the roof top, balcony, etc. shall be used. The pipes shall conform to IS 13592. Type A and shall have a minimum thickness of 1.8 mm.

17.11. Manholes and Inspection Chambers

The maximum distance between manholes shall be 30 m unless specially permitted otherwise. In addition, at every change of alignment / gradient or diameter there shall be a manhole or inspection chamber. The distance between manhole or inspection chamber and gully chamber shall not exceed 6 m unless desired otherwise. Manhole shall be constructed so as to be watertight under test. The benching at the sides shall be carried out in such a manner as to provide no lodgment for any splashing in case of accidental flashing of the chamber. The chamber or drain at the bottom of chamber shall be plastered with 1:3 cement, sand mortar and finished smooth to the grade. The channels and rains shall be shaped and laid to provide smooth flow. Connection to existing sewer lines shall be through a manhole. Manholes shall be provided with standard cover, usually C.I. or as desired by the Engineer-in-charge. The covers shall be close fitting so as to prevent gases come out.

17.11.1 Size of manholes: The size specified in the Schedule of Quantities shall be internal size of the manhole. The work shall be done strictly as per standard drawing and following specifications.

17.11.2 Bed Concrete: Shall be in 1: 4: 8 cement concrete 150 mm thick for inspection chambers, 230 mm for depths up to 2.1 m and 300 mm for greater depths in case of manhole.

17.11.3 Brick Work: Shall be with locally available best quality chamber burnt bricks in 1: 4 cement mortar or as specified.

17.11.4 Concrete Manhole: RCC manholes shall be with M-20 grade concrete or as specified and as per drawing. Specifications for concrete works and steel reinforcement shall be followed.

17.11.5 Plaster: Inside of the walls shall be plastered with 12 mm thick cement plaster 1:3 and finished with a floating coat of neat cement. In wet grounds, 20 mm thick plaster of the above specification shall be done on the exterior surface of the walls also and this plaster shall be waterproofed with the addition of approved water proofing compound as per manufacturer's specification.

17.11.6 Pointing: In dry ground, pointing shall be done in 1:2 cement mortar to the outside surface.

17.11.7 Benching: Channels and benching shall be done in cement concrete 1:2:4 rendered smooth with neat cement.

The following size of channels for the bench shall be adopted.

Size of the Darin		Depth at Centre		Depth at sides of walls	
In cm	In Inches	In cm	In Inches	In cm	In Inches
10	4	15	6	25	10
15	6	20	8	30	12
23	8	28	11	38	15

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30	12	35	14	45	18
38	15	43	17	53	21
45	18	50	20	61	24

17.11.8 Foot rests

C.I. foot rests / steps shall be embedded in masonry, whenever the depth of the manhole / chamber is more than 1.2 m as shown in the drawing. They shall be fixed 30 cm. apart and projecting 11 cm. from the wall. Foot rests shall be painted with bitumen as directed.

17.11.9 Manhole covers

Manhole covers shall be of tough homogeneous cast iron of heavy or light type as specified. The sizes specified are the clear internal dimensions. Covers for manholes in the road proper shall not weigh less than 200 kg. On footpaths and backyards, light weight covers of 45 cm. diameter having weight not less than 58 kg or covers of size 90 cm x 45 cm having weight of 135 kg or 61 cm x 45 cm having weight of 90 kg shall be used.

Covers shall be of heavy duty cast iron with lifting hooks as per the details given in the drawing and fixed on the CI frame embedded in concrete. Cover placed on the frame shall be airtight. Weight of the cover and frame shall be as specified in the schedule of quantities.

The frame and the cover shall be painted with black bitumen anti-corrosive paint.

17.11.10 Drop Connection

In case of drop connection CI pipes shall be provided with heel rest bend at the bottom and bend with access door at the top for cleaning purposes.

17.12. Sanitary Installation & Fixtures:

All fixtures and fittings shall be of approved quality and type manufactured by well known manufacturers. All items brought to the site must bear identification mark of the type and manufacturer. Procurements shall be made well in advance and got inspected and approved immediately by the Engineer-in-charge. All fixtures shall be adequately protected covering and plugging till handed over. All fittings, gratings, fasteners, unless specified otherwise, shall be chromium plated. All fixtures shall be fixed in a neat workman like manner true to line and as recommended by the manufacturer or shown on the drawings. Care shall be taken to fix all fixtures, brackets and accessories by proper wooden cleats, rawl plugs, bolts and nuts as each fixture will warrant with the correct size of screws, nuts or bolts. Care shall be taken in fixing all approved chromium plated fixtures and accessories so as not to leave any tool marks or damages. All such fixtures shall be tightened with fixed spanners. Use of pipe wrenches with toothed jaws shall not be allowed. All fixtures shall be thoroughly tested after connecting up the drainage and water supply system. All fixtures shall be thoroughly finished and any leakage in piping, valves and waste fittings corrected to the entire satisfaction of the Engineer-in-charge. Upon completion of the work, remove all labels, stickers, plasters etc. from the fixtures and clean all fixtures with soap and water so as to present a neat and clean toilet.

17.13. Water Closet

17.13.1 Indian type W.C. pans

The W.C. pan shall be of white vitreous china, of specified size and pattern. Pan shall be of approved quality and shall bear the mark of the firm manufacturing it. It shall have 10 cm. (4") porcelain trap ('P' or 'S' type with effective seal) and 5 cm. (2") vent arm. The footrests shall be of white glazed stoneware with chequered surface.

17.13.2 Orissa type pans

Shall be from an approved manufacturer and trapped as specified above.

17.13.3 Fixing

Pan shall be fixed securely with a cushioning bed in an approved manner taking care that the cushion is

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uniform and even, without having any hollows between pan and the concrete. The joint between the pan and the trap shall be made with cement mortar 1: 1 and shall be leak proof. Each closet shall be provided with the following accessories and the rate shall be all inclusive.

- Necessary length of 10 cm. H.C. I pipe or lead pipe connecting the pan and plug bend. (The plug bends / tee connection to vertical stack shall be paid under appropriate item).
- Wherever anti-syphonage pipe connections are required necessary length of lead pipe 62.5 mm diameter shall be provided.
- Necessary length of porcelain or lead or C.I. connecting pipe 10 cm. diameter (plug bend / tee connection to vertical stack shall be paid under appropriate item.)

17.13.4 Painting

All fittings and fixtures shall be painted with two coats of enamel paint over a coat of primer.

17.13.5 European Type W.C: The closet shall be of white vitreous china readily flushed, of “wash down type” and shall be of best quality manufactured by an approved firm, and fixed to the floor by approved means. It shall have 100 mm diameter porcelain ‘P’ or ‘S’ trap with effective seal. Each closet shall be provided with the following accessories and the rate shall be all inclusive.

17.13.6 Seat: Heavy black plastic seat of approved quality and seat cover with rubber buffers fixed to the pan with C.P. brass bar hinge.

17.13.7 Cistern: Low level flushing tank 15 liters capacity (3 gallon) of white vitreous china cistern of best quality manufactured by an approved firm with C.P flush handle and C.P overflow pipe of length as per Municipal requirement or as per Engineer-in-charge’s drawing with mosquito – proof bronze cap etc., complete unit including enameled or C.P flush pipe and bend. Necessary length of lead water inlet pipe and 12 mm diameter C.P. brass stopcock, with necessary length of porcelain or lead or C.I. connecting pipe 10 cm diameter (Plug bend / tee connection to vertical stack shall be paid under appropriate item). Wherever anti-syphonage pipe connections are required, necessary length of lead pipe 6.25 cm diameter shall be provided.

17.13.8 Painting: All fittings and fixtures shall be painted with two coats of enamel paint over a coat of primer.

17.14. Urinals

17.14.1 Lipped Urinals

Shall be flat back or angle urinal of specified dimensions and shall be of white vitreous china from an approved manufacturer. They shall be screwed to the wall with coach screws of chromium plated brass on dowel shaped wooden plugs built into the walls or fixed as per manufacturer’s specification. Each basin should have an outlet with C.P. brass hinged grating connected to 40 mm diameter waste pipe through a C.P. bottle trap. When a range of urinals are provided only a straight length of 40 mm diameter waste pipe and white glazed half round channel with tread platform finished with white glazed tiles complete as per Engineer-in-charge’s drawings shall be provided. All joints shall be in plumber’s wiped solder joints with necessary C.P brass sockets and thimble etc.

17.14.2 Stall Wall type urinals

Shall be white vitreous china of approved design and manufacturer. They shall be fixed to the wall as per manufacturer’s specification. Each urinal should have an outlet with C.P. brass hinged grating connected to 40 mm diameter waste pipe through a C.P. brass bottle trap. All joints shall be in plumber’s wiped solder joints with necessary C.P. brass sockets and thimble etc.

17.15. Flushing Cistern

These shall be automatic flushing cisterns of vitreous china or as specified in the Schedule of Quantities complete with valve less siphon fittings. Cistern shall be supported on brackets of standard pattern and fixed to wooden dowel plugs embedded in the wall with C.P brass screws.

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17.15.1 Angle Valve

The cistern shall be fed with 15 mm (1/2") C.P brass inlet tube angle valve of approved make with necessary length of lead inlet pipe complete with C.P brass unions unless otherwise specified in the Schedule of Quantities.

The capacity of flushing cistern and size of the flush pipe for the number of urinal shall be as follows:

Nos. of Urinals	Capacity of Flushing		Mains		Distribution	
	In liters	I gallons	In mm	In Inch	In mm	In Inch
1	5	1	-	-	15	½
2	10	2	20	¾	15	½
3	10	2	25	1	15	½
4	15	3	32	1-1/4	15	½.

The main and distribution pipe fittings and clamps shall be of C.P. bras unless otherwise specified in the Schedule of Quantities. Distribution pipes shall feed the urinals with C.P. brass spreaders of approved make.

17.15.2 Painting

All brackets etc. shall be painted with two coats of enamel paint over a coat of primer.

17.16. Lavatory Basin

Washbasin

They shall be of white vitreous china of best quality manufactured by an approved firm and size as specified in the schedule of quantities. They shall be supported on a pair of CI brackets of approved design.

Fittings

Each wash basin shall be provided with a single cold water C.P brass pillar tap of approved design and make, CP brass waste, C.P brass chain and rubber plug, C.P brass bottle trap of approved quality and design, with C.P brass stop cock and water inlet pipe of standard length complete.

Waste pipe

Waste pipe beyond bottle trap shall be measured and paid separately under appropriate item.

Painting

All brackets, pipes etc. shall be painted with two coats of enamel paint over a coat of primer.

Sinks

They shall be of white vitreous china of best quality and sizes as per the schedule of quantities. They shall be supported on necessary brackets.

Fittings

Each sink shall be provided with 40 mm. (1.5") C.P brass waste of approved pattern with C.P brass chain and 40 mm. Rubber plug and 40 mm diameter. C.P brass trap and union, which shall be connected to 40 mm diameter waste pipe. Waste pipe beyond the trap shall be measured separately and paid under appropriate item. Where specified, sinks shall be provided with puff pipe with a brass perforated screw cap.

Painting

All fittings, brackets and pipes shall be painted with two coats of enamel paint over a coat of primer.

Drain Board

Drain board of type and size as specified in the schedule of quantities shall be provided. These shall be

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fixed on strong brackets of approved design and where necessary provided with hinges. Brackets shall be painted with two coats of enamel paint over a coat of primer.

17.17. Toilet Requisites

Mirrors

Mirrors shall be of the best quality, specified size, approved design and make. It shall be mounted on asbestos sheet backing and shall be fixed in position by means of four C.P. brass screws and cup washers over rubber washers on wooden plugs firmly embedded in the wall. Alternative method for fixing could be by using brass clamps with C.P. brass screws. A suitable T.W cover of approved design shall be fixed all round as directed.

Glass Shelf

The shelf shall be of glass of approved quality and thickness with edges rounded off. The size of the shelf shall be as specified and shall rest on C.P., brass brackets which shall be fixed with C.P. brass screws to wooden plugs, firmly embedded in the wall. The shelf shall have C.P. brass guard rail all round.

Towel rail

Towel rail shall be of C.P. brass with two C.P. brass brackets. The size of the rail shall be as specified. The bracket shall be fixed by means of C.P. brass screws to wooden cleats firmly embedded in the wall. Where specified, anodized aluminum towel rails may be used of approved quality and design.

Toilet paper holder

Toilet paper holder shall be of white vitreous china or as specified. It shall be recessed in wall.

Floor traps

The trap shall be of CI and self cleaning and deep water seal type with a 50 mm water seal. It shall have a 100 mm diameter grating. These shall be fixed in concrete to the required level and position.

Shower

These shall be of CP finish swivel type as specified.

Towel Ring, Soap Tray, Cloth Stand etc.

These shall be of CP / anodized aluminum as described in the schedule and as per the displayed sample. These shall be fixed by means of CP brass screws to wooden cleats, firmly embedded in the wall.

Liquid Soap Dispenser

It shall be round and easily revolving with removable threaded nozzle. The body, bracket for wall mounting and screws shall be chromium plated.

Water Heaters

These shall be of Venus / Racold make. The type and capacity will be as per schedule of quantities. They shall be mounted on the wall with necessary bolts of approved make. They shall have 8 mm PVC inlet pipe, 12 mm lead pipe outlet, and 15 mm non-return valve.

17.18. C.I. Soil, Waste and Vent Pipes and Fittings

17.18.1 C.I. Pipes and Fittings

Cast iron soil, waste and vent pipes and fittings shall be of heavy quality conforming to IS: 989 for spun pipes which are preferred to sand cast soil pipes conforming to IS: 1729. The standard weights and thickness of pipes shall conform to IS: 3989 (for centrifugal spun soil pipe.) and IS: 1729 (for sand cast soil pipes) and a tolerance up to 4% may however be allowed against these standards

17.18.2 Laying: The pipes shall be laid as described in the Schedule of Quantities and as shown on the Engineer-in-charge's drawings.

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17.18.3 Fixing

The pipes and fittings shall be fixed to walls by using proper holder-bat clamps, if directed. The pipes shall be fixed perfectly vertical or in approved alignment. The spigot end shall abut the shoulder of the socket and shall leave no annular space in between. All soil and waste water pipes shall be carried up above the roof parapet wall and shall have C.I. vent cowl.

Connections between main pipe and the branch pipes shall be made by using appropriate branches and bends invariably with access doors for cleaning.

17.18.4 Lead caulked joints

Cast iron pipes shall be laid and jointed in conformity with the code of practice for laying of cast iron pipes. Cast iron pipes shall be jointed by best quality caulking lead free from all impurities. In wet trenches, joints shall be made with lead wool.

The annular space between the socket and spigot will be first well packed in with spun yarn soaked in bitumen and dried, leaving 25 mm. (1") from the lip of the socket for lead for pipes up to 100 mm diameter and 38 mm (1.5") depth for pipes of 150 mm diameter. The joints may be leaded by using proper leading rings or if they are not available by wrapping a ring of hemp rope covered with clay round the pipe at the end of the socket, leaving a hole through which molten lead shall be poured in.

Molten lead free from zinc or tin and thoroughly fluid shall be poured and each joint filled in one pouring. Before caulking, the projecting lead shall be removed by flat chisels and then the joint caulked round with proper caulking tools and a hammer of 1 to 1-1/2 kg. In weight, in such a manner as to make the joint quite sound. The joint shall be left flush neat and even with the socket.

17.18.5 Testing

All C.I. pipes and fittings including joints shall be tested by smoke test as recommended by ISI and left in working order after completion. The acceptance criteria shall be as laid down therein.

17.18.6 Nahani or floor traps

The traps shall be of self cleaning design deep seal type with a minimum seal of 5 cm. (2"). If directed, 25 mm. Puff pipe shall be provided. The other specifications for these shall be the same as those for C.I. soil, waste and vent pipes and fittings. The nahani trap shall be back inlet type.

17.18.7 Painting

All exposed C.I pipes and fittings shall be painted to match the colour of the surroundings with two coats of flat / enamel paint over a coat of approved primer. If directed, additional coats shall be given at no extra cost.

17.18.8 Lead Pipes

All lead pipes shall be hydraulic drawn and of equal substance throughout conforming to IS: 404. Weights and wall thickness of pipes shall be as under.

Nominal Diameter		Wall Thickness in mm	Weight in kg/m
In mm	In Inches		
32	1-1/4	2.6	3.28
40	1-1/2	2.6	3.95
50	2	2.7	5.07
75	3	2.7	7.48
100	4	2.7	9.88

When not supported on bearers, all lead pipes shall be supported by strong lead tacks at least 40 mm (1.5") wide soldered on to the pipes at suitable intervals.

17.18.9 Wiped solder joints

All joints of lead pipes shall be wiped solder joints as described below:

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The pipe ends to be jointed shall be cleaned with a wire brush and freed from oxide, if any. Chalk shall then be rubbed to kill the greasy nature of lead. After this, plumber's black shall be applied. The length of the joint as given below shall then be marked on the pipe. A fine shaving of lead shall be removed from this length will shave hook. Tallow shall then be smeared over the prepared surface. The molten solder, an alloy composed of three parts of tin and seven parts of lead shall be poured in a thin stream from a ladle moved in an elliptical direction over the joint position including a portion of the soil pipe at each end beyond the mark. When sufficient solder has been poured, the joint shall be wiped with pad of wiping cloth with long continuous movements in one direction only so as to leave a neatly formed elliptical shaped joint. Surplus solder remaining on the joint shall be removed.

The length of the wiped solder joint shall be as per relevant Indian Standard and the joints, shall be watertight, airtight and shall be free from tears, burrs, strings, ribs and, or droppings.

17.18.10 Lead pipe connections: The joints between lead pipe and C.I. or stoneware pipe shall be made as follows:-

One end of brass thimble or ferrule shall be slipped into or over the lead pipe and jointed to it by means of a wiped solder joint. The other end of the ferrule shall then be inserted into the socket of the C.I. or stoneware pipe. In the case of former the joint shall be made with molten lead (lead caulked) and in case of the latter with cement mortar as in stoneware pipe drains.

The joints between outgo of a WC pan and a lead pipe shall be made as under:

The lead pipe shall be slipped into brass socket and jointed to it by a wiped solder joint. The out go of a WC pan shall then be inserted into the socket and jointed by using cement mortar as in stoneware pipe drains.

17.18.11 Painting: All exposed lead pipes shall be painted as in H.C.I. pipes and fittings.

17.19. Internal Water Services

17.19.1 Specifications:

All pipes for water supply (both hot and cold) inside the buildings shall be of genuine PVC threaded pipes conforming to IS: 4985 with latest amendments and commercially available as schedule 40 grade.

All fittings shall be malleable iron galvanized fittings conforming to IS: 1239 (Part II). All fittings shall have manufacturer's trademark stamped on it. Fittings in pipelines shall include elbows, tees, bends, reducers, nipples, union bushes. G.I clamps of approved design. G.I. flanges with 3mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's works. Tenderers may be required to produce certificate to this effect from the manufactures.

17.19.2 Laying and jointing

Threaded PVC pipes shall be joined with threaded GI fittings. The sapion tape should be fixed over the threaded end of pipes before fixing the G.I. fittings. All necessary chasing of walls / floor to be made good after laying the pipes as per Engineer-in-charges' instructions.

17.19.3 Depth of cover for Underground Water pipes:

The cover for the mains shall be at least 90 cm under vehicular areas and 75 cm in pedestrian areas. The nominal bore, thickness and weight of the pipes shall be as per relevant IS Standard and quality approved by Engineer in Charge.

17.20. Water Fittings

17.20.1 Full way Gate Valves: The full way gate valves shall be of heavy gunmetal conforming to IS: 778.

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- 17.20.2** Stop cocks and Bib taps: Stop cocks and bib taps shall be of brass chromium plated. These shall be of heavy type having bright finish and conforming to IS: 781.
- 17.20.3** Pillar Taps: Pillar Taps shall be conforming to IS: 1795.
- 17.20.4** Ball valves; the ball valves shall be of high pressure or low pressure type and shall be of the size as specified. The body of the ball valve shall be capable to withstand a pressure of 14 kg/cm sq. A high pressure ball valve with the float immersed to not more than half of its volume shall remain closed against a test pressure of 10.5 kg/cm. sq. and a low pressure ball valve against a test pressure of 3.5 kg/sqcm. The ball valves shall conform to IS 1703.
- 17.21.** Water Tanks: Each overhead water storage tank shall be provided with sockets for inlet, outlet, overflow, scour and vent of required sizes. The overflow and vent shall be fixed with mosquito proof brass grating of approved design.
- 17.21.1** Ferro-cement Water Tank: Ferro-cement water tank shall be made of cement mortar 1: 2 (1 cement: 2 coarse sand) and layers wire mesh closely bound together to create a stiff structural form, absolutely free from cracks and other defects. Skeletal steel shall be 3-8mm MS wires with wire-mesh of galvanized wires of 24 gauge woven with hexagonal opening of 6-20mm, on both sides of skeleton. Final membrane of steel mesh shall leave no space greater than 1 cm. Super plasticizers should be added to mortar to increase workability. Water cement ratio of mortar shall be below 0.5. The minimum strength of mortar cubes having surface area of 50 sqcm shall be 25 N/ sqmm. Ferro-cement surfaces shall be cured for at least 10 days, by covering with hessian and profuse water spraying. Base of water tank shall be minimum 40mm thick in 1:1:5:3 (1 cement: 1.5 coarse sand: 3 stone aggregate 12.5mm nominal size) RCC. Shell thickness shall not be more than 25 mm. Vertical shell and top of water tank shall be casted in single piece. Base and shell shall be properly anchored to create a stiff structural form. Inside of tank shall be painted with anti fungal paint.
- 17.21.2** Fiber reinforced glass water tanks: Fiber reinforced glass water tanks shall be made of food grade polyester resin, single piece cast in approved colour and shade, suitably moulded, non-breakable, sturdy with necessary stiffeners and ribs as required, minimum 4mm thick shell with 350mm diameter lockable hinged cover, 20mm diameter G.I. inlet and outlet scour and over flow and vent connections of 20mm each, all with flanged joints. The tank shall retain potability of the stored water. There should not be any fungal termination and inside shall be coated with good graded anti fungal paint, if required. The tank throughout its body shall be stress and strain free, watertight and should not be prone to deformation.
- 17.21.3** Outlets: The outlet pipe shall be fixed 50 to 75 mm above the bottom of the tank and provided with copper gauge stainers.
- 17.21.4** Wash Out (Scour): The wash out or draining pipe shall be made flush with the bottom of the tank at it lowest point.
- 17.21.5** Overflow: The overflow pipe shall be one size higher than the inlet pipe and provided with copper gauge stainers. The water level of the tank shall be set below the overflow level at a distance of not less than 25mm or of not less than the internal diameter of the pipe, whichever is greater.
- 17.22.** External Water Supply
- 17.22.1** Rigid PVC Pipes: The un-plasticized PVC pipes shall be of class as specified in the BOQ conforming to IS: 4985.
- The pipes shall be with socket and spigot suitable for solvent welded joints (non-heat application method). The solvent cement shall conform to IS: 14182.

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The dimensions, wall thickness, standard lengths shall be as per IS 4985 with ISI marking indicating pressure head.

Proper care should be taken for transport of pipes on flat bed of vehicles. Each pipe shall be uniformly supported along its length and overhanging of pipes by more than 1m shall not be allowed. The pipes shall be stacked on leveled ground free from rough surface, loose stones, etc. Storage of pipes shall be done as per IS: 7634 (P III) in cool, covered dry place. Pipes of different size shall be stacked separately.

- 17.22.2** PVC fittings: PVC fittings shall be injection moulded with solvent cement joints confirming to IS: 7834. Fabricated PVC fittings shall not be used.

- 17.22.3** GI Pipes: The pipes shall confirm to IS: 1239 (P – I). The dimensions wall thickness and standard lengths shall be as per IS: 12315.

The tubes shall be galvanized with zinc coating from inside and outside as per IS: 4736. The galvanized pipe shall be capable of being bent cold without cracking of steel through 90 o C rolled a former having a radius at the bottom of groove equal to eight times, the outside diameter of pipe. Each pipe shall be tested for hydrostatic test for leak tightness as per clause 13 – 1 of IS: 1239.

- 17.22.4** Fittings: The fittings shall be as per IS: 1239 (P-II). Other fittings shall be manufactured from mild steel by any approved process.

Unless otherwise specified by the purchaser all fittings shall be manufactured with thread connections complying with requirements of IS: 1554.

- 17.22.5** Excavation of trenches

Trenches for laying of pipes shall be of sufficient width to provide free working space on each side of the pipe. The free working space shall be preferably 250 mm on either side. If the sides of the trench are not vertical, the toes of side slopes shall end at top of pipe and practically vertical sided trench shall be dug from these down to sub grade.

Not more than 100 meter run of pipe trench shall be opened up ahead of pipe laying operations unless otherwise approved by the Engineer-in-charge.

The trenches shall be kept dry and free from water until the joints are made. The Tenderer shall keep the sub soil water or accumulated water at a level lower than the bottom of all permanent works for such periods as Engineer-in-charge may direct. All proposed methods of dewatering of trenches shall be the responsibility of the Tenderer for the duration of the contract.

- 17.22.6** Laying of pipes in trenches: The pipe line alignments shown in the drawings are only tentative. The exact location of pipe line, etc. shall be decided by the Engineer-in-charge at site.

- 17.22.7** Pipe bedding and back fill: Pipes laid in trenches shall be bedded evenly and firmly as far up the haunches of pipes as to safely transmit the load expected from the backfill through the pipe to the bed. This shall be done either by excavating the bottom to the trench to fit the curve of the pipe or compacting the earth under and around the curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

The trenches shall be backfilled immediately after the pipes are laid, to a depth of 30 cm above the pipe.

Filling up the trench shall be carried on simultaneously on both sides of the pipe in such a manner that unequal pressure does not occur.

- 17.22.8** Sand Bedding

Pipes shall be laid in trenches on a well compacted bed of sand fill material as shown on the Drawings

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extending for the full width of the trench and with sufficient material at the sides to permit the pipes to be worked into the pipe bedding material and firmly supported to true line and level. Sufficient space should be left to enable the joints to be made tested and inspected but the Tenderer shall ensure that at least three quarters of the pipe length is fully supported. After the pipeline has been tested and approved by the Engineer-in-charge the trench shall be carefully filled in layers not exceeding 150 mm to the required levels.

17.22.9 Laying Pipes-General

Pipes shall be laid generally from downstream end to upstream end.

Pipes and fittings shall be examined for damage and carefully brushed out immediately before laying.

The formation of excavation for pipelines shall be firm, dry, even, true to grade, free of stones and other protrusions and compacted to a minimum of 90 percent Proctor density before placing of pipe bedding.

Each pipe shall be laid accurately to line and gradient so that except where otherwise specified or ordered by the Engineer-in-charge the finished pipeline shall be in a straight line both in horizontal and vertical planes. The maximum length of pipeline permitted in any individual line shall be limited to the section between two adjacent manholes or chambers.

Where instructed by the Engineer-in-charge, the Tenderer shall arrange for an approved independent laboratory to carry out tests to determine the insitu density of the pipe bedding material.

The Tenderer shall provide fix and maintain at such points as may be directed by the Engineer-in-charge properly painted sight rails and boning rods of predetermined measurement for the boning in of individual pipes to correct alignment. The sight rails shall be situated vertically above the line of pipes or immediately adjacent thereto and there shall at no time be less than three sight rails in position on each length of pipeline under construction to any one gradient. Consideration will be given by the Engineer-in-charge to any alternative method for controlling alignment such as laser beam instrument.

Where pipelines are to be constructed in the tunnel heading or duct provided by the Tenderer the minimum clearance between the inside face of the tunnel heading or duct and the pipe shall be 150 mm unless otherwise shown on the Drawings.

The Tenderer shall adopt a suitable method of controlling the alignment of a pipeline installed in a tunnel heading or duct to the approval of the Engineer-in-charge.

17.22.10 Sluice Valve

Sluice Valves shall be of the specified size and class and shall in all respects conform to the latest IS: 780, IS: 2666 with latest amendments, Class I sluice valves shall be used for a maximum working pressure of 10 kg per sqcm and class II sluice valves for 15 kg per sqcm. The valve shall be fully examined and cleared of all foreign matter before being fixed. The fixing of the valve shall be done by means of bolts, nuts and 3mm rubber insertion or chemically treated compressed fiber board 1.5 mm minimum thickness and of weight not less than 0.183 gm / sqcm with the flanges of spigot and the socketed tail pieces drilled to the same specification in case of S & S pipes and with flange in case of flanged pipes. The tail pieces shall conform to IS: 1938. These shall be jointed to the pipeline by Means of lead caulked joints. The sluice valve shall be provided along with key to operate from the ground.

17.23. External Water Supply

17.23.1 Cast Iron pipes and specials

All pipes and specials for water supply shall be of cast or spun iron straight with spigot and socket ends and shall conform to the latest edition of the I.S. specification for Class 'B' pipes. Heavier quality pipes and specials shall be used when the water pressure exceeds 122 m (400 ft.) of head, flanged end

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pipes may also be used where required and specifically approved.

All pipes and specials shall be coated inside and outside while hot with Dr. Angus Smith's solution or other approved anti-corrosive paint.

17.23.2 Trenches for C.I. pipes and specials

Trenches shall be excavated as described under "Drainage" for S.W. pipes.

17.23.3 Laying

Before laying the pipes, they shall be examined to see that there are no cracks or defects. Subject to the approval of the Engineer-in-charge the damaged portion of the cracked pipe may be cut at a point not less than 15 cm. beyond the visible extremity of the crack with diamond pointed chisel.

The pipes shall be thoroughly cleaned of all dust and dirt. Special care shall be taken to clean the inside of the sockets and the outside of the spigots before lowering the pipes into the trenches. Holes to receive the sockets shall be scooped out in the trench bed so as to firmly bed the full length of the pipe.

The pipes shall be lowered into the trench by means of suitable pulley blocks, shear-legs, chains, ropes, etc. In no case the pipes shall be rolled and dropped into the trench. After lowering the pipes, they shall be arranged to coincide the centre line of pipes with the centre line of alignment. The spigot of one pipe shall be carefully centered into the socket of the next pipe and driven to the full distance that it can go and the pipe line laid to levels required, being kept in position by earth filling, well watered and rammed at two or more places in its length.

Specials shall also be laid in their proper position as stated above.

The pipes shall be laid with socket facing the direction of flow of water facing uphill.

At the end of each day's work, the last pipe to be laid shall have its open end securely closed with a wooden plug, to avoid rats and other small animals getting in.

Cement concrete thrust blocks of suitable design shall be provided at 45 degree and 90 degree bends of the pipes so as to withstand dynamic and static forces likely to be developed due to water running through the pipes. The thrust blocks shall be made after the joints have been caulked with lead and these shall be paid for separately, unless otherwise specified.

17.23.4 Lead Caulked Joints

Lead for joints: It shall be bluish grey in colour, very soft and malleable, readily melted, free from mixture of zinc or tin.

Spun yarn for joints: This shall be of best quality preferably white. It shall be free from dust etc. It shall be soaked into hot coal tar or bitumen and dried before use.

Joints: The spigot shall be carefully centered in the socket by two or three laps of treated spun yarn, twisted into ropes of uniform thickness, well caulked into the back of the socket, leaving the requisite depth for the lead. The laps of the yarn must be longer than the circumference of the pipe. No making up of the pieces shall be allowed.

The leading of the pipes etc. shall be done by means of ropes covered with clay or by using special leading rings. The lead shall be rendered thoroughly fluid and each joint shall be filled in one pouring.

Caulking: After the joints have been run they must be thoroughly caulked until they are perfectly watertight. Caulking of joints will be done after a convenient length of pipes has been laid. The leading rings shall first be removed with a flat chisel and then the joint caulked all round three times

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with caulking tools of increasing thickness and a hammer of 2 to 3 kg (4 to 6 lbs) weight. Lead joints shall not be covered till the pipeline has been tested under pressure but the rest of pipeline may be covered to prevent expansion and contraction due to variation in temperature.

When it is inconvenient or dangerous to use molten lead for joints, they may be made with lead wool inserted in strings not less than 6 mm (1/4") thick and thoroughly caulked if approved by the Engineer-in-charge.

When it is inconvenient or dangerous to use molten lead for joints, they may be made with lead wool inserted in strings not less than 6 mm. (1/4") thick and thoroughly caulked if approved by the Engineer-in-charge.

Testing: The joints and pipes laid for water supply system shall be tested to a pressure of 12 kg per sqcm for two hours without developing leaks / fall in pressure of such head as otherwise specified after being caulked and should may leakage occur, the leaky joint or joints shall be remade and section retested at Tenderer's own expense, until satisfactory results are obtained.

Painting: Pipes laid under floor / ground shall be given two coat of bitumastic paint.

17.24. Sluice Valves:

17.24.1 Sluice Valves: The valve shall be of the specified size and shall be of approved quality.

The body and cover of the valve shall be of tough, homogeneous cast iron, the spindle of forged bronze, the nut and the valve seats of high grade gun metal and machine – faced. It shall be fitted with a C.I. wheel or a cap of standard type, marked with an arrow to show the direction of turn for opening of the valve. It shall have flanged ends drilled to Indian Standard Specifications.

The valves shall work easily and smoothly under all conditions and shall be watertight when closed under the working pressure as stipulated in the relevant, I.S.S. Unless otherwise specified, valves shall be class II type as in IS: 778.

The diameter of the waterway, when the valve is fully opened shall not be less than the diameter of the pipe.

17.24.2 Fixing:- Fixing of the valve shall be done by means of bolts, nuts and 3 mm. (1/8") rubber insertions with the flanges of the spigot and socket tail pieces drilled to the same specifications. The tail pieces shall be jointed to the pipeline by means of lead caulked joints.

17.25. Butterfly Valves

Valves above 50 mm diameter shall be butterfly valves.

Butterfly valves shall conform to the following specification:

Body : High duty cast iron to IS 210 FG 220 and BS 1452 Gr.220

Seating : Moulded in sit resilient lining of black nitrile rubber.

Disk: Nylon coated S.G. iron to IS 1865 / SG 400/12 and BS 2729 Gr. 470/12

Shaft: The shafts are made of stainless steel AISI 431. Only flanged and valves to be used with flanges drilled to BS 10 Table F. Valves shall be capable of being locked in open position. Hand wheel shall be with flow control lever unit for smooth opening and closing of the valve. Key rods with MS coated extended spindles to be provided whenever the valves are not approachable from the ground surface.

17.26. Appurtenances

The other appurtenances of the pipeline are mentioned below:

Air Valves: These are placed at every summit in the pipeline to permit the escape of air when the main is filled, and afterwards air if any is carried into the main (they are also placed on long stretches of

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nearly level main).

Scour valves: These are placed at the bottom of all depressions for emptying the main or letting out sediment.

Reflux valves: These are fixed on the ascending parts of the main, which open in the direction of flow, but automatically close if a burst occurs and when the water flows back. They diminish the damage done by the escape of water at a burst.

Safety or relief valves: These are fixed at the down stream ends of long lengths of mains or where water hammer may take place so as to reduce to the normal any excessive pressure that may occur.

Fire Hydrants: These shall be as per approved design and be fixed as shown on the drawings and as per Engineer-in-Charge direction. The cost of hydrant shall include cost of valve and masonry chamber as shown on the drawings with C.I cover etc. complete with two coats of enamel paint over a coat of primer.

Water Meter: It shall consist of meter, 'Y' strainer and other accessories shall be fixed as per the requirement of the Local Water Supply Authority. The cost of meter shall include the cost of testing and sealing by Municipal Authorities and fixing including masonry chamber as shown on the drawing. C.I cover and locking arrangement complete as directed.

Manhole chambers and surface chambers for housing valves etc. shall be constructed as per standard drawings.

17.27. Septic Tank and Effluent Disposal

17.27.1 Septic Tank

Septic Tank shall consist of the tank itself with inlet and outlets and complete with all necessary earthwork and back filling. This item shall also include ventilating pipe of at least 100 mm diameter whose top shall be provided with a suitable mosquito proof wire mesh and cowl. Ventilating pipe shall extend to a height of above 2 m when the septic tank is at least 15 m away from the nearest building and to a height of 2 m above the top of building when it is located closer than 15 m. Ventilating pipes can be connected to the normal soil ventilating system of the building where allowed.

17.27.2 Effluent Disposal

The effluent from the septic tank shall be disposed by allowing it into a soak pit for absorption by soil or shall be allowed to be absorbed by soil through open jointed S.W. pipes laid in a trench filled with broken bricks.

17.27.3 Soak Pit

The soak pit shall be complete as shown on drawing. In absence of a detailed drawing it shall consist of a 900 mm diameter pit, 1000 mm in depth below the invert level of the inlet pipe. The pit shall be lined with stone bricks, or concrete blocks set in cement mortar (1:6) and filled with brick bats. Inlet pipes shall be taken down to a depth of 900 mm from the top as an anti-mosquito measure.

17.27.4 Open Jointed S.W. pipes

Minimum diameter of the S.W. pipes shall be 200 mm nominal. The trench for laying the pipe shall be minimum 600 x 600 mm. The joints of the pipes shall be left unsealed.

17.27.5 Commissioning Septic Tank

After the Septic Tank has been proved watertight and the sewage system is checked the tank shall be filled with water to its outlet level before the sewage is let into the tank. It shall be seeded with well digested sludge obtained from septic tank or sludge digestion tank. In the absence of digested sludge a small quantity of decaying organic matter such as digested cow dung may be introduced.

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17.28. Testing and Acceptance

17.28.1 Inspection Before Installation

All pipes, fittings and fixtures shall be inspected before delivery at the site to see whether they conform to accepted standards. The pipes shall again be inspected on site before laying by sounding to disclose cracks. All defective items shall be clearly marked and forthwith removed from the site.

17.28.2 Testing of Pipelines for Drainage and Sanitation

Comprehensive test of all pipe lines shall be made by simulating conditions of use. The method of actual tests shall be decided by the Engineer-in-charge. All test data shall be recorded and submitted to the Engineer-in-charge for review and instruction. The Engineer-in-charge's discretion regarding tolerance shall be final.

General guidance for the tests is given below:

- **Smoke Tests**

All soil pipes, waste pipes and vent pipes and all other pipes when above ground shall be approved gastight by a smoke test connected under a pressure of 25 mm of water and maintained for 15 minutes after all trap seals have been filled with water. The smoke is produced by burning oily waste or tar paper or similar material in the combustion chamber of a smoke machine. Chemical smokes are not satisfactory.

- **Water Test for pipes other than Cast Iron**

Glazed ware pipes shall be subjected to a test pressure of at least 1.5 m head of water at the highest point of the section under test. The tolerance figure of two liters per centimeter of diameter per kilometer be allowed during a period of 10 (ten) minutes. The test shall be carried out by suitably plugging the low end of the drain and the ends of connections, if any, filling the system with water. A knuckle bend shall be temporarily jointed in at the top and a sufficient length of the vertical pipe jointed to it so to provide the required test head or the top may be plugged with connection to a hose ending in a funnel which could be raised or lowered till the required head is obtained and fixed suitable for observation.

Subsidence of test water may be due to one or more of the following causes:

- Absorption by pipes and joints
- Sweating of pipes or joints
- Leakage at joints or from defective pipes
- Trapped air

Allowance shall be made for (I) by adding water until absorption has ceased and after which the proper tests should commence. Any leakage and the defective part of the work shall be cut out and made good.

- **For Cast Iron Pipes**

Cast Iron sewers and drains shall be tested as for glazed ware and concrete pipes. The drain plug shall be suitably strutted to prevent their being forced out of the pipe during the test.

- **For Straightness**

By inserting at the high end of the sewer or drain a smooth ball of a diameter 13 mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball will roll down the invert of the pipe and emerge at the lower end; and by means of mirror at one end of the line and lamp at the other. If the pipeline is straight, the full circle of light may be observed. The mirror will also indicate obstruction in the barrel if the pipeline is not straight.

- **Testing of Septic Tank**

The septic tank shall be tested for water tightness. It shall be filled up with water and allowed to soak for 24 hours. Then it shall be topped up and allowed to stand again for 24 hours and loss of level recorded. The fall shall not be more than 15 mm.

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- Fixtures Etc.

All fixtures and fittings shall be connected by watertight joints. No dripping shall be accepted.

- 17.29.** List of Approved Brand / Make / Manufacture: All the materials utilized for the work shall as per IS Standard and shall be with IS Marks. The Brand/Make/Manufacturer indicated below are indicative

PROCELAIN WARES	:	PARRYWARE / HSW
G.I. PIPES	:	TATA / ST / JINDAL
G.I. FITTINGS	:	'R' BRAND
P.V.C. PIPES	:	FINOLEX / SUPREME / TRUBORE
P.V.C. FITTINGS	:	PRINCE / INFRA / SUPREME
C.P. FITTINGS	:	METRO / ESSCO / JAQUAR
BALL VALVES	:	AUDCO / BDK / VALTEC
GATE VALVES	:	LEADER / NETA
PLASTIC TANK	:	SINTEX / INFRA
FLUSHING CISTERN	:	COMMANDER / SLIM LINE
SEAT COVER	:	COMMANDER / PATEL
MIRROR	:	MODIGUARD / ASAHI
BUTTERFLY VALVES	:	AUDCO / BDK
S.W. PIPES	:	ANDHRA / DALMIA
C.I. PIPES	:	NECO / BIK
PUMPS	:	BEST / TEXMO
H.D.P.E. PIPES	:	MANIKYA / HASTI / PLASTICHEM

- 17.30.** Galvanized Iron Pipes and Fittings:

17.30.1 Specifications:

Where specified G.I pipes for water supply inside and outside the buildings shall be genuine galvanized steel tubes conforming to IS: 1239 of specified grade with latest amendments. All fittings shall be malleable iron galvanized fittings conforming to IS: 1239 (Part II) with latest amendments. All fittings shall have manufacturer's trademark stamped on it. Fittings in G.I. pipe lines shall include elbows, tees, bends, reducers, nipples, union bushes, G.I. clamps of approved design, G.I. flanges with 3mm rubber insertion, nuts, bolts, washers, etc. All fittings shall be tested at manufacturer's work. Tenderers may be required to produce certificate to this effect from the manufacturer.

17.30.2 Laying and Fixing:

Screwed G.I. pipes shall be joined with screwed socket points, using screwed fittings. Care shall be taken to remove any burr from the end of the pipes after cutting, while lead with grommet of a few strands of fine hemp shall be applied while tightening. Other pipe jointing compound may be permitted if approved by the Engineer-in-charge before starting the work. All pipes shall be fixed with G.I. holder bat clamps clear off the wall. If pipes are fixed in chases they shall be fixed in position by iron hooks. All piping shall be kept plugged at the end of day's work.

Pipe shall be laid evenly, painted with two coats of anti-corrosive bitumastic paint and covered with fine sand 150mm all around. The pipes in chases shall be painted with bitumastic paint.

17.30.3 Depth Of Cover For Underground Water Pipes

The cover for the mains shall be at least 90cm under vehicular areas and 75 cm in pedestrian areas.

17.30.4 Non Return Valves

The valves shall be of quality approved by the Engineer-in-charge and shall generally conform to IS: 778 with latest amendments.

17.30.5 Valve Chamber

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- a. Constructions: Base concrete, masonry work and plastering shall be as described under Sub-section manholes.
- b. Size: The size of the valve chamber shall be as specified in the Bill of Quantities.

17.31. Sanitary Fixtures & Fittings

17.31.1 Workmanship

All sanitary ware shall be fixed in a neat workmanship like manner, true to level and plumb. Manufacturer's instructions shall be followed closely regarding the installation and commissioning.

17.31.2 Sanitary Ware:

All porcelain sanitary ware shall be of approved make. All fittings shall be of first quality, free from warps, cracks and glazing defects. All sanitary ware fittings and fixtures shall be as shown in drawings and Bill of Quantities.

All vitreous sanitary appliances (vitreous china) shall be conforming to IS: 2556 with latest amendments.

Kitchen sinks shall be of white glazed fire clay conforming to IS: 771 (Part 2) with latest amendments.

17.31.3 Fixing: All fixtures shall be fixed with chromium plated brass screws with washers wherever necessary.

17.31.4 Painting: The high level Cast Iron Flushing Cisterns and G.I. flues pipes shall be painted with one coat of red oxide and 3 coats of paint of approved shade and quality. All supporting brackets for cisterns, wash basins and sinks shall also be painted, as directed by the Engineer-in-charge.

Fixtures shall be protected throughout the progress of the work from damage. Special care shall be taken to prevent damage and scratching of chromium-plated fitting. Tool marks on chromium fixtures, etc. shall not be accepted.

17.32. Plant And Machinery

General:

All plant and equipment shall be new and of appropriate grade and quality suitable for and adequately, protected against the prevailing climatic conditions and in accordance with specifications and shall be of approved manufacture. Any plant, which is found to be unsuitable for use under these conditions, shall be dismantled and replaced by suitable plant entirely at the expense of the Tenderer.

The complete installation shall be carried out in a neat and orderly manner by competent personnel with adequate experience of respective trade of work.

Materials shall be the best of their type available and shall conform to the appropriate standards. Materials of construction shall be certified by a recognized testing authority and shall be suitable for use in the stipulated environment. Installation of materials and equipment shall be strictly in accordance with manufacturer's recommendation.

17.33. Testing And Commissioning

17.33.1 General

The Tenderer shall be responsible for testing and commissioning the entire services installations described in these specifications and will demonstrate the operation of the system to the entire satisfaction of and approval of the Engineer-in-charge.

17.33.2 Methods of Testing:

The tests on various services shall be carried out as described herein. The carrying out and recording of tests shall be agreed with the Engineer-in-charge.

17.33.3 Water for Testing:

Water for testing shall be obtained by the Tenderer from an approved source. It shall be free from

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bacterial contamination, silt, grit, sand etc. After testing, the Tenderer shall satisfactorily dispose off all water, or it may be reused provided it is clean and it not contaminated.

17.33.4 Test Records

The Tenderer shall be responsible for keeping all records of tests and on completion, shall provide records and reports of the tests in triplicate. All test records shall clearly identify the item of the test and must be signed by a witness to the test.

17.33.5 Unsatisfactory Works:

If the tests reveal unsatisfactory materials, installation or adjustment, the Tenderer shall, at his own expense, carry out such alterations or replacement as may be necessary to rectify the defective work. The Tenderer shall then repeat the tests as necessary to establish the satisfactory nature of the alterations or replacements.

17.33.6 Testing at Works:

All plants and equipment shall be tested at maker's works before dispatch and the test certificate in duplicate shall be forwarded to the Engineer-in-charge.

The Tenderer shall similarly provide a set of manufacturer's certified test curves for any pump installed under the Contract. All tests shall be in accordance with the appropriate Indian Standards.

17.33.7 On Site Testing

The Tenderer shall provide on site all the necessary instruments, plants, equipment, materials, water electricity and labour necessary for carrying out the specified tests. All tests shall be carried out as required to meet the construction program and the Tenderer shall include for all necessary installation and other works as may be required for testing the whole or parts of the installation. The Tenderer shall also be responsible for re-testing, if necessary, until satisfactory tests are achieved.

17.33.8 Test Records:

Pipe Line	Test Pressure	Period	Method
Water Mains, Fair Mains & Water Services	5 Kg/cm. Sq. or max. Working pressure plus 50 percent which ever is greater	2 hours	Pressure Test
Underground Drainage	1.5 m head of water at highest point	30 min test	Hydraulic Test
Foul Drainage above ground	Not more than 4.5 M head in pipe 75 mm water gauge	3 minutes	Hydraulic Test Air test

17.33.9 Testing of Various Services

a. Water Services

Before the pipes for water supply are painted or covered, they shall be tested to a hydraulic pressure of 5 kg/cm. Sq. or maximum working pressure plus 50 percent, whichever is greater. Pressure shall be maintained for at least 2 hours without appreciable drop in pressure. In addition to the sectional testing of water supply pipes, the Tenderer shall test the entire installation on completion of the job to the entire satisfaction of the Engineer-in-charge. The Tenderer shall rectify all leakage and restore damage done to the building and furniture at his own cost.

b. Underground Drainage:

The sewer and drain lines shall be tested for water tightness and straightness as described below:

i. Water Test

Pipes and joints shall be subjected to a test pressure of at least 1.5m head of water at the highest point of the section under test. The test shall be carried out by suitably plugging the low end of the drain and filling the system with water. A knuckle bend shall be temporarily

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joined in at the top end and a sufficient length of vertical pipe jointed to it so as to provide the required head. Or top end may be plugged with a connection to a hose ending in a funnel, which could be raised or lowered till the required head is obtained and fixed suitably for observation.

- ii. Test for Straightness and Obstruction: Sewer lines shall be tested for straightness
 - By inserting at the high end of the sewer or drain a smooth ball of diameter 13mm less than the pipe bore. In the absence of obstruction, such as yarn or mortar projecting through the joints, the ball should roll down the invert of the pipe and emerge at the lower end; and
 - By means of a mirror at one end of the line and lamp at the other. If the pipeline is straight, the full circle of light can be observed. If the pipeline is not straight, this will be apparent. The mirror will also indicate obstruction in the barrel.

c. Above Ground foul drainage

All soil, waste and vent pipes shall be tested by filling up the whole or part of stack with water. All openings for connections, etc. shall be suitable plugged. The total head shall, however, not exceed 4.5 m.

The Tenderer shall remove and replace all pipes having holes, cracks etc. All leaking joints and access doors shall be replaced or remade to the entire satisfaction of the Engineer-in-charge. Water shall be retained in stack for a minimum period of 2 hours. After all plumbing fixtures are installed; the Tenderer shall apply the smoke test to the entire stack to the satisfaction of the Engineer-in-charge.

d. Sanitary Fixtures & Fittings

When the installations have been completed to the satisfaction of the Engineer-in-charge, it shall be tested in the following manner:

- The entire system shall be slowly filled with water, allowing any trapped air to escape.
- When all outlets are closed, the system shall be checked for water tightness.
- Each outlet shall then be checked for rate of flow and correct operation.
- Waste outlets of wash basins and sinks shall be plugged and the basin and sink bowls shall be filled up to overflow level. Plug shall be removed and waste pipe and trap shall be checked for leakage and floor drain (if fixture waste is connected to floor drain) shall be checked to overflow.

e. Testing Manholes

All open channel manholes shall be tested with water to a height of 1 meter above the channel invert or as otherwise directed. The water level shall be retained for a 2 hour period without appreciable loss. When the water is released, the benching shall be inspected to ensure that there are no cracks.

f. Flushing Out and Sterilization off Pipe Work And Tanks

It is essential that all internal water services, external mains and tanks are thoroughly flushed out prior to being put into service and that drinking and domestic water services mains and tanks are sterilized in accordance with Clause 13 of IS : 2065 for Water Supply in buildings.

The Tenderer shall be responsible for making any temporary pipe work connections required.

Following completion of sterilization of every part of the drinking a domestic water system, the Tenderer is to ensure that satisfactory bacteriological samples are obtained and tested at an

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approved laboratory and the results approved by the Engineer-in-charge prior to completion of the Tenderer and handing over to the Employer.

17.34. As Fitted ‘ Drawings and Operation & Maintenance Manuals:

The Tenderer shall submit, after the completion of the work, set of originals and two sets of prints of the “As Fitted” drawings, giving the following information:

- a. Position of all sanitary fittings
- b. Runs of all piping and diameters on all floors and vertical stacks
- c. Position of control valves, access panels and all other plant and equipment.
- d. I.L. of all manholes.

Operation and Maintenance Manuals:

The Tenderer shall hand over to the Engineer-in-charge, all Operation & Maintenance Manuals of the plant and equipment supplied and installed by him. Only manufacturer’s catalogues, wiring diagrams and installation drawings, relevant to particular items of equipment concerned shall be submitted. General catalogues will not be acceptable.

17.35. Trade Preamble:

i. Manholes, Masonry Chambers for Valves, Hydrants and other Appurtenances:

Manholes and other chambers shall be measured in number. The rates shall include:

- a. Excavation in any kind of solid including quick sand but excluding rock.
- b. Protecting the excavation with all necessary shoring, strutting and keeping the excavation clear of water.
- c. Providing and laying foundation concrete as shown on drawing and as specified.
- d. Providing and constructing brick masonry walls in cement mortar as shown on drawing and as specified. The openings required to be left open for pipes and subsequent grouting shall also be included in the rates.
- e. Providing and casting R.C.C. cover as shown in drawing and as specified.
- f. Providing, fitting and fixing C.I. surface box, manhole cover as shown in drawing and as specified and / or directed at site by Engineer-in-charge’s Representative, and
- g. Providing cement plastering to the walls of chamber, internally as well as externally.
- h. For manholes the rates shall include the cost of C.I. / G.I. foot rests. The depth of the manhole shall be reckoned from the top level of C.I. cover to the invert level of channel. The extra depth shall be measured and paid as extra over the specified depth.

ii. Pipe Work:

- a. Pipe work has to be measured in running meter nearest to a cm as laid or fixed from inside of one manhole to inside of the other manhole. The length shall be taken along the centre lines of the pipes over all fittings such as bends, junctions, etc. which shall not be measured separately.
- b. The rate shall include the cost of excavation in trenches, dressing, supplying, lowering, laying, jointing and testing of pipes, cement concrete encasing, back filling and disposal of surplus earth.

iii. Soil, Waste & Ventilation Pipe work:

- a. Pipe work is to be measured in running m nearest to a cm. As fixed or laid. The length shall be taken along the center line of the pipes over all the fittings, such as bends, tees, junction all with or without doors, door pieces, cowls, etc. which shall not be measured separately.
- b. The rate shall include the cost of materials and labour involved in supplying, fixing with holder bats and M.S. Stays, laying underground cutting holes, chases in walls, floors and painting two or more coats of enamel paint of approved quality and shade over a coat of primer. The rate shall be inclusive of cost of materials and labour, cutting holes and closing

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in walls and floors and making good the same, providing sleeves etc. and encasing pipes laid under floor / ground with 50mm thick cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 20mm nominal size) around.

iv. Floor Traps:

Floor traps shall be measured by number. The rate shall be inclusive of supplying of trap and grating, setting in concrete and connecting branch pipes to it.

v. G.I. pipes for Water Supply (External):

- a. Pipe work is to be measured in running meter nearest to a centimeter. For the finished work, this shall include G.I pipe and G.I fittings such as bends, tees, elbows, reducers, unions, crosses, plugs, nipples and nuts but shall exclude brass or gunmetal taps, valves etc.
- b. The rate shall be inclusive of the cost of materials and labour, excavation and earth work, painting pipes with two coats of anticorrosive paint and surrounding with sand 150mm all round.

vi. G.I. pipes for Water Supply (Internal)

- a. As (a) above
- b. The rate shall be inclusive of cost of materials and labour, cutting holes and chasing in walls, and floors and making good the same, providing sleeves, applying anticorrosive paint on buried and concealed pipe work and painting of exposed pipes with two coats of enamel paint over a coat of primer.

vii. Taps, Concealed stop cocks, Valves etc.

Appurtenances like taps, concealed cocks, valves etc. shall be measured in number. Rates shall include

- a. Testing and checking of appurtenances and fittings before taking delivery of the same.
- b. Delivering the appurtenances to specified storage area at site.
- c. Fixing the same at specified space, jointing, fitting and fixing true to line and level including repairing of protective coating, if necessary, and
- d. Providing equipment, labours and materials necessary to carry out the above works complete to carry out the above works complete in all respects as specified and / or instructed.

viii. Sanitary Fixtures:

All sanitary fixtures of specified trade or equivalent shall be paid by number and rate shall include all C.P. brass fittings, flushing cistern (in case of W.C. and Urinal) specials, connection pipe and fixing component, brackets, screws, cutting holes in walls and making good the same.

The rate shall be inclusive of painting of R.S. or M.S. brackets for cistern, washbasins, sinks etc. with two coats of enamel paint over a coat of primer.

ix. Water Closet:

The rate of water closet shall be inclusive of supplying, installing, testing and commissioning the complete W.C. unit with cistern with ISI marked Standard internal PVC fittings and all other fittings and interconnecting pipe work and C.P. brass angle valve on inlet to cistern with C.P. copper connection pipe.

x. Wash Basin:

The rate of wash basin shall be inclusive of supply, installing, testing and commissioning of the complete wash basin with C.P. waste C.P. bottle trap, a pair of C.P. pillar cock, C.P. brass angle valve on cold & hot inlets with C.P. copper connections pipes. Etc.

18. TECHNICAL SPECIFICATIONS FOR ELECTRIC WORKS

18.1. GENERAL

The electrical wiring installations shall be carried out in conformity with the requirements of the Indian Electricity Rules, 1956 as amended up to date and to the relevant regulations of the electric supply authority concerned, and IS : 732 Indian Standards Code of Practice for Electrical wiring installations.

All the equipment, fittings and accessories, materials selected for the wiring installations shall conform to the relevant Indian Standards wherever these exist. These will be of makes as specified in the tender or as approved by the Engineer-in-charge.

Looping back system of wiring shall be adopted.

A light circuit will not have more than total 10 points of lights, fans and 6 amps. Socket outlets or a load of 80° watts, whichever is less. Power Circuit will not have more than two outlets per circuit. Circuit wiring will form part of point wiring and no extra payment on this account will be entertained.

All the wiring shall be recessed conduit with PVC insulated, unsheathed, stranded, copper conductor wire of sizes 1.5 Sqmm for light points / circuits and 4 Sqmm. for power points / power, circuits having one outlet per circuit. The outlet from Distribution Board will be wired with 4 Sqmm. insulated copper conductor wires.

Only IS marked PVC conduits (Medium), with suitable accessories, shall be used. Minimum size of conduit used, shall not less than 20mm diameter.

Separate conduits shall be laid for the wiring of lighting / fan points, circuits, power points including circuits, sub mains, telephone and TV system.

MS Junction boxes in the conduit run on walls wherever required should be provided with MS sheet covers of not less than 1.60 mm thick. For PVC junction boxes on the ceiling or wall, rubber grommets shall be used to plug in unused entries.

Each light / power circuit will have not less than 1.5/2.5 Sqmm PVC copper wire as independent earth continuity wire. The same shall be green coloured.

Location of the light and power points shall be as per the details in drawings and as approved by the Engineer-in-charge.

Height of switch box (bottom) shall be 1.25 M above the finished floor level and of 6 amps for TV/ Telephone and 16 amps Socket outlet box (bottom) 20 cm above the finished floor level. 16 Amps socket outlet box (bottom) in kitchen will be 20 cm above the top of working platform and for geysers in Toilet shall be placed 500mm below the roof as per drawings. Light bracket / bulkhead / Fluorescent Tube fittings points shall be at 2.10 M above finished floor level. Distribution box shall be at 1.5M above finished floor level. The heights given may be changed to suit local requirements and shall be approved finally by the Engineer-in-charge. No extra claim of whatever nature will be entertained due to any change in location / mounting height.

18.2. Electrical Installations & Testing

Each light point / exhaust fan point shall comprise of providing and fixing recessed conduit including accessories, PVC insulated 1.5 Sqmm conductor cable, light point outlet box, 6 Amp. SP piano type switch in 16 SWG MS box with 3mm thick decorative Hylam sheet cover of approved shade, painting etc. as required and complete with circuit wiring. This also includes continuous PVC insulated copper wire earthing (Green colour). Light point in stairs where specified shall be two-way type each controlled by two no. of two-way SP piano switches.

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Each 3/5 pin 6 Amp. Socket outlet points shall comprise providing and fixing out recessed conduit and accessories 1.5 sqmm copper conductor PVC insulated cable, 6 Amps. 3/5 pin socket outlet and 6 amp. SP Piano Type switch in 16 SWG M.S. box with 3mm thick decorative Hylam sheet cover of approved shade, painting and earthing the earth pin of socket outlet with 14 SWG bare copper wires etc. complete as required.

Each ceiling fan / exhaust fan point shall comprise of providing and fixing recessed conduit including accessories, PVC insulated 1.5 sqmm. copper conductor, cables 1.5 sqmm PVC insulated copper wire for earthing the fan regulator, 6 Amp SP piano Type Switch in 16 SWG MS box with 5 mm thick decorative Hylam sheet cover of approved shade, 150 mm Hexagonal 16 SWG MS box for fan clamp with 13mm diameter, 450mm long MS rod, bent downwards at ends etc. complete as required. Circular 3mm laminated sheet cover shall be provided for fan box.

- a. 1.5 sqmm PVC insulated copper wire shall be run for all lights and fan points wiring as continuous earth wire.
- b. All metallic fixtures to be earthed.

Each 6 pin 16 Amp. Socket outlet point shall comprise of providing and fixing recessed conduit including accessories, 4 sqmm, 6 sqmm PVC insulated copper conductor cables, 16 Amp, 6 pin socket outlet, 16 amps. SP piano type switch in 16 amps. SP piano type switch in 16 SWG MS box 3mm thick decorative Hylam sheet cover of approved shade and including earthing of the earth pin of socket out let with 2.5 sqmm PVC insulated copper wire complete as required.

Each call bell point shall comprise of providing and fixing recessed conduit including accessories PVC insulated, copper conductor cable, outlet junction box. 6 Amps SP piano type bell push in 16 SWG MS box with 3mm thick decorative Hylam sheet cover of approved shade point etc. complete as required.

Each telephone point shall comprise of 2 x 0.61 mm diameter PVC insulated and sheathed tinned, copper conductor cable, recessed conduit including providing and fixing of 6 Amp. 2 pin telephone socket outlet in 16 SWG MS box with 3mm decorative Hylam sheet cover suitable socket outlet for aerial wires.

TV antenna point comprises 25mm diameter recessed conduit including providing TV cable and fixing suitable socket outlet in MS box with 3mm thick decorative Hylam sheet cover suitable socket outlet for aerial wires.

Sub mains and mains wiring comprising PVC insulated, copper conductor cables of required size (based on load of individual flat) in recessed conduit shall be provided. The size of the PVC conduit shall be as per relevant IS codes, amended up to date.

SPN / TPN Double Door Distribution Boards of required ways with 25/32/63 mps ELC MCB (where not specified) for incoming and 6 amps. SP MCB for each light circuit, 10-25 amps SP MCB for each power circuit as per design approved by the Engineer-in-charge, will be provided. MCB's shall be of not less than 10 KA breaking capacity. TPN DB's shall have 16 amp and 25 amp capacity SP MCB for power equipment. All MCBs provided in the DBs shall be of "G" category. These boards shall conform to IS - 13032 with degree of protection I.P. 42.

All electrical wiring accessories such as Piano type switch, bell push, 6/16 amps socket outlets, telephone outlet, TV outlets, Ceiling Rose, Pendant / batten holder etc. shall be of Anchor make as recommended catalogue type.

Porcelain connectors shall be installed at wiring terminals for fittings / fans etc.

Luminaries / fans shall not be provided unless specified.

Earthing (Plate earth Electrode) conforming to IS 3043 shall be provided.

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On completion of the installations, following tests shall be carried out for each flat as laid down in IS: 732 and should give satisfactory results:

- i. Insulation Resistance test
- ii. Polarity Test of Switches
- iii. Earth Continuity Test
- iv. Earth Resistance Test.

Testing instruments, labour, material and other incidentals necessary to conduct the tests shall be provided by the Tenderer at his own cost. All the above tests shall be carried out preferably in presence of Engineer-in-charge or his authorized representative and test result recorded in the test sheets.

The meter board shall be cubical type, made out of MS sheet not less than 16 gauge. It will have the following compartments:

- i. Bus bar chamber with aluminum bus bars of adequate ratings, suitable for 415 volts, 3 phase, 50 cycles AC supply.
- ii. Independent lockable compartment with hinged door wooden plank 12mm thick, for each flat for housing KWH meter. For facilitating meter reading, cover will be equipped with standard size window covered with 2mm transparent plastic sheet. Each meter cubical shall be number painted for identification of flat number. One inch pad lock shall be provided for all the metering cubicles, Bus-bar and main switch chambers. The pad locks shall be of approved make. Neutral link and kit-kat fuses shall be separately housed and shall have lockable cover. Suitable cable ally shall be provided for sub-mains.
- iii. 3 phase HRC fuse switch unit or MCCB of suitable rating front operated for controlling the incoming SEB supply.
- iv. MCB chamber flitted with suitable rate SPN / TPN MCB for independently controlling the supply of each flat and common area, hinged door having cutout for dolly / handle operation.
- v. All inter connected wiring of not less than 10 sq. mm PVC insulated, stranded copper conductor cable, between bus bar chamber to meter chambers and to MCB chambers. All termination of the wiring with the busbars shall be compressed sockets of suitable size.
- vi. Earthing connection at two points as required.
- vii. The meter board shall be dust and vermin proof, free standing / wall mounted type. The design of the meter board will be as per requirements of SEB. PVC gasket shall be provided under the covers.
- viii. Cable galleries shall be provided in the metering panel for easy run / termination of wiring.
- ix. The meter board shall be painted with powder coating process of approved shade and manufacture.
OR
- x. 15.17.A The meter cubicle shall be of approved design as per requirements of the State Electricity Board.

18.3. Earthing:

All the non current carrying parts of electrical installation shall be earthed as per IS: 304. All equipment, metal conduits, rising mains, cable metal armour, switch gear, distribution boards, meter all other metal parts forming part of two separate and distinct conductors to earth electrodes. Earthing shall be in conformity with the provision of rules 32, 61, 62 & 68 of IER 1956.

The Tenderer shall be responsible for getting wiring approved from the local body, i.e. State Electricity Board / Electrical Inspector, as per requirement at his cost.

18.4. Exterior Electrical Works:

18.5. UG cabling and terminations

KV grade aluminum armoured PVC insulated and PVC sheathed UG cable shall be employed for the following works

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- a. Street lighting
- b. Water pump installations
- c. Sewage pump installations

The minimum size of cable to be employed for the work is 4 Sqmm. The sizes of various cables to be used for various installations are indicated in the drawings and specifications.

18.6. Cable trench preparation

Excavation in all types of soil up to a depth of 750mm, dry river sand filling 75 mm thick, laying of cables and laying of well burnt bricks over the cable to protect the same. The trench shall then be closed with excavated earth, the surplus earth shall be removed to a distant place.

18.7. Cable markers

Cable markers are of good quality cast iron plates, round with engraving giving the voltage level of cable buried. The same shall be fixed to the ground by grouting the same with cement concrete. Cable markers shall be fixed at intervals and at turning points.

18.8. Termination

Termination shall be carried out with SIBG type glands and copper crimping sockets. Proper tool shall be employed for crimping the sockets.

18.9. Junction Boxes

Junction boxes are employed for terminating the street lighting cable to the street lighting poles. The same shall be fabricated out of 16 SWG CRCA sheets, painted with 2 coats of red oxide primer, and 2 coats of enamel paint of approved shade. The same shall house 1 no 4- way terminal block to terminate up to 4 Sqmm cable and 1 no 16A-kit Kat fuse. The junction box shall be fully weather proof with canopy and gasketed door with locking arrangements. The same shall mounting brackets to fix the same to the pole.

Telephone and Cable TV

PVC pipes

50 to 100mm diameter PVC pipes shall be provided along the main road and sub road facilitating the DOT to draw the telephone cable and give connections to all houses and cable TV provider to lay the cable and give individual connections. The routing and layout of the PVC pipes shall be as per the drawings. The PVC pipes shall B class only. Necessary excavation for laying the pipes shall be carried out to a depth of 450mm. Inspection chambers shall be constructed at intervals and at junctions of size 600x600x450mm out of brick masonry with thickness of 230mm, cement plastering inside and top of chamber and covering the same with 150mm thick RCC slab provided with concealed lifting hooks.

Separate pipes shall be laid for cable TV and telephone.

Pump Control Panel

The panel shall be cubicle type, free standing, floor mounted with necessary bus bar chamber, cable alley, floor mounting channel and other accessories. This panel will feed the water pumps and the sewage treatment plant and shall be located in the pump house. The bus bars shall be made out of adequate rating aluminum bars insulated with colour coded PVC sleeves, and supported on SMC supports. TPN switch fuse units, motor starters etc shall be mounted in separate cubicles fitted with hinged doors. The enclosure of panel shall conform to IP 42. The no of feeders and other details are given in the respective item description in the schedule.

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SECTION 8: DRAWINGS

S No.	Drawing Title	Drawing No./Date
a	Building	enclosed
1	Building plan	enclosed
2	Cross Section	enclosed
3	Foundation & Structural Drawing	enclosed

SECTION 10: FORMAT OF BANK GUARANTEES

A. FORMAT OF BANK GUARANTEE FOR EARNEST MONEY DEPOSIT (EMD)

B.G. No. _____ dated _____.

This Deed of Guarantee executed at _____ by _____ (Name of Bank) having its Head/Registered office at _____ (hereinafter referred to as “the Guarantor”) which expression shall unless it be repugnant to the subject or context thereof include its, successors and assigns;

In favour of

the Managing Director, RGHCL”, having its office at 9th Floor E & F Block Cauvery Bhavan, KG Road Bangalore 560009, which expression shall unless it be repugnant to the subject or context thereof include its , successors and assigns;

WHEREAS

- A. M/s. _____ Ltd³, a Company incorporated under provisions of the Companies Act, 1956/registered partnership firms having its registered office at _____ (hereinafter called “the Tenderer”) which expression shall unless it be repugnant to the subject or context thereof include its/their executors administrators, successors and assigns, has/have Tender for the (Project Name) (hereinafter referred to as “the Project”).
- B. Tender Document dated issued in respect of the Project (hereinafter referred to as “Tender Document”) the Tenderer is required to furnish to RGHCL an unconditional and irrevocable Bank Guarantee for an amount of Rs _____/- (Rupees _____ only) as EMD.
- C. The Guarantor has at the request of the Tenderer and for valid consideration agreed to provide such Bank Guarantee being these presents:

NOW THEREFORE THIS DEED WITNESSETH AS FOLLOWS:

- (a) The Guarantor, as primary obligor shall, without demur, pay to RGHCL an amount not exceeding Rs _____/- (Rupees _____only), within 5 days of receipt of a written demand from RGHCL calling upon the Guarantor to pay the said amount and stating that the EMD provided by the Tenderer has been forfeited in terms of Clause 15 of the Tender Document.
- (b) Any such demand made on the Guarantor by RGHCL shall be conclusive and absolute as regards the forfeiture of EMD and the amount due and payable by the Guarantor under this Guarantee.
- (c) The above payment shall be made without any reference to the Tenderer or any other person and irrespective of whether the claim of RGHCL is disputed by the Tenderer or not.
- (d) This Guarantee shall be irrevocable and remain in full force for a period⁴ of _____ months from (date) _____ or for such extended period as may be mutually agreed between RGHCL and the Tenderer and shall continue to be enforceable till all amounts under this Guarantee are paid.

³ Insert name of the Successful Tenderer (a company) as the case may be..

⁴ Duration of the Tender Validity Period in accordance with the Tender Document

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- (e) The Guarantee shall not be affected by any change in the constitution or winding up of the Tenderer/the Guarantor or any absorption, merger or amalgamation of the Tenderer/the Guarantor with any other person.
- (f) In order to give full effect to this Guarantee, RGHCL shall be entitled to treat the Guarantor as the principal debtor. The obligations of the Guarantor shall not be affected by any variations in the terms and conditions of the Tender Document or other documents or by extension of time of performance of any obligations granted to the Tenderer or postponement/non exercise/delayed exercise of any of its rights by RGHCL against the Tenderer or any indulgence shown by RGHCL to the Tenderer and the Guarantor shall not be relieved from its obligations under this Bank Guarantee on account of any such variation, extension, postponement, non exercise, delayed exercise or omission on the part of RGHCL or any indulgence by RGHCL to the Tenderer to give such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so relieving the Guarantor.
- (g) The Guarantor has power to issue this Guarantee and discharge the obligations contemplated herein, the undersigned is duly authorized to execute this Guarantee pursuant to the power granted under _____.

IN WITNESS WHEREOF THE GUARANTOR HAS SET ITS HANDS HEREUNTO ON THE DAY, MONTH AND YEAR FIRST HEREINABOVE WRITTEN.

Signed and Delivered by _____
Bank by the hand of Mr/Ms _____
its _____ and authorized official.

Tender document for: Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B

B. FORMAT OF BANK GUARANTEE FOR SECURITY DEPOSIT

To:

**The Managing Director
RGHCL,
Bangalore.**

WHEREAS _____ [*name and address of Contractor*] (hereinafter called "the Contractor") has undertaken, in pursuance of Contract No. _____ dated _____ to execute work of "**Construction of KPS Model Moulana Azad School (School Building at G+3 Floors and Other Infrastructure Works) for Minority Department at Devarahatti, Davanagere Taluk, Davanagere District (New Work) (Fixed Price No Variation) – Package – 3B**"; (hereinafter called "the Contract");

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligations in accordance with the Contract;

AND WHEREAS we have agreed to give the Contractor such a Bank Guarantee;

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you, on behalf of the Contractor, up to a total of Rs. _____ [*amount of guarantee*] ⁵Rupees _____ [*in words*], and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of _____ [*amount of guarantee*]⁶ as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract or of the Works to be performed there under or of any of the Contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

This guarantee shall be valid until 30 days from the date of expiry of the Defects Liability Period.

Signature and seal of the guarantor _____

Name of Bank _____ 21

Address _____

Date _____

⁵ An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract

⁶ An amount shall be inserted by the Guarantor, representing the percentage of the Contract Price specified in the Contract