



# WAPCOS

(A Government of India Undertaking)

## Selection of Contractor for Construction of Director's Bungalow at Gujarat National Law University Campus

---

VOLUME I – TECHNICAL PROPOSAL

VOLUME II – SCOPE OF WORK, TECHNICAL SPECIFICATION

VOLUME III – FINANCIAL PROPOSAL

VOLUME IV- DRAWINGS

WAP/GIS/GNR/INFRA/GNLU/2020/03

### WAPCOS LIMITED

515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421Tele: 079-23600292Tele fax: 079-23600352  
Email: [gandhinagar@wapcos.co.in](mailto:gandhinagar@wapcos.co.in)



**WAPCOS**  
(A Government of India Undertaking)

Selection of Contractor for Construction of Director's  
Bungalow at Gujarat National Law University Campus

---

**VOLUME I – TECHNICAL PROPOSAL**

**WAPCOS LIMITED**

515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421Tele: 079-23600292Tele fax: 079-23600352  
Email: [gandhinagar@wapcos.co.in](mailto:gandhinagar@wapcos.co.in)

**Table of Content**

VOLUME-INOTICE INVITING TENDER (NIT).....	7
SECTION– I: INSTRUCTIONS TO BIDDER.....	11
1.0 BIDDER’S GUIDE FOR MSTC-WAPCOS PORTAL.....	11
2.0 INSTRUCTIONS TO BIDDER.....	16
3.0 EARNEST MONEY DEPOSIT (EMD) .....	18
4.0 COST OF BIDDING .....	18
5.0 LANGUAGE OF BID .....	19
6.0 CURRENCY OF BID.....	19
7.0 ANNEXURES.....	19
SECTION– II: SELECTION AND QUALIFYING CRITERIA.....	21
1.0 SITE VISIT.....	21
2.0 GEOTECHNICAL & TOPOGRAPHICAL SURVEY (if required).....	21
3.0 QUALIFYING CRITERIA: ONLINE TECHNICAL BID SUBMISSION.....	21
4.0 OFFLINE SUBMISSIONS OF DOCUMENTS (PHYSICAL SUBMISSION).....	26
5.0 CONTENTS OF FINANCIAL BID.....	27
6.0 OPENING OF FINANCIAL BID.....	28
SECTION– III: GENERAL CONDITIONS TO CONTRACT .....	29
1.0 GENERAL RULES AND DIRECTIONS .....	29
2.0 CONDITIONS OF CONTRACT.....	32
3.0 CLAUSES OF CONTRACT .....	36
CLAUSE 1: PERFORMANCE GUARANTEE.....	36
CLAUSE 1A: RECOVERY OF SECURITY DEPOSIT .....	37
CLAUSE 2: COMPENSATION FOR DELAY .....	37
CLAUSE 2A: INCENTIVE FOR EARLY COMPLETION .....	37
CLAUSE 3: WHEN CONTRACT CAN BE DETERMINED .....	38
CLAUSE 3A Performance Guarantee.....	40
CLAUSE 4: CONTRACTOR LIABLE TO PAY COMPENSATION EVEN IF ACTION NOT TAKEN UNDER CLAUSE 3 .....	40
CLAUSE 5: TIME AND EXTENSION FOR DELAY .....	40
CLAUSE 6: MEASUREMENTS OF WORK DONE.....	43

CLAUSE 7: PAYMENT ON INTERMEDIATE CERTIFICATE TO BE REGARD AS ADVANCE.....	46
CLAUSE 8: COMPLETION CERTIFICATE AND COMPLETION PLANS .....	47
CLAUSE 9: PAYMENT OF FINAL BILL.....	49
CLAUSE 10: MATERIALS SUPPLIED BY WAPCOS .....	50
CLAUSE 10C: PAYMENT ON ACCOUNT OF INCREASE IN PRICE / WAGES DUE TO STATUTORY ORDER .....	53
CLAUSE 11: WORKS TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS ETC. ....	55
CLAUSE 12: DEVIATIONS / VARIATIONS EXTENT AND PRICING.....	56
CLAUSE 13: FORECLOSURE OF CONTRACT DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK .....	58
CLAUSE 14 : CARRYING OUT PART WORK AT RISK & COST OF CONTRACTOR .....	58
CLAUSE 15 : SUSPENSION OF WORK.....	60
CLAUSE 16: ACTION IN CASE WORK NOT DONE AS PER SPECIFICATIONS .....	61
CLAUSE 17: CONTRACTOR LIABLE FOR DAMAGES, DEFECTS DURING DEFECT LIABILITY PERIOD .....	62
CLAUSE 18: CONTRACTOR SUPPLY TOOLS & PLANTS ETC.....	63
CLAUSE 19: LABOUR LAWS TO BE COMPLIED BY CONTRACTOR.....	64
CLAUSE 20: MINIMUM WAGES ACT TO BE COMPLIED WITH.....	70
CLAUSE 21: WORK NOT TO BE SUBLET. ACTION IN CASE OF INSOLVENCY .....	70
CLAUSE 22 COMPENSATION .....	71
CLAUSE 23 : CHANGES IN FIRM’S CONSTITUTION TO BE INTIMATED .....	71
CLAUSE 24 .....	71
CLAUSE 25: SETTLEMENT OF DISPUTES & ARBITRATION .....	71
CLAUSE 26: CONTRACTOR INDEMNIFY WAPCOS AGAINST PATENT RIGHTS .....	72
CLAUSE 27: LUMP SUM PROVISIONS IN TENDER .....	73
CLAUSE 28: ACTION WHERE NO SPECIFICATIONS ARE SPECIFIED.....	73
CLAUSE 29 : WITHOLDING AND LIEN IN RESPECT OF SUM DUE FROM CONTRACTOR.....	73
CLAUSE 29A: LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS .....	74
CLAUSE 30: EMPLOYMENT OF COAL MINING OR CONTROLLED AREA LABOUR NOT PERMISSIBLE .....	75
CLAUSE 31: UNFILTERED WATER SUPPLY .....	75

CLAUSE 32: ALTERNATE WATER ARRANGEMENTS.....	76
CLAUSE 33 : RETURN OF SURPLUS MATERIALS .....	76
CLAUSE 34: HIRE OF PLANT & MACHINERY .....	77
CLAUSE 35: CONDITION RELATING TO USE OF ASPHALTIC MATERIALS.....	79
CLAUSE 36 : EMPLOYMENT OF TECHNICAL STAFF AND EMPLOYEES.....	79
CLAUSE 37: LEVY / TAXES PAYABLE BY CONTRACTOR.....	81
CLAUSE 38: CONDITIONS FOR REIMBURSEMENT OF LEVY/TAXES IF LEVIED AFTER RECEIPT OF TENDERS .....	82
CLAUSE 39: TERMINATION OF CONTRACT .....	82
CLAUSE 40: IF RELATIVE WORKING IN WAPCOS THEN THE CONTRACTOR NOT ALLOWED TO TENDER .....	85
CLAUSE 41: NO GAZETTED ENGINEER TO WORK AS CONTRACTOR WITHIN ONE YEAR OF RETIREMENT .....	86
CLAUSE 42: RETURN OF MATERIALS & RECOVERY FOR MATERIAL ISSUED .....	86
CLAUSE 43: COMPENSATION DURING WARLIKE SITUATION .....	87
CLAUSE 44: APPRENTICES ACT PROVISIONS TO BE COMPLIED WITH .....	88
CLAUSE 45: RELEASE OF SECURITY DEPOSIT AFTER LABOUR CLEARANCE.....	88
CLAUSE46: INSURANCE.....	88
CLAUSE 47: CONDITIONS SPECIFIC TO GREEN BUILDINGS PRACTICES CLAUSE .....	89
CLAUSE 48: PAYMENT.....	101
SECTION– IV: SPECIAL CONDITIONS OF CONTRACT .....	105
1.0 SPECIAL CONDITIONS OF CONTRACT.....	105
2.0 ADDITIONAL CONDITIONS .....	113
3.0 Arbitration:.....	120
4.0 Variation in Quantities .....	121
5.0 Performance Bound Contract .....	121
SECTION– V: ANNEXURES .....	122
Annexure –I: GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER SUPPLY AND SANITARY INSTALLATIONS.....	122
Annexure –II: GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR FOR WATER PROOFING TREATMENT FOR TOILETS .....	124
Annexure –III: BANK GUARANTEE FORMAT FOR EMD (Not Applicable).....	126

Annexure –IV: FORM OF PERFORMANCE SECURITY.....	127
Annexure – V : FORMAT FOR AFFIDAVIT .....	130
Annexure –VI: FORM OF ADVANCE PAYMENT GUARANTEE .....	131
ANNEXURE – VII: FORM OF INTEGRITY PACT .....	134
ANNEXURE – VIII: FORMAT OF RESUME OF PROPOSED PERSONNEL .....	141
ANNEXURE – IX: ACCEPTABLE MAKES OF MATERIALS .....	142
ANNEXURE –X : SAFETY CODES.....	149
ANNEXURE – XI: MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS .....	155
Annexure –XII- Information Required to Calculate the BID Capacity.....	162
SECTION– VI- FORMS: .....	164
SECTION– VI: FORMS .....	165
LETTER OF TRANSMITTAL .....	165
FORM ‘A’: FINANCIAL INFORMATION.....	166
FORM “B”: FORM OF BANKERS’ CERTIFICATE FROM A SCHEDULED BANK.....	167
FORM “C”: STRUCTURE & ORGANISATION.....	168
FORM-D: FORMAT FOR No-Conviction Certificate .....	169
FORM-E: FORMAT FOR UNDERSTANDING THE PROJECT SITE .....	170
FORM-F: FORMAT FOR NO DEVIATION CERTIFICATE .....	171
FORM-G: FORMAT FOR INTEGRITY PACT .....	172
FORM-H: PRELIMINARY AGREEMENT.....	173
FORM-I: LIST OF EQUIPMENTS .....	176
SECTION-VII : SCOPE OF WORK (VOLUME- II).....	178
SECTION– VIII: TECHNICAL SPECIFICATION (VOLUME- II).....	180
Item Specifications for Civil Works.....	253
SECTION-IX: FINANCIAL PROPOSAL (VOLUME-III) .....	768
1.0 Letter of Transmittal for Financial Bid .....	768
2.0 Price Schedule.....	769
3.0 SUMMARY OF COST .....	835
4.0 PAYMENT SCHEDULE .....	836
4.1 Back to back payment:.....	836

4.2 Payment Breakup..... 836

## **NOTICE INVITING TENDER (NIT)**



**VOLUME-INOTICE INVITING TENDER (NIT)****NIT No.****Dated:**

Gujarat National Law University (GNLU) is the statutory university established by the Govt. of Gujarat under the Gujarat National Law University Act, 2003. The University is recognized by the Bar Council of India (BCI) and the University Grants Commission (UGC) (2f & 12B) has appointed WAPCOS Limited, for various Engineering, procurement & construction works Under Gujarat National Law University. WAPCOS Limited, on behalf of Gujarat National Law University (GNLU) invites Online Electronic Tenders from experienced and competent bidders, meeting the prescribed qualifying criteria as mentioned in tender document.

1.	Name of Work:	:	Selection of contractor for Construction of Director's Bungalow at Gujarat National Law University.
2.	Location	:	Gujarat National Law University (GNLU), Gandhinagar Gujarat
3.	Website for viewing tender/ Corrigendum/ Addendum	:	<a href="http://www.wapcos.co.in">www.wapcos.co.in</a> , <a href="https://gnlu.ac.in/GNLU/Tender">https://gnlu.ac.in/GNLU/Tender</a>
4.	Website for Procurement/ downloading and uploading Tender document/ Corrigendum/ Addendum	:	<a href="https://www.mstcecommerce.com/eprochome/wapcos">https://www.mstcecommerce.com/eprochome/wapcos</a>
5.	Estimated Cost of Work	:	Rs. 2,18,07,810.00 /- (Rupees Two Crore Eighteen lakh Seven thousand eight hundred Ten Only)
6.	Tender submission fee	:	Rs. 5,000/-(Non-refundable) in form of Demand Draft in favour of WAPCOS Limited payable at Gandhinagar
7.	Amount of Earnest Money Deposit (Non- Interest Bearing)	:	Rs. 4,36,200/-(Refundable) in the form of Demand Draft/ FDR in favour of WAPCOS Limited payable at Gandhinagar
8.	Site Visit	:	Contractor may visit the project site for his satisfaction before submitting the bid
9.	Project Duration	:	12 Months
10.	Validity of Bid/Tender	:	180 Days
11.	Last date & time of Procurement/ download of tender document	:	<b>02.09.2020 up to 11:00 hours</b> The bidder must officially procure/download the tender documents from the MSTC portal of

			WAPCOS before the last date and time of sale of tender document in order to bid.
12.	Last date & time for online submission of Technical & Financial Bid.	:	02.09.2020 up to 13:00 hours
13.	Joint Venture	:	Not Allowed
14.	Defect Liability Period	:	1 Year
15.	Warranty Period of product supplied	:	5 years
16.	Commencement of Work	:	After Signing of Contract Agreement and as per date mentioned in Letter of Commencement.
17.	Pre Bid Meeting	:	No pre bid meeting. Bidders have to send their queries to <a href="mailto:wapcosgandhinagar@yahoo.co.in">wapcosgandhinagar@yahoo.co.in</a>
18.	Last Date of Receipt of pre-bid queries on email	:	7 days prior to Bid submission date
18.	Offline Submission of Tender Fees, EMD etc. as detail in Tender (Physical Submission)	:	03.09.2020 up to 15:00 hours at; Bidders must submit the Technical Bid, Tender Fees & EMD in separate Envelopes as per clause 4 & Financial Bid to be submitted online only. WAPCOS Limited (515, 5th Floor, Shree UGATI Corporate Park, Opp. Pratik Mall, Koba-Gandhinagar Road, Kudasan, Dist: Gandhinagar, Gujarat-382421)
19.	Online opening of Technical Bid	:	03.09.2020 at 15:30 hours
20.	Online opening of Financial Bid	:	Will be intimated to Eligible Bidders
21	WAPCOS Contact Information	:	Sh. R.J.Patel, Project Manager, Kaoustubh Tiwari (Sr. Eng), Kartik Mehta (Eng) WAPCOS Limited Tele: 079-23600292 E-mail: wapcosgandhinagar@yahoo.co.in
22	Tender Inviting Authority	:	Regional Project Director (Western Region) WAPCOS Limited 515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road, Kudasan, Dist: Gandhinagar, Gujarat-382421 Tele: 079-23600292, Tele fax: 079-23600352 E-mail: gandhinagar@wapcos.co.in
1. Exemption from Earnest Money Deposit: -			
a. Micro and Small Enterprises (MSEs) – registered with District Industries Centres or Khadi and Village Industries commission or Khadi and Village Industries Board or Coir Board or National			

Small Industries Corporation or Directorate of Handicraft and Handloom or any other body specified by the Ministry of Micro, Small and Medium Enterprises as per MSMED Act 2006, and further amendments for goods produced and service rendered –shall be issued Tender Documents free of cost and shall be exempted from paying Earnest Money Deposit (EMD).

Document Required for Availing Exemption of EMD Amount for NSIC/ MSEs

- a. MSMEs, which are specified by the Ministry of Micro, Small and Medium Enterprises under MSMED Act 2006 and Public Procurement Policy, 2012 as Manufacturing/Service Enterprises should have registered with NSIC under its Single Point Registration Scheme (SPRS).
- b. The certificate with monetary limit indicated should be valid on the scheduled date/Extended date of submission of tender. Certificates without monetary limit will not be considered.
- c. The items of Product/Services mentioned under NSIC certificate should be the same or similar to the tendered items (Schedule of items of Tendered).
- d. The monetary limit stipulated in the certificate of MSMEs/NSIC should be equal or more than the value of work in hand awarded under MSME benefits during the financial year plus estimated cost of this tender for availing EMD exemptions.
- e. If monetary limit is less than the value of work in hand awarded under MSME/NSIC benefits during the financial year plus estimated cost of this tender, they should obtain "Competency Certificate" from NSIC for participating in this tender as well as to avail MSME benefits.

If the office of WAPCOS Limited happens to be closed on the last date and time mentioned for any of the event, the said event will take place on the next working day at the same time and venue.

- The tender document has to be downloaded from above specified websites. Bidders are advised to visit above specified websites regularly for updates/Amendments/Corrigendum, if any. The Updates/Corrigendum/Addendum to be followed up till submission of tender and it will be a part of the tender. The full details about the work, specifications, Drawings, terms and conditions shall be available in the Tender Document. The tender document has to be submitted online on websites <https://www.mstcecommerce.com/eprochome/wapcos>.
- The purpose of this NIT is to provide interested parties with information to assist the preparation of their bid. While WAPCOS Limited has taken due care in the preparation of the information contained herein, and believe it to be complete and accurate, neither it nor any of its authorities or agencies nor any of its respective officers, employees, agents or advisors give any warranty or make any representations, expressed or implied as to the completeness or accuracy of the information contained in this document or any information which may be provided in association with it.
- Further, WAPCOS Limited does not claim that the information is exhaustive. Respondents to this NIT are required to make their own inquiries/ surveys and will be

required to confirm, in writing, that they have done so and they did not rely solely on the information in NIT. WAPCOS Limited is not responsible if no due diligence is performed by the bidders.

**List of works**

Sl.no.	Name of work
1	Construction of Director Bungalow at Gujarat National Law University

The Scope of work & technical specification of individual works shall mentioned in Section VII & Section VIII under Volume- II.

**IMPORTANT POINTS**

1.1 The bidder should be an Indian Registered Company under Companies Act 1956 or 2013, Proprietorship Company/ Partnership Company/ Limited company private or public or corporation.

1.2 All Bidders are hereby cautioned that Bids containing any deviation or reservation as described in Clauses of “Instructions to Bidders” shall be considered as non-responsive and shall be summarily rejected.

1.3 The above List of Works is preliminary; the Contractor has to quote its rate against each individual work. However, the Engineer-In-Charge may exclude any work from the above list while issuing the Work order.

1.4 WAPCOS Ltd. reserves the right to accept or reject any or all bids without assigning any reasons. No Bidder shall have any cause of action or claim against the WAPCOS Ltd. For rejection of his Bid and will not be bound to accept the lowest or any other tender.

1.5 No reimbursement of cost of any type or on any account will be paid to persons or entities submitting their Bid.

1.6 All information submitted in response to this NIT shall be the property of WAPCOS Limited and it shall be free to use the concept of the same at its will.

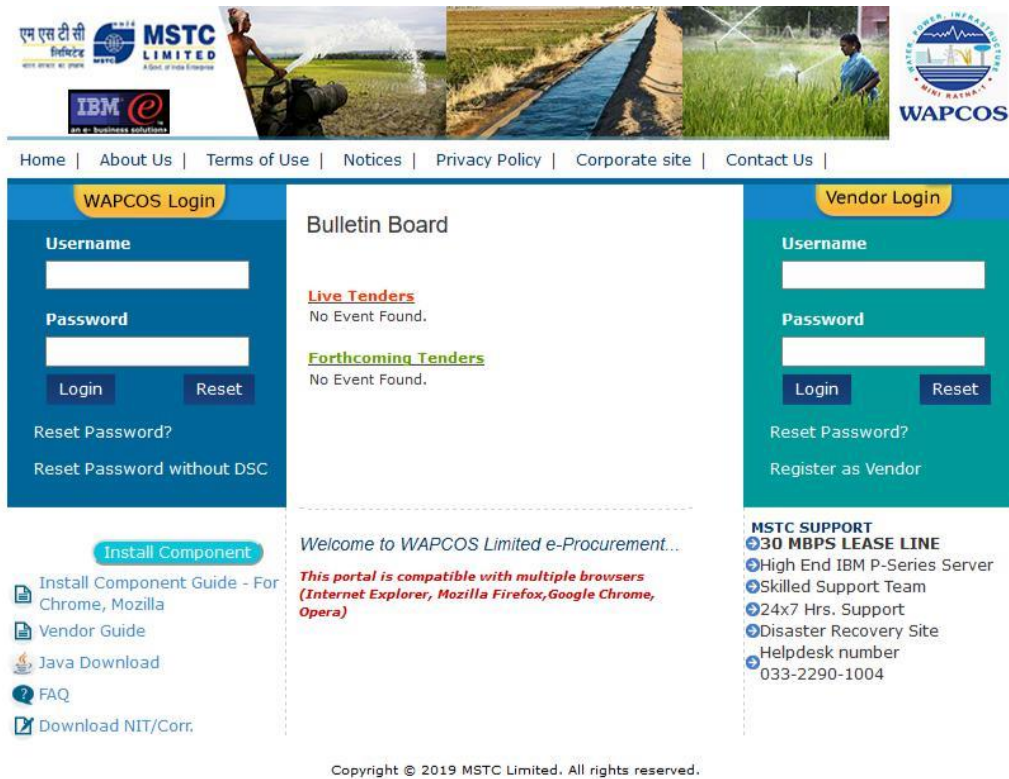
1.7 It is hereby declared that WAPCOS is committed to follow the principle of transparency, equity and competitiveness in public procurement. The subject Notice Inviting Tender (NIT) is an invitation to offer made on the condition that the **Bidder will submit the Integrity Pact, which is an integral part of tender / bid documents**, failing which the tenderer/bidder will stand disqualified from the tendering process and the bid of the bidder would be summarily rejected. The Integrity Pact shall form part and parcel of the Bid and signing of the same shall be deemed as acceptance and signing of the Integrity Agreement on behalf of the WAPCOS.

**For and on behalf of WAPCOS LIMITED  
Regional Project Director (Western Region)**

## SECTION– I: INSTRUCTIONS TO BIDDER

### 1.0 BIDDER'S GUIDE FOR MSTC-WAPCOS PORTAL

1. Use Internet Explorer to go to <https://www.mstcecommerce.com/eprochome/wapcos>



2. On the right side of the page click on Register as a Vendor:



- Fill the form that appears to create username and password.

**MSTC Limited**  
e-Procurement - Vendor - New Registration

**Personal Information**

Company Name\*  
Contact Person\*  
Company Type\* (Select Company type)

**User Preferences**

Choose a Username\* (Click here to check availability of your User Id)  
Choose a Password\* (Your Password is Case Sensitive)  
Retype Password\*

**Your Contact Details**

Email Id\*  
Mobile Phone No. (Please provide mobile no. to serve you better)  
Day Phone\*  
Fax No.

**Your Contact Address**

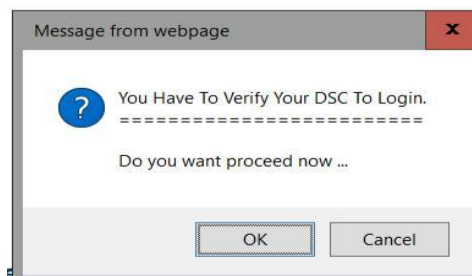
Street\*  
City\*  
Pin\*  
District\*  
Country\* (India) Other (Field Disabled)  
State\* (Select State)

- Once the registration is done, login with your user name and password:

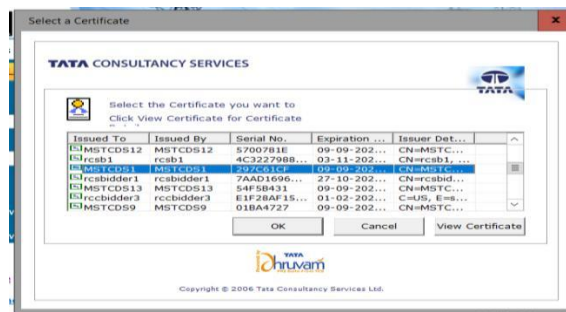
**Vendor Login**

Username: rectpcivendor1  
Password: [Masked]  
Login Reset  
Reset Password?  
Register as Vendor

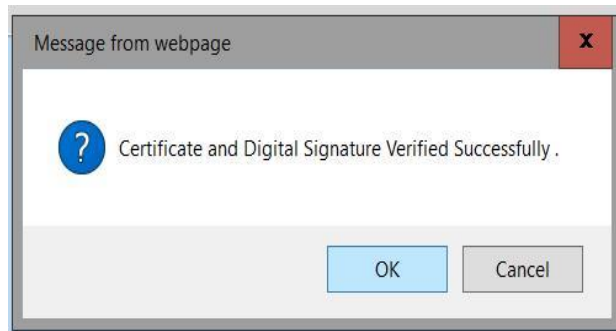
- System will ask you to verify your digital signature



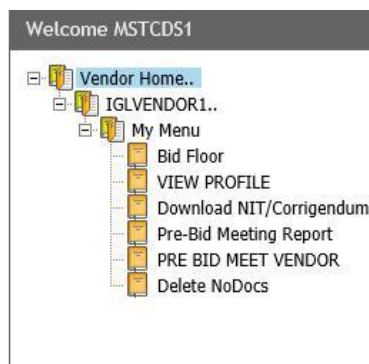
- Press Ok and select your digital signature from the List:



7. Your digital signature will be verified



8. Once login is complete, a bidder can access My Menu through the left side of the page:



9. Here click on Download NIT/Corrigendum button to download the NIT/Corrigendum. Select Event number and click on download to download the files:



10. To submit the bid a bidder can proceed to Bid Floor through the left side My menu. In Bid Floor click on live events to view a list of Live events. In live events select the tender number where you wish to submit a bid.



11. On clicking the event number, if the bidder has not paid transaction fee, system will prompt them to pay the transaction fee. They can pay the transaction fee by going to Transaction Fee payment link in their login, and pay the same through online payment (debit card, credit card, net banking etc) or RTGS/NEFT (Challan).





12. Tender can be of multiple types with price bid uploading in Excel or Technical-Price type. The bid floor for each type of event will change automatically. On clicking the tender number one of the following screens will appear: For 2 cover with price bid in excel E-Tender Technical Cum Price Bid

EVENT INFO						
Events Details		Current Server Time: 18.3.2019 16:48:59 IST				
Event No	Event Type	Event Start Time	Event Close Time			
IGL/11/18-19/ET/30	2Cover_Price_Bid_Upload_in_Excel	05.02.2019 12:55:00	18.03.2019 18:00:00			
Technical Bid		Upload Docs				
ITEM NO	ITEM Name	Price Bid	Final Submission	Withdraw Bid	Delete Bid	Bid Status
1	BUILDING	Download Upload Price	Final Submission	Withdraw Bid Submit regist letter with	Delete Bid	No Bid Saved

EVENT INFO							
Events Details		Current Server Time: 18.3.2019 16:50:6 IST					
Event No	Event Type	Event Start Time	Event Close Time				
IGL/abc/18-19/ET/77	E-Tender Technical Cum Price Bid	16.03.2019 13:36:00	19.03.2019 00:00:00				
Common Terms		Upload Documents					
Lot No/Lot Name	Cover 1	Cover 2	Final Submission	Withdraw Bid	Delete Bid	Bid Status	
1	test 1	Techno-Commercial	Price	Final Submission	Withdraw Bid	Delete Bid	Price Saved
2	test 2	Techno-Commercial	Price	Final Submission	Withdraw Bid	Delete Bid	No Bid Saved

13. For each type of event the event details including start time and close time the details will be given on the top of the page.
14. To submit the tender, the bidder has to start from top left and submit the details one by one.
15. For 2 cover with price bid in excel, the bidder has to submit technical bid, by filling the details and clicking the save button.

Purchaser's Specification			Agree
1 Technical Terms			
1.1	a		Agree with remarks
1.2	a		Remarks
1.3	a		AGREE
1.4	a		Agree
1.5	a		AGREE

- a) After the technical bid is saved, a bidder can proceed to uploading documents through the link upload docs:



- b) Please note that under no circumstance the price bid excel has to be uploaded here.
- c) After the documents have been uploaded, the bidder can click on download excel to download the excel format.
- d) Fill up the excel sheet as per the details given therein and tender document.
- e) To upload the filled up excel click on Upload Price Button, click on browse to select the file and then click on Upload and Save encrypt file.

- f) The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. Please note that at the end the bid must be final submit, otherwise the same will not be considered.

16. For E-Tender Technical Cum Price Bid:

- a. In the manner similar to above the bidder has to fill up Common terms, then press save button to submit.
- b. Then the bidder has to upload documents as per the list shown therein.
- c. Once the documents are uploaded the bidder has to submit the Technical and Price bids.
- d. The bidder can then click on final submit to finally submit the bid. In case of any amendments after final submit, click on delete bid button to delete the techno-commercial and price bids and resubmit the same. **Please note that at the end the bid must be final submit, otherwise the same will not be considered.**

Bidder's may note that in each case using the Delete bid button will only delete the bids and then the bidder can resubmit upload tender closing time.

Using the withdraw button the bid will be withdrawn and the bidder will not be allowed to submit any further bid in that event.

For any assistance regarding the Tender Document and/or term and conditions the bidders may contact WAPCOS:

For any assistance during bid submission, system settings etc. bidders may contact MSTC:

**Phone Number**  
**03322901004, 01123212357, 01123215163, 01123217850**

**Email**  
[mstcnro@mstcindia.co.in](mailto:mstcnro@mstcindia.co.in)

Please mention "Helpdesk" as subject while sending emails

**Availability**  
10 AM to 5:30 PM on all working days.

## **BID SUBMISSION**

The entire bid-submission would be online on ETS. Broad outline of submissions are as follows:

- Technical Bid (Volume-I of tender document and Volume-II Scope of Work & Technical Specifications)
- Financial bid (volume-III of tender document)

## **2.0 INSTRUCTIONS TO BIDDER**

The purpose of these instructions to serve as a guide to Bidders for preparing offer for carrying out the project in all respect.

- a) Submission of a tender by a tenderer implies that the tenderer has read this notice and all other Tender Documents and has made himself aware of the scope, the specifications, conditions of contract, local conditions and other factors having bearings on the execution of the work.
- b) WAPCOS Limited desires that the bidders, suppliers, and Sub-contractors under the Project, observe the highest standard of ethics during the performance, procurement and execution of such contracts. In pursuance of this requirement, WAPCOS Limited:

Defines, for the purposes of this provision, the terms set forth below:

- i. "Corrupt Practice" means the offering, giving, receiving, or soliciting, directly or indirectly, anything of value to influence improperly the actions of another party;
- ii. "Fraudulent Practice" means any act of submission of forged documentation, or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation, or to succeed in a competitive bidding process;

- iii. "Coercive Practice" means impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;
- iv. "Collusive Practice" means an arrangement between two or more parties designed to achieve an improper purpose, including influencing improperly the actions of another party.

Will reject the award of Contract, even at a later stage, if it determines that the bidder recommended/ selected for award/awarded has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices in competing for the Contract;

Will sanction a party or its successors, including declaring ineligible, either indefinitely or for a stated period of time, to participate in any further bidding/procurement proceedings under the Project, if it at any time determines that the party has, directly or through an agent, engaged in Corrupt, Fraudulent, Collusive, Or Coercive Practices in competing for, or in executing, the contract; and

The party may be required to sign an Integrity Pact, if required; and WAPCOS Limited will have the right to require the bidders, or its suppliers, contractors and consultants to permit WAPCOS Limited to inspect their accounts and records and other documents relating to the bid submission and contract performance and to have them audited by auditors appointed by WAPCOS Limited at the cost of the bidders.

The Bidder must obtain for himself on his own responsibility and at his own expenses all the information which may be necessary for the purpose of making a bid and for entering into a contract, must examine the Drawings, must inspect the sites of the work, acquaint himself with all local conditions, means of access to the work, nature of the work and all matters pertaining thereto. WAPCOS Limited will in no case be responsible or liable for those costs, regardless of the conduct or outcome of the bidding process.

- c) The Contract shall be governed by each SECTION OF TENDER DOCUMENT i.e. instructions to bidders, selection & qualifying criteria, scope of works, General Conditions for Contract (GCC), Special Conditions for Contract (SCC), Annexures, Forms, Drawings, Technical Specification, Addendum / Clarification / Corrigendum etc. and all other Conditions mentioned in the tender documents.
- d) All Bidders are hereby explicitly informed that conditional offers or offers with deviations from the Conditions of Contract, the bids not meeting the minimum eligibility criteria, Technical Bids not accompanied with EMD and Tender Document Fees of requisite amount in acceptable format, Bids in altered/modified formats, or in deviation with any other requirements stipulated in the tender documents are liable to be rejected.
- e) The bidders shall not tamper or modify any part of the tender documents in any manner. In case in part of the bid is found to be tampered or modified at any stage, the bids are liable

to be rejected, the contract is liable to be terminated and the full earnest deposit/retention money/performance guarantee will be forfeited and the bidder will be liable to be banned from doing any business with WAPCOS Limited.

- f) Incomplete Price bid shall be liable to be rejected, at the discretion of WAPCOS Limited. The total bid price shall cover the entire scope of works covered in the tender.

### **3.0 EARNEST MONEY DEPOSIT (EMD)**

- i. The Earnest Money Deposit as mentioned in NIT and shall be submitted in physical form in favor of WAPCOS Ltd payable at Gandhinagar.

The earnest money may be accepted only in the following forms:

- Demand Draft/ FDR of a Scheduled Commercial/ Nationalized Bank.
- Should be valid for 45 days beyond the bid validity period

The EMD of unsuccessful tenderer(s) except lowest three shall be refunded after finalization of tender process. WAPCOS Limited shall retain the Earnest Money deposit submitted by the successful tenderer until the tenderer submits the Performance Bank Guarantee (PBG). The successful Tenderer shall accept the LOA within 14 days from receipt of the same, failing which the EMD shall be forfeited and the work shall be awarded to the second Lowest qualified bidder as per merits, as per the sole discretion of WAPCOS, whose decision shall be binding and final. The EMD of second & Third Lowest Bidder shall be refunded on successful signing of contract Agreement by the tenderer.

If any tenderer withdraws or make any changes in his offer already submitted before the expiry of the above validity period or any extension thereof without the written consent of the company, the EMD amount shall be forfeited for such act of the tenderer.

WAPCOS Limited reserves the right of forfeiture of Earnest Money deposit (EMD) in case of the successful tenderer.

- After opening of Tender, revokes his tender within the validity period or increases his earlier quoted rates.
- Does not commence the work within the period as per LOA/Contract. In case, the LOA/Contract is silent in this regard then within 14days after Letter of Commencement.
- Non-submission of PBG within 14 days of receipt of LOA.
- EMD shall not carry any interest.

### **4.0 COST OF BIDDING**

The Bidder shall bear all costs associated with the preparation and submission of the Bid as well as costs associated for facilitating the evaluation. WAPCOS Limited shall in no case be responsible or liable for these costs, regardless of the conduct or outcome of the bidding process.

## 5.0 LANGUAGE OF BID

The Bid and all related correspondence and documents relating to the Project shall be in English language only. Supporting documents and printed literature furnished by the Bidder may be in another language provided they are accompanied by an accurate English translation, which shall be certified by a qualified translator. Any material that is submitted in a language other than English and which is not accompanied by an accurate English translation will not be considered.

## 6.0 CURRENCY OF BID

Bid prices shall be quoted in Indian Rupees.

Tender submitted by tenderer shall remain valid for acceptance as mentioned in NIT from the date set for submission of the tender. The tenderer shall not be entitled within the said period to revoke or cancel or vary the tender given or any item thereof, without the consent of WAPCOS Limited. In case tenderer revokes, cancels, or varies his tender in any manner without the consent of WAPCOS Limited, within this period, his earnest money shall be forfeited.

## 7.0 ANNEXURES

The successful Bidder shall submit the following formats and follow the guidelines as per "Section of Annexures" mentioned in tender document.

ANNEXURE – I	:	Guarantee to be executed by the contractor for removal of defects after completion in respect of water supply and sanitary installations
ANNEXURE – II	:	Guarantee bond to be executed by the contractor for water proofing treatment for toilets
ANNEXURE - III	:	Bank Guarantee format for EMD (not applicable)
ANNEXURE - IV	:	Form of Performance Security
ANNEXURE - V	:	Format for Affidavit
ANNEXURE - VI	:	Form of advance payment guarantee
ANNEXURE - VII	:	Form of Integrity Pact
ANNEXURE – VIII	:	Format of resume of proposed personnel
ANNEXURE – IX	:	Acceptable makes of materials
ANNEXURE- X	:	Safety Codes
ANNEXURE- XI	:	Model Rules for the protection of health and sanitary arrangements for workers employed by contractors

WAPCOS Limited reserves the right to reject any or all the bids or to cancel the Tender, without assigning any reason(s) whatsoever.

**For & on behalf of Tenderer**

**APPENDIX-I**

**BANK GUARANTEE FORMAT FOR EMD (not applicable)**

~~WHEREAS, M/s .....having their Registered / Head Office at ..... (hereinafter called "the Bidder") has submitted his Bid dated ..... for the ..... [hereinafter called "the Bid"] to M/s WAPCOS Limited (hereinafter called the Employer)~~

~~KNOW ALL PEOPLE by these presents that we ..... (name of the Bank) having our head office at ..... (hereinafter called "the Bank") are bound unto Employer in the sum of ..... for which payment well and truly to be made to the Employer, the Bank binds itself, its successors and assigns by these presents.~~

~~SEALED with the Common Seal of the said Bank this ..... day of ..... 2019.~~

~~THE CONDITIONS of this obligation are:~~

- ~~1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified; OR~~
- ~~2) If the Bidder having been notified of the acceptance of his bid by ..... during the period of Bid Validity:~~

~~We undertake to pay to the ..... up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Bidder will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above mentioned two conditions and specify the occurred condition or conditions.~~

## SECTION– II: SELECTION AND QUALIFYING CRITERIA

---

### 1.0 SITE VISIT

Intending Bidder(s) have to visit site to inspect and examine the site at his own cost and its surroundings and satisfy themselves before submitting their bids as to the nature of the work and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their bid. A bidder(s) shall be deemed to have full knowledge of the site whether he inspects it or not and no extra charge consequent on any misunderstanding or otherwise shall be allowed. The bidder(s) shall be responsible for arranging and maintaining at his own cost all materials, tools & plants, water, electricity access, facilities for workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder(s) implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which stores, tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of the work.

**Bidders are encouraged to visit the site to understand the actual scope of work/ site condition.**

### 2.0 GEOTECHNICAL & TOPOGRAPHICAL SURVEY (if required)

The Geotechnical & Topographical Survey may be required to understand the site better. No reimbursement other than the quoted cost shall be reimbursed to the bidder. However, on own interest bidders may conduct the necessary survey for better understanding of the site before submission of bids.

The Successful Tenderer shall confirm the sizes of each component by their own design and shall submit the same to WAPCOS for approval before construction. No extra claim shall be entertained by WAPCOS for increase in size of units by the Successful Tenderer.

### 3.0 QUALIFYING CRITERIA: ONLINE TECHNICAL BID SUBMISSION

The intending bidders must read the terms & conditions of tender documents carefully. He should only submit his technical bid if he considers himself eligible and he is in possession of all the documents required.

The Technical Bid shall be uploaded **with colored scanned copies of following documents. All the documents must be Serial wise as stated below along with check list.**

**FORMAT OF CHECK LIST**

Sr. No.	Particular of Document	Yes	No	Page Nos. (from – to)
1.	Original Authorization Letter to sign the Tender.			
2.	Scanned copy of EMD			
3.	Scanned copy of Demand Draft(for Tender Fee)			
4.	Letter of Transmittal on bidder letter Head to submit Technical Bid.			
<b>Eligibility criteria</b>				
5.	Yearly sales <b>Turnover and Audited Balance Sheet for Last 5 (Five) years</b> , including Profit & Loss Statement sending on the financial year 2019-20. (Form-A)			
6.	The contractor should not have incurred <b>any loss (profit after tax should be positive) in more than two years</b> during last five years ending 2019-20, duly audited by the Chartered Accountant.			
7.	<b>Turnover:</b> Average annual financial turnover of the bidder should be <b>at least 50% of the estimated cost</b> of work during the immediate last 3 consecutive financial years ending 2019-20. This should be duly audited by the Chartered Accountant.			
8.	The bidder should also have satisfactorily completed the works as mentioned below during the last seven years ending previous day of last date of submission of tender.  i) One similar completed work costing not less than 80% of the estimated cost of work.  Or  ii) Two similar completed works of order value each not less than 50% of the estimated cost of work.  Or  iii) Three similar completed works of order			



Sr. No.	Particular of Document	Yes	No	Page Nos. (from – to)
	<p>value not less than 40% of the estimated cost of work.</p> <p>“Similar work” means construction of bungalow/guest house/ government staff quarters /institutional buildings with all electrical &amp; interior works, directly executed for Central / State / PSU's. <b>(attested Completion certificate needs to be enclosed)</b></p> <p>Experience as sub-contractor / Nominated sub-contractor shall not be considered in “similar work experience” while evaluation.</p> <p>The experience certificate from the client equivalent to not below the rank of Executive Engineer shall only be considered. The experience of sublet works / in house / private / foreign work shall not be considered.</p> <p>The value of executed works shall be brought to the current level by enhancing the actual value of work done at a simple rate of 7% per annum, calculated from the date of completion of last day of the month previous to the one in which applications are invited.</p>			
9.	<p>The bidder should not be insolvent, in receivership, bankrupt or being wound up, not have had their business activities suspended. Accordingly, Bidder shall submit Solvency certificate with details of Financial Status i.e. Name of the Banker &amp; Current Solvency Certificate (i.e the solvency certificate shall be dated after the date of publication) from the Banker in original for a sum of at least <b>40% of the estimated cost of work. (Form-B)</b></p>			
10.	<p>Name, Address, details of the Organization, Name(s) of the Owner/Partners/Promoters and Directors of the firm / company. <b>(Form-C)</b></p>			

Sr. No.	Particular of Document	Yes	No	Page Nos. (from – to)
11.	Copy of P.F and PAN Number.			
12.	Goods and Service Tax (GST): Bidders are advised to get themselves registered for GST in at different place, which are mandatory, as per Govt. of India notification regarding GST. Accordingly, bidder shall submit relevant documents if already registered. If not registered till date of submission of bid, bidder will give undertaking on bidder letter head stating that they will get registered in GST as per Govt. norms before submission of bills.			
13.	The bidder should be an Indian Registered Company under Companies Act 1956/ Proprietorship Company/ Partnership Company/ Limited company private or public or corporation.  <b>Joint Ventures are not accepted.</b>  Copy of Certificate of Incorporation / Registration / Partnership Deed or any other relevant document, as applicable, should be submitted along with a copy of address proof.			
14.	A Certificate of registration as approved contractor of concerned State Government/ Railway/CPWD/ Government bodies.			
15.	Bidder should not be blacklisted/ debarred by any government/ semi government department/ PSU. Bidder should submit the declaration (Form-D) of not being ineligible for corrupt or fraudulent practices			
16.	Letter of understanding the project site on bidder letter Head (Form-E).			
17.	'No Deviation Certificate' in prescribed format in Bidder's Letter Head (Form-F).			
18.	Consent Letter to execute the Integrity Pact (Form-G).			

Sr. No.	Particular of Document	Yes	No	Page Nos. (from – to)
19.	Information of Key Technical Representatives who is going to associate with the Project (Annexure-VIII).			
20.	Details of the Equipment's /Machinery owned /hired by the Bidder for the Project(Form-I).			
21.	<p>BID Capacity: The Bidder who inter alia meet the minimum qualification criteria will be qualified only if their available Bid Capacity is more than the Total Tendered Value. The available Bid Capacity will be calculated as per following based on information mentioned enclosed in the Bid Format for Bid Capacity.</p> <p>Assessed available Bid Capacity <math>= (A * N * 2 - B)</math>, Where  N= Number of years prescribed for completion of work for which Bid is invited</p> <p>A= Maximum value of civil engineering works in respect of projects executed in any one year during the last five years (updated to the price level of the year indicated in table below under note) taking into account the completed as well as works in progress.</p> <p>B = Value (updated to the price level of the year indicated in table below under note) of existing commitments and on-going works to be completed during the period of completion of the works for which BID is invited.</p> <p>Note-1: The bidder is required to submit the declaration of his financial liabilities, work on hand/completed projects on Rs.100/- Non Judicial stamp paper. In case of false statement/ declaration the bidder shall be liable for penal action. Further, the details furnished in the relevant form as per tender should be in line to the declaration by the bidder.</p>			

Sr. No.	Particular of Document	Yes	No	Page Nos. (from – to)												
	(Annexure XIII). <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>Year</th> <th>Year 1</th> <th>Year 2</th> <th>Year 3</th> <th>Year 4</th> <th>Year 5</th> </tr> </thead> <tbody> <tr> <td>Updation Factor</td> <td>1</td> <td>1.05</td> <td>1.10</td> <td>1.15</td> <td>1.20</td> </tr> </tbody> </table>	Year	Year 1	Year 2	Year 3	Year 4	Year 5	Updation Factor	1	1.05	1.10	1.15	1.20			
Year	Year 1	Year 2	Year 3	Year 4	Year 5											
Updation Factor	1	1.05	1.10	1.15	1.20											
22.	Bidder shall submit Information on litigation history, liquidated damages, disqualification etc. in bidder Letter Head.															
23.	Power of Attorney duly authorized by a notary public, if power is delegated for signing the Bid to other person by the Bidder.															

No information relating to financial terms of services should be included in the technical bid. Bids are to be submitted to determine that the bidder has a full comprehension of the tendered work. Where a bidder technical submittal is found non - compliant with the requirement or work, it may be rejected. This process is to assure that only technical acceptable bids are considered for the tendered work.

#### Evaluation Criteria

The bidder will be technically qualified based on above mentioned Eligibility Criteria’s. The financial Bid of only those Bidders who are technically qualified shall be opened. The Bid shall be evaluated on Least Cost Basis (LCS).

#### 4.0 OFFLINE SUBMISSIONS OF DOCUMENTS (PHYSICAL SUBMISSION)

The Bidder shall submit following Document offline also.

- 1) **All the documents in ORIGINAL, mentioned in “Section-II: Selection and Qualifying Criteria” in Para 3: Qualifying Criteria for Technical Bid i.e. at Sr. No. (1) to (23) along with checklist & page numbering** in separate sealed envelope clearly labelled as “TECHNICAL BID” for the Work (Write Name of Work/Project as mentioned in NIT) along with Details of Bidders Address, Phone, E-mail on Envelope.
- 2) **Originals EMD and Tender submission fees** in separate sealed envelope clearly labelled as “EMD AND TENDER FEE” for the Work (Write Name of Work/Project as mentioned in NIT) along with Details of Bidders Address, Phone, E-mail on Envelope.

***NOTE: The offline submissions as mentioned above shall be submitted on WAPCOS address mentioned in NIT as per date & time mentioned in NIT otherwise bids are liable to be rejected.***

## **5.0 CONTENTS OF FINANCIAL BID**

The Financial Bid shall be uploaded online only before last date & time of submission of Tender Document along with Technical bid.

The estimated cost mentioned in NIT is based on the rates of item of works in R&B & GWSSB Schedule of Rates and Non-SOR items on market rate. The quoted rate filled in Schedule of Quantities, should include all associated costs with the project including any out of pocket / mobilization expenses, TDS, taxes including GST if any applicable as per Govt. terms, shall be paid by the Contractor.

It is mandatory to bidders to deposit GST within time limit framed by Govt. of India, if applicable. The Goods and Services Tax (GST), shall only be paid to the Agency on submission of proof of deposition of GST.

The company shall be performing all its duties of deduction of TDS and other deduction on payment made to the contractor as per applicable legislation.

The tenderer shall quote rates up to zero decimal and as well as in words. In case of any discrepancy rate quoted in words shall prevail.

The payment will be made as per the Price schedule and Terms of Payment.

### **Note for submission:**

1. Bidders shall take due care to ensure that the documents uploaded by them in the e-Procurement platform are virus free. If the Employer is unable to download the Documents due to a virus and /or the downloaded documents are not legible, such Bids shall be rejected and the Employer will not be liable for the same.
2. Employer shall not accept any responsibility for failures or breakdowns for systems other than in those systems strictly within the control of the Employer and its e-Tendering service provider.
3. The onus is on the Bidder to ensure availability of the requisite infrastructure and systems required for online bid submission viz. Digital Signature Certificates and as applicable Digital Encryption Certificates required for bid submission in the e-Tendering platform, reliable internet connectivity and requisite client software.
4. Bidder is informed to get acquainted with the bid submission process in e-Tendering platform by contacting the e-Tendering service provider.
5. Bidder is solely responsible for safe keeping of its Digital Signature Certificate (DSC) and as applicable Digital Encryption Certificate (DEC).

6. The Employer reserves the right to verify original copies of scanned documents uploaded by bidders. The employer may seek additional documentary evidence on their technical proposals, which the bidder shall provide either online via the e-Tendering platform or in manual form.

7. Bidders shall upload their bid documents in formats, which can be opened and read by open standard interfaces.

8. Bidders shall not lock electronic files uploaded in their proposal with passwords of their choice. The Employer reserves the right to reject password locked files outright and not consider contents within such locked files for bid.

### **6.0 OPENING OF FINANCIAL BID**

The financial bids of the technically qualified bidders shall be opened at the notified date & time mentioned in NIT. Technically qualified bidders may send their representative at the time of opening.

The company reserves the right to waive minor deviations if they do not materially affect the capability of the Tenderer to perform the contract.

**For & on behalf of Tenderer**

**(Signature)**

## SECTION– III: GENERAL CONDITIONS TO CONTRACT

---

### 1.0 GENERAL RULES AND DIRECTIONS

- 1) The work proposed for execution by contract will be notified in a form of invitation to tender by publication in Newspapers and / or posted on website as the case may be.  
This form will state the work to be carried out, as well as the date for submitting and opening tenders and the time allowed for carrying out the work, also the amount of earnest money to be deposited with the tender, and the amount of the security deposit and Performance guarantee to be deposited by the successful tenderer and the percentage, if any, to be deducted from bills.
- 2) In the event of the tender being submitted by a firm, it must be signed separately by each partner thereof or in the event of the absence of any partner, it must be signed on his behalf by a person holding a Power of Attorney authorizing him to do so, such power of attorney to be produced with the tender, and it must disclose that the firm is duly registered under the Indian Partnership Act, 1952.
- 3) Receipts for payment made on account of work, when executed by a firm, must also be signed by all the partners, except where contractors are described in their tender as a firm, in which case the receipts must be signed in the name of the firm by one of the partners, or by some other person having due authority to give effectual receipts for the firm.
- 4) The rate(s) must be quoted in decimal coinage. Amounts must be quoted in full rupees by ignoring fifty paise and considering more than fifty paise as rupee one. In case the lowest tendered amount (worked out on the basis of quoted rate of Individual items) of two or more contractors is same, then such lowest contractors may be asked to submit sealed revised offer quoting rate of each item of the schedule of quantity for all sub sections/sub heads as the case may be, but the revised quoted rate of each item of schedule of quantity for all sub sections/sub heads should not be higher than their respective original rate quoted already at the time of submission of tender. The lowest tender shall be decided on the basis of revised offer.  
If the revised tendered amount (worked out on the basis of quoted rate of individual items) of two or more contractors received in revised offer is again found to be equal, then the lowest tender, among such contractors, shall be decided by draw of lots and the lowest contractors those have quoted equal amount of their tenders.  
In case of any such lowest contractor in his revised offer quotes rate of any item more than their respective original rate quoted already at the time of submission of tender, then such revised offer shall be treated invalid. Such case of revised offer of the lowest contractor shall be treated as withdrawal of his tender before acceptance and 100 % of his earnest money shall be forfeited.

- 5) The designated committee will open tenders in the presence of any intending contractors who may be present at the time, and will enter the amounts of the several tenders in a comparative statement in a suitable form. In the event of a tender being accepted, a receipt for the earnest money shall thereupon be given to the contractor who shall thereupon for the purpose of identification sign copies of the specifications and other documents. In the event of a tender being rejected, the earnest money shall thereupon be returned to the contractor remitting the same, without any interest.
- 6) WAPCOS shall have the right of rejecting all or any of the tenders and will not be bound to accept the lowest or any other tender
- 7) The receipt of an accountant or clerk for any money paid by the contractor will not be considered as any acknowledgment or payment to the officer inviting tender and the contractor shall be responsible for seeing that he procures a receipt signed by the officer inviting tender or a duly authorized Cashier.
- 8) The memorandum of work tendered for and the schedule of materials to be supplied by the WAPCOS and their issue-rates, shall be filled and completed in the office of the officer inviting tender before the tender form is issued. If a form is issued to an intending tenderer without having been so filled in and incomplete, he shall request the officer to have this done before he completes and delivers his tender.
- 9) The tenderers shall sign a declaration under the officials Secret Act 1923, for maintaining secrecy of the tender documents drawings or other records connected with the work given to them.
- 10) In the case of Item Rate Tenders, only rates quoted shall be considered. Any tender containing percentage below/above the rates quoted is liable to be rejected. Rates quoted by the contractor in item rate tender in figures and words shall be accurately filled in so that there is no discrepancy in the rates written in figures and words. However, if a discrepancy is found, the rates which correspond with the amount worked out by the contractor shall unless otherwise proved be taken as correct. If the amount of an item is not worked out by the contractor or it does not correspond with the rates written either in figures or in words, then the rates quoted by the contractor in words shall be taken as correct. Where the rates quoted by the contractor in figures and in words tally, but the amount is not worked out correctly, the rates quoted by the contractor will unless otherwise proved be taken as correct and not the amount. In event no rate has been quoted for any item(s), leaving space both in figure(s), word(s), and amount blank, it will be presumed that the contractor has included the cost of this/these item(s) in other items and rate for such item(s) will be considered as zero and work will be required to be executed accordingly.
- 11) In the case of any tender where unit rate of any item/items appear unrealistic, such tender will be considered as unbalanced and in case the tenderer is unable to provide satisfactory explanation, such a tender is liable to be disqualified and rejected.
- 12) All rates shall be quoted on the tender form. The amount for each item should be worked out and requisite totals given. Special care should be taken to write the rates in



figures as well as in words and the amount in figures only, in such a way that interpolation is not possible. The total amount should be written both in figures and in words. In case of figures, the word 'Rs.' should be written before the figure of rupees and word 'P' after the decimal figures, e.g. 'Rs. 2.15 P' and in case of words, the word, 'Rupees' should precede and the word 'Paise' should be written at the end. Unless the rate is in whole rupees and followed by the word 'only' it should invariably be upto two decimal places. While quoting the rate in schedule of quantities, the word 'only' should be written closely following the amount and it should not be written in the next line.

- 13) The Contractor, whose tender is accepted, will be required to furnish performance guarantee of 5% (Ten Percent) of the tendered amount within the period specified in Special Conditions of Contract.

The contractor whose tender is accepted will also be required to furnish by way of Security Deposit for the fulfillment of his contract, an amount equal to 2.5% of the tendered value of the work. The Security deposit will be collected by deductions from the running bills as well as final bill of the contractor at the rates of 2.5% of the amount of the Bill. On acceptance of the tender, the name of the accredited representative(s) of the contractor who would be responsible for taking instructions from the Engineer-in-Charge shall be communicated in writing to the Engineer-in-Charge.

- 14) GST/CESS, purchase tax, turnover tax or any other tax applicable in respect of this contract shall be payable by the Contractor and Government will not entertain any claim whatsoever in respect of the same.

In view of implementation of GST w.e.f. 01.07.17 by Govt. of India, bidders are advised to quote their rates considering the positive (+ve) / negative (-ve) cost impact on their rates in present scenario.

However, in respect of Goods and Services Tax, same shall be paid by the contractor to the concerned department on demand and it will only be paid/reimbursed to him by the Engineer-in-Charge after satisfying that it has been actually and genuinely paid by the contractor.

- 15) The tender for the work shall not be witnessed by a contractor or contractors who himself/themselves has/have tendered or who may and has/have tendered for the same work. Failure to observe this condition would render, tenders of the contractors tendering, as well as witnessing the tender, liable to summary rejection.

- 16) The contractor shall give a list of employees related to him

- 17) The tender for composite work includes, in addition to building work, all other works such as sanitary and water supply installations drainage installation, electrical work, horticulture work, roads and paths etc. The tenderer apart from being a registered contractor Government of Gujarat, must associate himself with agencies of appropriate class which are eligible to tender for sanitary and water supply drainage, electrical and horticulture works in the composite tender.

- 18) The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and WAPCOS may in his discretion, without prejudice to any other right or remedy available in law, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

## 2.0 CONDITIONS OF CONTRACT

- Definitions
- 1 The Contract means the documents forming the tender and acceptance thereof and the formal agreement executed between the WAPCOS and the Contractor, together with the documents referred to therein including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Engineer-In-Charge and all these documents taken together, shall be deemed to form one contract and shall be complementary to one another.
  - 2 In the contract, the following expressions shall, unless the context otherwise requires, have the meanings, hereby respectively assigned to them: -
    - “Client / Employer” shall mean “WAPCOS Limited”, A Government of India undertaking- Ministry of Jal Shakti, for execution of the “Selection of contractor for various infrastructure Construction works in Gujarat National Law University Campus”
    - i. Having their Registered office at “5th Floor, "Kailash Building", 26, Kasturba Gandhi Marg, New Delhi - 110 001” & include their successors & permitted assigns as well as their authorized officer/ representatives
    - ii. The “COMPANY / WAPCOS” shall mean WAPCOS Limited.
    - iii. The expression works or work shall, unless there be something either in the subject or context repugnant to such construction, be construed and taken to mean the works by or by virtue of the contract contracted to be executed whether temporary or permanent, and whether original, altered, substituted or additional.
    - iv. The Site shall mean the land/or other places on, into or through which work is to be executed under the contract or any adjacent land, path or street through which work is to be executed under the contract or any adjacent land, path or street which may be allotted or used for the purpose of carrying out the contract.
    - v. The Contractor shall mean the individual, firm or company, whether

incorporated or not, undertaking the works and shall include the legal personal representative of such individual or the persons composing such firm or company, or the successors of such firm or company and the permitted assignees of such individual, firm or company.

vi. The Engineer-in-charge means the Engineer Officer appointed by WAPCOS or his duly authorized representative who shall direct, supervise and be in charge of the work for the purpose of this Contract

vii. Accepting Authority shall mean the authority mentioned in Special Conditions of Contract.

viii. Tenderer / Bidder shall mean the firm/party who intends to participate in this Notice Inviting Tender

ix. Excepted Risk are risks due to riots (other than those on account of contractor's employees), war (whether declared or not) invasion, act of foreign enemies, hostilities, civil war, rebellion revolution, insurrection, military or usurped power, any acts of Government, damages from aircraft, acts of God, such as earthquake, lightening and unprecedented floods, and other causes over which the contractor has no control and accepted as such by the Accepting Authority or causes solely due to use or occupation by Government of the part of the works in respect of which a certificate of completion has been issued or a cause solely due to Government's faulty design of works.

x. Market Rate shall be the rate as decided by the Engineer-in-Charge on the basis of the cost of materials and labour at the site where the work is to be executed plus the percentage mentioned in Special Conditions of Contract to cover, all overheads and profits.

xi. Schedule(s) referred to in these conditions shall mean the relevant schedule(s) annexed to the tender papers or the standard Schedule of Rates of the government mentioned in Special Conditions of Contract hereunder, with the amendments thereto issued up to the date of receipt of the tender.

xii. District Specifications means the specifications followed by the State Government in the area where the work is to be executed.

xiii. The Contractor/Successful Bidder shall mean the firm or company whose bid has been accepted by WAPCOS.

xiv. Consultant shall mean any consultant nominated by the WAPCOS

			<p>xv. Tendered value means the value of the entire work as stipulated in the letter of award.</p> <p>xvi. Date of commencement of work: The date of commencement of work shall be the date of start as specified in Special Conditions of Contract or the first date of handing over of the site, whichever is later, in accordance with the phasing if any, as indicated in the tender document.</p>
Scope and Performance	3	Where the context so requires, words imparting the singular only also include the plural and vice versa. Any reference to masculine gender shall whenever required include feminine gender and vice versa.	
	4	Headings and Marginal notes to these General Conditions of Contract shall not be deemed to form part thereof or be taken into consideration in the interpretation or construction thereof or of the contract.	
	5	The contractor shall be furnished, free of cost one certified copy of the product brochures of equipment offered and such other printed and published documents, together with all drawings as may be forming part of the tender papers. None of these documents shall be used for any purpose other than that of this contract.	
Works to be carried out	6	The work to be carried out under the Contract shall, except as otherwise provided in these conditions, include all labour, materials, tools, plants, equipment and transport which may be required in preparation of and for and in the full and entire execution and completion of the works. The descriptions given in the Schedule of Quantities/ Building Components shall, unless otherwise stated, be held to include wastage on materials, carriage and cartage, carrying and return of empties, hoisting, setting, fitting and fixing in position and all other labours necessary in and for the full and entire execution and completion of the work as aforesaid in accordance with good practice and recognized principles.	
Sufficiency of Tender	7	The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the (Not Applicable) Cost quoted in the Schedule of Quantities/ Building Components, which rates and prices shall, except as otherwise provided, cover all his obligations under the Contract and all matters and things necessary for the proper completion and maintenance of the works.	
Discrepancies and	8	The several documents forming the Contract are to be taken as mutually explanatory of one another, detailed drawings being followed in	

- Adjustment of Errors preference to small scale drawing and figured dimensions in preference to scale and special conditions in preference to General Conditions.
- 8.1 In the case of discrepancy between the schedule of Quantities/Building Components, the Specifications and/ or the Drawings, the following order of preference shall be observed: -
- i. Description of Schedule of Quantities/ Building Components.
  - ii. Particular Specification and Special Condition, if any.
  - iii. Drawings.
  - iv. CPWD Specifications.
  - v. Indian Standard Specifications of B.I.S.
- 8.2 If there are varying or conflicting provisions made in any one document forming part of the contract, the Accepting Authority shall be the deciding authority with regard to the intention of the document and his decision shall be final and binding on the contractor.
- 8.3 Any error in description, quantity or rate in Schedule of Quantities or any omission therefrom shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to drawings and specifications or from any of his obligations under the contract.
- Signing of Contract 9 The successful tenderer/contractor, on acceptance of his tender by the Accepting Authority, shall, within 14 days from the stipulated date of start of the work, sign the contract consisting of:-
- i. The Successful tenderer will have to execute an agreement in stamp paper worth Rs.300/- as prescribed in form.
  - ii. Special Conditions of Contract consisting of:
    - a) Various standard clauses with corrections up to the date stipulated in Special Conditions of Contract along with annexures thereto.
    - b) Safety Code.
    - c) Model Rules for the protection of health, sanitary arrangements for workers employed WAPCOS or its contractors.
    - d) Contractor's Labour Regulations.

- e) List of Acts and omissions for which fines can be imposed.
- iii. No payment for the work done will be made unless contract is signed by the contractor.

### 3.0 CLAUSES OF CONTRACT

#### CLAUSE 1: PERFORMANCE GUARANTEE

- 1) The contractor shall submit an irrevocable **Performance Guarantee of 5% (FIVE percent) of the tendered amount in form of BG** in addition to other deposits mentioned elsewhere in the contract for his proper performance of the contract agreement, (not withstanding and/or without prejudice to any other provisions in the contract) within period specified in Special Conditions of Contract from the date of issue of letter of acceptance (LoA). This period can be further extended by the Engineer-in-Charge up to a maximum period as specified in Special Conditions of Contract on written request of the contractor stating the reason for delays in procuring the Performance Guarantee, to the satisfaction of the Engineer-in-Charge. This guarantee shall be in the form of Demand Draft/ FDR of any scheduled bank (in case guarantee amount is less than Rs. 1,00,000/-).
- 2) The Performance Guarantee shall be initially valid up to the stipulated date of completion specified in Special Conditions of Contract. In case the time for completion of work gets enlarged, the contractor shall get the validity of Performance Guarantee extended to cover such enlarged time for completion of work. After recording of the completion certificate for the work by the competent authority, the performance guarantee shall be returned to the contractor, without any interest.
- 3) The Engineer-in-Charge shall not make a claim under the performance guarantee except for amounts to which the WAPCOS is entitled under the contract (not withstanding and/or without prejudice to any other provisions in the contract agreement) in the event of:
  - a. Failure by the contractor to extend the validity of the Performance Guarantee as described herein above, in which event the Engineer-in-Charge may claim the full amount of the Performance Guarantee.
  - b. Failure by the contractor to pay WAPCOS any amount due, either as agreed by the contractor or determined under any of the Clauses/Conditions of the agreement, within 30 days of the service of notice to this effect by Engineer-in-Charge.
- 4) In the event of the contract being determined or rescinded under provision of any of the Clause/Condition of the agreement, the performance guarantee shall stand forfeited in full.
- 5) The Performance Guarantee shall be returned to the Contractor soon after the completion of works and issuance of the completion certificate.

**CLAUSE 1A: RECOVERY OF SECURITY DEPOSIT**

The Bidder whose tender(s) may be accepted (hereinafter called the contractor) shall permit WAPCOS at the time of making any payment to it for the work done under the contract to deduct a sum at the rate of 2.5% of the gross amount of each running and final bill till the sum deducted will amount to security deposit of 2.5% of the tendered value of the work. Such deductions will be made and held by WAPCOS till the successful completion of Defect Liability Period as mentioned in NIT.

**CLAUSE 2: COMPENSATION FOR DELAY**

If the contractor fails to maintain the required progress in terms of clause 5 or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the purview of the Contract on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the authority specified in Special Conditions of Contract (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day/month (as applicable) that the progress remains below that specified in Clause 5 or that the work remains incomplete.

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

- 1 Compensation for delay of work @ 0.5 % per week of delay to be computed on per day basis

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

The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the WAPCOS. In case, the contractor does not achieve a particular milestone mentioned in Special Conditions of Contract, or the re-scheduled milestone(s) in terms of Clause 5.4, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of Extension of Time. Withholding of this amount on failure to achieve a milestone, shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However, no interest, whatsoever, shall be payable on such withheld amount.

**CLAUSE 2A: INCENTIVE FOR EARLY COMPLETION**

In case, the contractor completes the work ahead of updated stipulated date of completion considering the effect of extra work (to be calculated on pro-rata basis as cost of extra work X

stipulated period/tendered cost), a bonus @ 1% (one per cent) of the tendered value per month computed on per day basis, shall be payable to the contractor, subject to a maximum limit of 5% (five per cent) of the tendered value. The amount of bonus, if payable, shall be paid along with final bill after completion of work. Provided always that provision of the Clause 2A shall be applicable only when so provided in 'Special Conditions of Contract'.

**CLAUSE 3: WHEN CONTRACT CAN BE DETERMINED**

Subject to other provisions contained in this clause, the Engineer-in-Charge may, without prejudice to his any other rights or remedy against the contractor in respect of any delay, inferior workmanship, any claims for damages and/or any other provisions of this contract or otherwise, and whether the date of completion has or has not elapsed, by notice in writing absolutely determine the contract in any of the following cases:

- i. If the contractor having been given by the Engineer-in-Charge a notice in writing to rectify, reconstruct or replace any defective work or that the work is being performed in an inefficient or otherwise improper or unworkman like manner shall omit to comply with the requirement of such notice for a period of seven days thereafter.
- ii. If the contractor has, without reasonable cause, suspended the progress of the work or has failed to proceed with the work with due diligence so that in the opinion of the Engineer-in-Charge (which shall be final and binding) he will be unable to secure completion of the work by the date for completion and continues to do so after a notice in writing of seven days from the Engineer-in-Charge.
- iii. If the contractor fails to complete the work within the stipulated date or items of work with individual date of completion, if any stipulated, on or before such date(s) of completion and does not complete them within the period specified in a notice given in writing in that behalf by the Engineer-in-Charge.
- iv. If the contractor persistently neglects to carry out his obligations under the contract and/ or commits default in complying with any of the terms and conditions of the contract and does not remedy it or take effective steps to remedy it within 7 days after a notice in writing is given to him in that behalf by the Engineer-in-Charge.
- v. If the contractor shall offer or give or agree to give to any person in WAPCOS service or to any other person on his behalf any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any act in relation to the obtaining or execution of this or any other contract for WAPCOS.
- vi. If the contractor shall enter into a contract with WAPCOS in connection with which commission has been paid or agreed to be paid by him or to his knowledge, unless the particulars of any such commission and the terms of payment thereof have been previously disclosed in writing to the Engineer-in-Charge.
- vii. If the contractor had secured the contract with WAPCOS as a result of wrong tendering or other non-bonafide methods of competitive tendering or commits breach of Integrity Agreement.



- viii. If the contractor being an individual, or if a firm, any partner thereof shall at any time be adjudged insolvent or have a receiving order or order for administration of his estate made against him or shall take any proceedings for liquidation or composition (other than a voluntary liquidation for the purpose of amalgamation or reconstruction) under any Insolvency Act for the time being in force or make any conveyance or assignment of his effects or composition or arrangement for the benefit of his creditors or purport so to do, or if any application be made under any Insolvency Act for the time being in force for the sequestration of his estate or if a trust deed be executed by him for benefit of his creditors.
- ix. If the contractor being a company shall pass a resolution or the court shall make an order that the company shall be wound up or if a receiver or a manager on behalf of a creditor shall be appointed or if circumstances shall arise which entitle the court or the creditor to appoint a receiver or a manager or which entitle the court to make a winding up order.
- x. If the contractor shall suffer an execution being levied on his goods and allow it to be continued for a period of 21 days.
- xi. If the contractor assigns, transfers, sublets (engagement of labour on a piece-work basis or of labour with materials not to be incorporated in the work, shall not be deemed to be subletting) or otherwise parts with or attempts to assign, transfer, sublet or otherwise parts with the entire works or any portion thereof without the prior written approval of the Engineer -in-Charge.

When the contractor has made himself liable for action under any of the cases aforesaid, the Engineer-in-Charge on behalf of the WAPCOS shall have powers:

- a) To determine the contract as aforesaid (of which termination notice in writing to the contractor under the hand of the Engineer-in-Charge shall be conclusive evidence). Upon such determination, the Security Deposit already recovered and Performance Guarantee under the contract shall be liable to be forfeited and shall be absolutely at the disposal of the WAPCOS.
- b) After giving notice to the contractor to measure up the work of the contractor and to take such whole, or the balance or part thereof, as shall be un-executed out of his hands and to give it to another contractor to complete the work. The contractor, whose contract is determined as above, shall not be allowed to participate in the tendering process for the balance work.

In the event of above courses being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any materials or entered into any engagements or made any advances on account or with a view to the execution of the work or the performance of the contract. And in case action is taken under any of the provision aforesaid, the contractor shall not be entitled to recover or be paid any sum for any work thereof or actually performed under this contract

unless and until the Engineer-in-Charge has certified in writing the performance of such work and the value payable in respect thereof and he shall only be entitled to be paid the value so certified.

**CLAUSE 3A Performance Guarantee**

In case, the work cannot be started due to reasons not within the control of the contractor within 1/8th of the stipulated time for completion of work or one month whichever is higher, either party may close the contract. In case contractor wants to close the contract, he shall give notice to the WAPCOS stating the failure on the part of WAPCOS. In such eventuality, the Performance Guarantee of the contractor shall be refunded within following time limits:

- a) Tendered value of work is up to Rs. 45 lacs: 15 days
- b) If the Tendered value of work is more than Rs. 45 lacs and up to Rs. 2.5 Crore: 21 days
- c) If the Tendered value of work exceeds Rs. 2.5 Crore: 30 days

**CLAUSE 4: CONTRACTOR LIABLE TO PAY COMPENSATION EVEN IF ACTION NOT TAKEN UNDER CLAUSE 3**

In any case in which any of the powers conferred upon the Engineer-in-Charge by Clause-3 thereof, shall have become exercisable and the same are not exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable in the event of any future case of default by the contractor and the liability of the contractor for compensation shall remain unaffected. In the event of the Engineer-in-Charge putting in force all or any of the powers vested in him under the preceding clause he may, if he so desires after giving a notice in writing to the contractor, take possession of (or at the sole discretion of the Engineer-in-Charge which shall be final and binding on the contractor) use as on hire (the amount of the hire money being also in the final determination of the Engineer-in-Charge) all or any tools, plant, materials and stores, in or upon the works, or the site thereof belonging to the contractor, or procured by the contractor and intended to be used for the execution of the work/or any part thereof, paying or allowing for the same in account at the contract rates, or, in the case of these not being applicable, at current market rates to be certified by the Engineer-in-Charge, whose certificate thereof shall be final, and binding on the contractor, clerk of the works, foreman or other authorized agent to remove such tools, plant, materials, or stores from the premises (within a time to be specified in such notice) in the event of the contractor failing to comply with any such requisition, the Engineer-in-Charge may remove them at the contractor's expense or sell them by auction or private sale on account of the contractor and his risk in all respects and the certificate of the Engineer-in-Charge as to the expenses of any such removal and the amount of the proceeds and expenses of any such sale shall be final and conclusive against the contractor.

**CLAUSE 5: TIME AND EXTENSION FOR DELAY**

The time allowed for execution of the Works as specified in the Special Conditions of Contract or the extended time in accordance with these conditions shall be the essence of the Contract. The execution of the works shall commence from such time period as mentioned in Special

Conditions of Contract or from the date of handing over of the site whichever is later. If the Contractor commits default in commencing the execution of the work as aforesaid, WAPCOS shall without prejudice to any other right or remedy available in law, be at liberty to forfeit the performance guarantee absolutely.

As soon as possible after the Contract is concluded, the Contractor shall submit a Time and Progress Chart for each mile stone and get it approved by the WAPCOS. The Chart shall be prepared in direct relation to the time stated in the Contract documents for completion of items of the works. It shall indicate the forecast of the dates of commencement and completion of various trades of sections of the work and may be amended as necessary by agreement between the Engineer-in-Charge and the Contractor within the limitations of time imposed in the Contract documents, and further to ensure good progress during the execution of the work, the contractor shall in all cases in which the time allowed for any work, exceeds one month (save for special jobs for which a separate Programme has been agreed upon) complete the work as per mile stones given in Special Conditions of Contract.

(a) Project Management shall be done by using project management software for works costing more than Rs. 5 Crore.

(b) The project management shall be done using M.S. Project software for works costing more than Rs. 5 Crore and up to Rs. 20 Crore.

(c) For works costing more than Rs. 20 Crore, project management shall be done using Primavera Software.

### **5.1 PROGRAMME CHART**

- i. The Contractor shall prepare an integrated Programme chart in MS Project/Primavera software for the execution of work, showing clearly all activities from the start of work to completion, with details of manpower, equipment and machinery required for the fulfillment of the Programme within the stipulated period or earlier and submit the same for approval to the Engineer-in-Charge within ten days of award of the contract. A recovery of Rs. 500/- (for works costing up to Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per day basis in case of delay in submission of the above Programme.
- ii. The programme chart should include the following:
  - (a) Descriptive note explaining sequence of the various activities.
  - (b) Network (PERT / CPM / BAR CHART).
  - (c) Programme for procurement of materials by the contractor.Programme of procurement of machinery / equipment's having adequate capacity, commensurate with the quantum of work to be done within the stipulated period, by the contractor. In addition to above, to achieve the progress of Work as per Programme, the contractor must bring at site adequate shuttering material required for cement concrete and R.C.C. works etc. for three floors within one month from the date of start

of work till the completion of RCC work as per requirement of work. The contractor shall submit shuttering schedule adequate to complete structure work within laid down physical milestone.

- iii. If at any time, it appears to the Engineer-in-Charge that the actual progress of work does not conform to the approved Programme referred above or after rescheduling of milestones, the contractor shall produce a revised Programme within 7 (seven) days, showing the modifications to the approved Programme to ensure timely completion of the work. The modified schedule of Programme shall be approved by the Engineer in Charge. A recovery of Rs. 500/- (for works costing up to Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per day basis in case of delay in submission of the modified Programme.
- iv. The submission for approval by the Engineer-in-Charge of such Programme or such particulars shall not relieve the contractor of any of the duties or responsibilities under the contract. This is without prejudice to the right of Engineer-in-Charge to take action against the contractor as per terms and conditions of the agreement.
- v. The contractor shall submit the progress report using MS Project/Primavera software with base line Programme referred above for the work done during previous month to the Engineer-in-charge on or before 5th day of each month failing which a recovery Rs. 500/ - (for works costing upto Rs. 20 Crores) / Rs. 5000/- (for works costing more than Rs. 20 Crores) shall be made on per day basis in case of delay in submission of the monthly progress report.

**5.2 If the work(s) be delayed by: -**

- i. force majeure, or
- ii. abnormally bad weather, or
- iii. serious loss or damage by fire, or
- iv. civil commotion, local commotion of workmen, strike or lockout, affecting any of the trades employed on the work, or
- v. delay on the part of other contractors or tradesmen engaged by Engineer-in- Charge in executing work not forming part of the Contract, or
- vi. non-availability of stores, which are the responsibility of WAPCOS to supply or
- vii. non-availability or break down of tools and Plant to be supplied or supplied by WAPCOS or
- viii. any other cause which, in the absolute discretion of the Engineer-in-Charge is beyond the Contractor's control.

then upon the happening of any such event causing delay, the Contractor shall immediately give notice thereof in writing to the authority as indicated in Special Conditions of Contract but shall nevertheless use constantly his best endeavors to prevent or make good the delay and shall do all that may be reasonably required to the satisfaction of the Engineer-in-Charge to proceed with the works.

5.3 Request for rescheduling of Mile stones and extension of time, to be eligible for consideration, shall be made by the Contractor in writing within fourteen days of the happening of the event causing delay on the prescribed form to the authority as indicated in Special Conditions of Contract. The Contractor may also, if practicable, indicate in such a request the period for which extension is desired.

5.4 In any such case the authority as indicated in Special Conditions of Contract may give a fair and reasonable extension of time and reschedule the mile stones for completion of work. Such extension or rescheduling of the milestones shall be communicated to the Contractor by the authority as indicated in Special Conditions of Contract in writing, within 3 months or 4 weeks of the date of receipt of such request respectively. Non application by the contractor for extension of time/ rescheduling of the milestones shall not be a bar for giving a fair and reasonable extension/ rescheduling of the milestones by the authority as indicated in Special Conditions of Contract and this shall be binding on the contractor.

#### **CLAUSE 6: MEASUREMENTS OF WORK DONE**

- Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement, the value in accordance with the contract of work done.
- All measurement of all items having financial value shall be entered in Measurement Book and/or level field book so that a complete record is obtained of all works performed under the contract.
- All measurements and levels shall be taken jointly by the Engineer-in-Charge or his authorized representative and by the contractor or his authorized representative from time to time during the progress of the work and such measurements shall be signed and dated by the Engineer- in-Charge and the contractor or their representatives in token of their acceptance. If the contractor objects to any of the measurements recorded, a note shall be made to that effect with reason and signed by both the parties. If for any reason the contractor or his authorized representative is not available and the work of recording measurements is suspended by the Engineer-in-Charge or his representative, the Engineer-in-Charge and the WAPCOS shall not entertain any claim from contractor for any loss or damages on this account. If the contractor or his authorized representative does not remain present at the time of such measurements after the contractor or his authorized representative has been given a notice in writing three (3) days in advance or fails to countersign or to record objection within a week from the date of the measurement, then such measurements recorded in his absence by the Engineer-in-Charge or his representative shall be deemed to be accepted by the Contractor.
- The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for measurements and recording levels.
- Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in

the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available, then a mutually agreed method shall be followed.

- The contractor shall give, not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work, before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing, the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.
- Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the WAPCOS to check the measurements recorded jointly or otherwise as aforesaid and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.
- It is also a term of this contract that recording of measurements of any item of work in the measurement book and/or its payment in the interim, on account or final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

#### **CLAUSE 6A: COMPUTERIZED MEASUREMENT BOOK**

- Engineer-in-Charge shall, except as otherwise provided, ascertain and determine by measurement the value of work done in accordance with the contract.
- All measurements of all items having financial value shall be entered by the contractor and compiled in the shape of the Computerized Measurement Book having pages of A-4 size as per the format of the WAPCOS so that a complete record is obtained of all the items of works performed under the contract.
- All such measurements and levels recorded by the contractor or his authorized representative from time to time, during the progress of the work, shall be got checked by the contractor from the Engineer-in-Charge or his authorized representative as per interval or program fixed in consultation with Engineer-in-Charge or his authorized representative. After the necessary corrections made by the Engineer-in-Charge, the

measurement sheets shall be returned to the contractor for incorporating the corrections and for resubmission to the Engineer-in-Charge for the dated signatures by the Engineer-in-Charge and the contractor or their representatives in token of their acceptance.

- Whenever bill is due for payment, the contractor would initially submit draft computerized measurement sheets and these measurements would be got checked/test checked from the Engineer-in-Charge and/or his authorized representative. The contractor will, thereafter, incorporate such changes as may be done during these checks/test checks in his draft computerized measurements, and submit to the WAPCOS a computerized measurement book, duly bound, and with its page's machine numbered. The Engineer-in-Charge and/or his authorized representative would thereafter check this MB, and record the necessary certificates for their checks/test checks.
- The final, fair, computerized measurement book given by the contractor, duly bound, with its page's machine numbered, should be 100% correct, and no cutting or over-writing in the measurements would thereafter be allowed. If at all any error is noticed, the contractor shall have to submit a fresh computerized MB with its pages duly machine numbered and bound. The contractor shall submit two spare copies of such computerized MB's for the purpose of reference and records.
- The contractor shall also submit to the WAPCOS separately his computerized Abstract of Cost and the bill based on these measurements, duly bound, and its page's machine numbered along with two spare copies of the bill. Thereafter, this bill will be processed by the Engineer-In-Charge
- The contractor shall, without extra charge, provide all assistance with every appliance, labour and other things necessary for checking of measurements/levels by the Engineer-in-Charge or his representative.
- Except where any general or detailed description of the work expressly shows to the contrary, measurements shall be taken in accordance with the procedure set forth in the specifications notwithstanding any provision in the relevant Standard Method of measurement or any general or local custom. In the case of items which are not covered by specifications, measurements shall be taken in accordance with the relevant standard method of measurement issued by the Bureau of Indian Standards and if for any item no such standard is available then a mutually agreed method shall be followed.
- The contractor shall give not less than seven days' notice to the Engineer-in-Charge or his authorized representative in charge of the work before covering up or otherwise placing beyond the reach of checking and/or test checking the measurement of any work in order that the same may be checked and/or test checked and correct dimensions thereof be taken before the same is covered up or placed beyond the reach of checking and/or test checking measurement and shall not cover up and place beyond reach of measurement any work without consent in writing of the Engineer-in-Charge or



his authorized representative in charge of the work who shall within the aforesaid period of seven days inspect the work, and if any work shall be covered up or placed beyond the reach of checking and/or test checking measurements without such notice having been given or the Engineer-in-Charge's consent being obtained in writing the same shall be uncovered at the Contractor's expense, or in default thereof no payment or allowance shall be made for such work or the materials with which the same was executed.

- Engineer-in-Charge or his authorized representative may cause either themselves or through another officer of the WAPCOS to check the measurements recorded by contractor and all provisions stipulated herein above shall be applicable to such checking of measurements or levels.
- It is also a term of this contract that checking and/or test checking the measurements of any item of work in the measurement book and/or its payment in the interim, on account of final bill shall not be considered as conclusive evidence as to the sufficiency of any work or material to which it relates nor shall it relieve the contractor from liabilities from any over measurement or defects noticed till completion of the defects liability period.

**CLAUSE 7: PAYMENT ON INTERMEDIATE CERTIFICATE TO BE REGARD AS ADVANCE**

- No payment shall be made for work, estimated to cost Rs. Twenty thousand or less till after the whole of the work shall have been completed and certificate of completion given. For works estimated to cost over Rs. Twenty thousand, the interim or running account bills shall be submitted by the contractor for the work executed on the basis of such recorded measurements on the format of the WAPCOS in triplicate on or before the date of every month fixed for the same by the Engineer-in-Charge. The contractor shall not be entitled to be paid any such interim payment if the gross work done together with net payment/ adjustment of advances for material collected, if any, since the last such payment is less than the amount specified in Special Conditions of Contract, in which case the interim bill shall be prepared on the appointed date of the month after the requisite progress is achieved. Engineer-in-Charge shall arrange to have the bill verified by taking or causing to be taken, where necessary, the requisite measurements of the work. In the event of the failure of the contractor to submit the bills, Engineer-in-Charge shall prepare or cause to be prepared such bills in which event no claims whatsoever due to delays on payment including that of interest shall be payable to the contractor. Payment on account of amount admissible shall be made by the Engineer-in- Charge certifying the sum to which the contractor is considered entitled by way of interim payment at such rates as decided by the Engineer-in-Charge. The amount admissible shall be paid by 10th working day after the day of presentation of the bill by the Contractor to the Engineer-in-Charge together with the account of the material issued by the WAPCOS, or dismantled materials, if any. In the case of works outside the headquarters of the Engineer- in-Charge, the period of ten working days will be extended to fifteen working days.



- All such interim payments shall be regarded as payment by way of advances against final payment only and shall not preclude the requiring of bad, unsound and imperfect or unskilled work to be rejected, removed, taken away and reconstructed or re-erected. Any certificate given by the Engineer-in-Charge relating to the work done or materials delivered forming part of such payment, may be modified or corrected by any subsequent such certificate(s) or by the final certificate and shall not by itself be conclusive evidence that any work or materials to which it relates is/are in accordance with the contract and specifications. Any such interim payment, or any part thereof shall not in any respect conclude, determine or affect in any way powers of the Engineer-in-Charge under the contract or any of such payments be treated as final settlement and adjustment of accounts or in any way vary or affect the contract.
- Pending consideration of extension of date of completion, interim payments shall continue to be made as herein provided without prejudice to the right of the WAPCOS to take action under the terms of this contract for delay in the completion of work, if the extension of date of completion is not granted by the competent authority.
- The Engineer-in-Charge in his sole discretion on the basis of a certificate from the Engineer-In-Charge to the effect that the work has been completed up to the level in question make interim advance payments without detailed measurements for work done (other than foundations, items to be covered under finishing items) up to lintel level (including sunshade etc.) and slab level, for each floor working out at 75% of the assessed value. The advance payments so allowed shall be adjusted in the subsequent interim bill by taking detailed measurements thereof.
- In case of composite tenders, running payment for the major component shall be made by Engineer-In-Charge of major discipline to the main contractor. Running payment for minor component shall be made by the Engineer-in-Charge of the discipline of minor component directly to the main contractor.
- In case main contractor fails to make the payment to the contractor associated by him within 15 days of receipt of each running account payment, then on the written complaint of contractor associated for such minor component, Engineer in charge of minor component shall serve the show cause to the main contractor and if reply of main contractor either not received or found unsatisfactory, he may make the payment directly to the contractor associated for minor component as per the terms and conditions of the agreement drawn between main contractor and associate contractor fixed by him. Such payment made to the associate contractor shall be recovered by Engineer-in-charge of major or minor component from the next R/A/ final bill due to main contractor as the case may be.

#### **CLAUSE 8: COMPLETION CERTIFICATE AND COMPLETION PLANS**

- Within ten days of the completion of the work, the contractor shall give notice of such completion to the Engineer-in-Charge and within thirty days of the receipt of such notice, the Engineer-in-Charge shall inspect the work and if there is no defect in the

work, shall furnish the contractor with a final certificate of completion, otherwise a provisional certificate of physical completion indicating defects (a) to be rectified by the contractor and/or (b) for which payment will be made at reduced rates, shall be issued. But no final certificate of completion shall be issued, nor shall the work be considered to be complete until the contractor shall have removed from the premises on which the work shall be executed all scaffolding, surplus materials, rubbish and all huts and sanitary arrangements required for his/their work people on the site in connection with the execution of the works as shall have been erected or constructed by the contractor(s) and cleaned off the dirt from all wood work, doors, windows, walls, floor or other parts of the building, in, upon, or about which the work is to be executed or of which he may have had possession for the purpose of the execution; thereof, and not until the work shall have been measured by the Engineer-in-Charge. If the contractor shall fail to comply with the requirements of this Clause as to removal of scaffolding, surplus materials and rubbish and all huts and sanitary arrangements as aforesaid and cleaning off dirt on or before the date fixed for the completion of work, the Engineer-in-Charge may at the expense of the contractor remove such scaffolding, surplus materials and rubbish etc., and dispose of the same as he thinks fit and clean off such dirt as aforesaid, and the contractor shall have no claim in respect of scaffolding or surplus materials as aforesaid except for any sum actually realized by the sale thereof.

**CLAUSE 8A: CONTRACTOR TO KEEP SITE CLEAN**

- When the annual repairs and maintenance of works are carried out, the splashes and droppings from white washing, colour washing, painting etc., on walls, floor, windows, etc shall be removed and the surface cleaned simultaneously with the completion of these items of work in the individual rooms, quarters or premises etc. where the work is done: without waiting for the actual completion of all the other items of work in the contract. In case the contractor fails to comply with the requirements of this clause, the Engineer-in-Charge shall have the right to get this work done at the cost of the contractor either WAPCOS or through any other agency. Before taking such action, the Engineer-in-Charge shall give ten days' notice in writing to the contractor.

**CLAUSE 8B: COMPLETION PLANS TO BE SUBMITTED BY THE CONTRACTOR**

- The contractor shall submit completion plan as required vide General Specifications for Electrical works (Part-I internal) 2005 and (Part-II External) 1994 as applicable within thirty days of the completion of the work.
- In case, the contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum equivalent to 2.5% of the value of the work subject to a ceiling of Rs. 15,000 (Rs. Fifteen thousand only) as may be fixed shall be final and binding on the contractor.
- The contractor shall submit completion plan for water, sewerage and drainage line plan within thirty days of the completion of the work.

- In case, the contractor fails to submit the completion plan as aforesaid, the WAPCOS will get it done through other agency at his cost and actual expenses incurred plus Rs. 15,000/- for the same shall be recovered from the contractor.

#### **CLAUSE 9: PAYMENT OF FINAL BILL**

- The final bill shall be submitted by the contractor in the same manner as specified in interim bills within three months of physical completion of the work or within one month of the date of the final certificate of completion furnished by the Engineer-in-Charge whichever is earlier. No further claims shall be made by the contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payments of those items of the bill in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by Engineer-in-Charge, will, as far as possible be made within the period specified here-in-under, the period being reckoned from the date of receipt of the bill by the Engineer-in-Charge or his authorized Engineer, complete with account of materials issued by the WAPCOS and dismantled materials.
  - a) Tendered value of work is up to Rs. 45 lacs - 2 months
  - b) If the Tendered value of work is more than Rs. 45 lacs and up to Rs. 2.5 Crore - 3 months
  - c) If the Tendered value of work exceeds Rs. 2.5 Crore: 6 months

#### **CLAUSE 9A: PAYMENT OF CONTRACTOR'S BILLS TO BANKS**

- Payments due to the contractor may, if so desired by him, be made to his bank, registered financial, co-operative or thrift societies or recognized financial institutions instead of direct to him provided that the contractor furnishes to the Engineer-in-Charge (1) an authorization in the form of a legally valid document such as a power of attorney conferring authority on the bank; registered financial, co-operative or thrift societies or recognized financial institutions to receive payments and (2) his own acceptance of the correctness of the amount made out as being due to him by WAPCOS or his signature on the bill or other claim preferred against WAPCOS before settlement by the Engineer-in-Charge of the account or claim by payment to the bank, registered financial, co-operative or thrift societies or recognized financial institutions. While the receipt given by such banks; registered financial, co-operative or thrift societies or recognized financial institutions shall constitute a full and sufficient discharge for the payment, the contractor shall whenever possible present his bills duly receipted and discharged through his bank, registered financial, co-operative or thrift societies or recognized financial institutions.
- Nothing herein contained shall operate to create in favour of the bank; registered financial, co-operative or thrift societies or recognized financial institutions any rights or equities vis-à-vis the WAPCOS.

**CLAUSE 10: MATERIALS SUPPLIED BY WAPCOS**

Not Applicable

**CLAUSE 10A: MATERIALS TO BE PROVIDED BY CONTRACTOR**

- The contractor shall, at his own expense, provide all materials, required for the works other than those which are stipulated to be supplied by the WAPCOS
- The contractor shall, at his own expense and without delay, supply to the Engineer-in-Charge samples of materials to be used on the work and shall get these approved in advance. All such materials to be provided by the Contractor shall be in conformity with the specifications laid down or referred to in the contract. The contractor shall, if requested by the Engineer-in-Charge furnish proof, to the satisfaction of the Engineer-in-Charge that the materials so comply. The Engineer-in-Charge shall within thirty days of supply of samples or within such further period as he may require intimate to the Contractor in writing whether samples are approved by him or not. If samples are not approved, the Contractor shall forthwith arrange to supply to the Engineer-in-Charge for his approval, fresh samples complying with the specifications laid down in the contract. When materials are required to be tested in accordance with specifications, approval of the Engineer-in-Charge shall be issued after the test results are received.
- The contractor shall submit an original warranty certificates to WAPCOS for all the supplied materials & equipment's under the scope of work.
  - Civil structure- required test certificates for strength as per CPWD norms
  - Mechanical Items including plumbing & hardware – Warranty certificates from OEM.
  - Electrical Items- Safety certification & Warranty certificates from OEM.
- The Contractor shall at his risk and cost submit the samples of materials to be tested or analyzed and shall not make use of or incorporate in the work any materials represented by the samples until the required tests or analysis have been made and materials finally accepted by the Engineer-in-Charge. The Contractor shall not be eligible for any claim or compensation either arising out of any delay in the work or due to any corrective measures required to be taken on account of and as a result of testing of materials.
- The contractor shall, at his risk and cost, make all arrangements and shall provide all facilities as the Engineer-in-Charge may require for collecting, and preparing the required number of samples for such tests at such time and to such place or places as may be directed by the Engineer-in-Charge and bear all charges and cost of testing unless specifically provided for otherwise elsewhere in the contract or specifications. The Engineer-in-Charge or his authorized representative shall at all times have access to the works and to all workshops and places where work is being prepared or from where materials, manufactured articles or machinery are being obtained for the works and the contractor shall afford every facility and every assistance in obtaining the right to such access.

- The Engineer-in-Charge shall have full powers to require the removal from the premises of all materials which in his opinion are not in accordance with the specifications and in case of default, the Engineer-in-Charge shall be at liberty to employ at the expense of the contractor, other persons to remove the same without being answerable or accountable for any loss or damage that may happen or arise to such materials. The Engineer-in-Charge shall also have full powers to require other proper materials to be substituted thereof and in case of default, the Engineer-in-Charge may cause the same to be supplied and all costs which may attend such removal and substitution shall be borne by the Contractor.
- The contractor shall at his own expense, provide a material testing lab at the site for conducting routine field tests. The lab shall be equipped at least with the testing equipment as specified in Special Conditions of Contract.
- Minimum 01-year warranty for Mechanical & Electrical Equipment's and other bought out items, at the discretion of WAPCOS Limited, if supplied directly by the contractor. The standard warranty period offered by the Manufacturer shall be retained, in case the original warranty period is more than one year.

*CLAUSE 10B : (i) SECURED ADVANCE ON NON-PERISHABLE MATERIALS*

- The contractor, on signing an indenture in the form to be specified by the Engineer-in-Charge, shall be entitled to be paid during the progress of the execution of the work up to 90% of the assessed value of any materials which are in the opinion of the Engineer-in-Charge non-perishable, non-fragile and non-combustible and are in accordance with the contract and which have been brought on the site in connection therewith and are adequately stored and/or protected against damage by weather or other causes but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be recovered/ deducted from the next payment made under any of the clause or clauses of this contract.
- Such secured advance shall also be payable on other items of perishable nature, fragile and combustible with the approval of the Engineer-in-Charge provided the contractor provides a comprehensive insurance cover for the full cost of such materials. The decision of the Engineer-in-Charge shall be final and binding on the contractor in this matter. No secured advance, shall however, be paid on high-risk materials such as ordinary glass, sand, petrol, diesel etc.

*CLAUSE 10B:(ii) MOBILISATION ADVANCE*

- Mobilization advance not exceeding 5% of the tendered value may be given, if requested by the contractor in writing within one month of the order to commence the work. Such advance shall be released by the Engineer-in-charge to the contractor on a request made by the contractor to the Engineer-in-Charge in this behalf.

- Before release of advance, the contractor shall execute a Bank Guarantee Bond from Scheduled Bank for the amount equal to 110% of the amount of advance and valid for the contract period. The Bank Guarantee against Mobilization Advance shall be release upon Acceptance of Performance Test & Commissioning by the Engineer-In-Charge.

*CLAUSE 10B: (iii) PLANT MACHINERY & SHUTTERING MATERIAL ADVANCE*

- An advance for plant, machinery & shuttering material required for the work and brought to site by the Contractor may be given if requested by the contractor in writing within one month of bringing such plant and machinery to site. Such advance shall be given on such plant and machinery which in the opinion of the Engineer-in-charge will add to the expeditious execution of work and improve the quality of work. The amount of advance shall be restricted to 5% percent of the tender value. In the case of new plant and equipment to be purchased for the work, the advance shall be restricted to 90% of the price of such new plant and equipment paid by the contractor for which the contractor shall produce evidence satisfactory to the Engineer-in-Charge. In the case of second hand and used plants and equipment, the amount of such advance shall be limited to 50% of the depreciated value of plant and equipment as may be decided by the Engineer-in-Charge. The contractor shall, if so required by the Engineer-in-Charge, submit the statement of value of such old plant and equipment duly approved by a Registered Valuer recognized by the Central Board of Direct Taxes under the Income- Tax Act, 1961. No such advance shall be paid on any plant and equipment of perishable nature and on any plant and equipment of a value less than Rs. 50,000/- Seventy-five per cent of such amount of advance shall be paid after the plant & equipment is brought to site and balance twenty-five percent on successfully commissioning the same.
- Leasing of equipment shall be considered at par with purchase of equipment and shall be covered by tripartite agreement with the following:
  1. Leasing company which gives certificate of agreeing to lease equipment to the contractor.
  2. Engineer in Charge, and
  3. The contractor.
- This advance shall further be subject to the condition that such plant and equipment (a) are considered by the Engineer-in-Charge to be necessary for the works; (b) and are in working order and are maintained in working order; (c) hypothecated to the WAPCOS as specified by the Engineer-in-Charge before the payment of advance is released. The contractor shall not be permitted to remove from the site such hypothecated plant and equipment without the prior written permission of the Engineer-in-Charge. The contractor shall be responsible for maintaining such plant and equipment in good working order during the entire period of hypothecation failing which such advance shall be entirely recovered in lump sum. For this purpose, steel scaffolding and form work shall be treated as plant and equipment.
- The contractor shall insure the Plant and Machinery for which mobilization advance is sought and given, for a sum sufficient to provide for their replacement at site. Any amounts not recovered from the insurer will be borne by the contractor.

**CLAUSE 10B: (iv) INTEREST & RECOVERY**

- The mobilization advance and plant and machinery advance in (ii) & (iii) above bear simple interest at the rate of 10 per cent per annum and shall be calculated from the date of payment to the date of recovery, both days inclusive, on the outstanding amount of advance. Recovery of such sums advanced shall be made by the deduction from the contractor's bills commencing after first 10% of the gross value of the work is executed and paid, on pro-rata percentage basis to the gross value of the work billed beyond 10% in such a way that the entire advance is recovered by the time 80% of the gross value of the contract is executed and paid, together with interest due on the entire outstanding amount up to the date of recovery of the installment.

**CLAUSE 10C: PAYMENT ON ACCOUNT OF INCREASE IN PRICE / WAGES DUE TO STATUTORY ORDER**

- If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour increases as a direct result of the coming into force of any fresh law, or statutory rule or order (but not due to any changes of rate in GST/CESS, Central/State Excise/Custom Duty) beyond the prices/wages prevailing at the time of the last stipulated date of receipt of tenders including extensions, if any, for the work during contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2, then the amount of the contract shall accordingly be varied and provided further that any such increase shall be limited to the price/wages prevailing at the time of updated stipulated date of completion considering effect of extra work (extra time to be calculated on prorata basis only as cost of extra work x stipulated period/tendered amount).
- If after submission of the tender, the price of any material incorporated in the works (excluding the materials covered under Clause 10CA and not being a material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 thereof) and/or wages of labour as prevailing at the time of last stipulated date of receipt of tender including extensions, if any, is decreased as a direct result of the coming into force of any fresh law or statutory rules or order (but not due to any changes of rate in GST/CESS, Central/State Excise/Custom Duty), WAPCOS shall in respect of materials incorporated in the works (excluding the materials covered under Clause 10CA and not being material supplied from the Engineer-in-Charge's stores in accordance with Clause 10 hereof) and/or labour engaged on the execution of the work after the date of coming into force of such law statutory rule or order be entitled to deduct from the dues of the contractor, such amount as shall be equivalent to the difference between the prices of the materials and/or wages as prevailed at the time of the last stipulated date for receipt of tenders including extensions if any for the work and the prices of materials and/or wages of labour on the coming into force of such law, statutory rule or order.



This will be applicable for the contract period including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2.

- Engineer-in-Charge may call books of account and other relevant documents from the contractor to satisfy himself about reasonability of increase in prices of materials and wages. The contractor shall, within a reasonable time of his becoming aware of any alteration in the price of any such materials and/or wages of labour, give notice thereof to the Engineer-in-Charge stating that the same is given pursuant to this condition together with all information relating thereto which he may be in position to supply.
- For this purpose, the labour component of the work executed during period under consideration shall be the percentage as specified in Special Conditions of Contract, of the value of work done during that period and the increase/decrease in labour shall be considered on the minimum daily wages in rupees of any unskilled adult male mazdoor, fixed under any law, statutory rule or order.

*CLAUSE 10 CA: PAYMENT DUE TO VARIATION IN PRICES OF MATERIALS AFTER RECEIPT OF TENDER*

- If after submission of the tender, the price of materials specified in Special Conditions of Contract increases/ decreases beyond the base price(s) as indicated in Special Conditions of Contract for the work, then the amount of the contract shall accordingly be varied and provided further that any such variations shall be effected for stipulated period of Contract including the justified period extended under the provisions of Clause 5 of the Contract without any action under Clause 2.
- However, for work done/during the justified period extended as above, it will be limited to indices prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work x stipulated period/tendered cost).
- The increase/decrease in prices of cement, steel reinforcement, structural steel and POL shall be determined by the Price Indices Economic Advisor to Government of India, Ministry of Commerce and Industry. For other items provided in the Special Conditions of Contract, this shall be determined by the All India Wholesale Price Indices of materials as published by Economic Advisor to Government of India, Ministry of Commerce and Industry. Base price for cement, steel reinforcement, structural steel and POL shall be as issued by the state / Central Govt. from time to time. In case, price index of a particular material is not issued by Ministry of Commerce and Industry, then the price index of nearest similar material as indicated in Special Conditions of Contract shall be followed.
- The amount of the contract shall accordingly be varied for all such materials and will be worked out as per the formula given Clause 10CA, Conditions of Contract of CPWD.



**CLAUSE 10CC: PAYMENT DUE TO INCREASE/DECREASE IN PRICES/WAGES (EXCLUDING MATERIALS COVERED UNDER CLAUSE 10 CA) AFTER RECEIPT OF TENDER FOR WORKS**

- If the prices of materials (not being materials supplied or services rendered at fixed prices by the WAPCOS in accordance with clause 10 & 34 thereof) and/or wages of labour required for execution of the work increase, the contractor shall be compensated for such increase as per provisions detailed below and the amount of the contract shall accordingly be varied, subject to the condition that that such compensation for escalation in prices and wages shall be available only for the work done during the stipulated period of the contract including the justified period extended under the provisions of clause 5 of the contract without any action under clause 2. However, for the work done during the justified period extended as above, the compensation as detailed below will be limited to prices/wages prevailing at the time of updated stipulated date of completion considering the effect of extra work (extra time to be calculated on pro-rata basis only as cost of extra work x stipulated period/tendered cost). No such compensation shall be payable for a work for which the stipulated period of completion.
- is equal to or less than the time as specified in Special Conditions of Contract. Such compensation for escalation in the prices of materials and labour, when due, shall be worked out based on the provisions mentioned in the Clause 10CC of CPWD Conditions of Contract.

**CLAUSE 10D : DISMANTLED MATERIAL WAPCOS PROPERTY**

- The contractor shall treat all materials obtained during dismantling of a structure, excavation of the site for a work, etc. as WAPCOS's property and such materials shall be disposed off to the best advantage of WAPCOS according to the instructions in writing issued by the Engineer-in-Charge.

**CLAUSE 11: WORKS TO BE EXECUTED IN ACCORDANCE WITH SPECIFICATIONS, DRAWINGS, ORDERS ETC.**

- The contractor shall execute the whole and every part of the work in the most substantial and workmanlike manner both as regards materials and otherwise in every respect in strict accordance with the specifications. The contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing in respect of the work signed by the Engineer-in-Charge and the contractor shall be furnished free of charge one copy of the contract documents together with specifications, designs, drawings and instructions as are not included in the standard specifications specified in Special Conditions of Contract or in any Bureau of Indian Standard or any other, published standard or code or, Schedule of Rates or any other printed publication referred to elsewhere in the contract.
- The contractor shall comply with the provisions of the contract and with the care and diligence execute and maintain the works and provide all labour and materials, tools

and plants including for measurements and supervision of all works, structural plans and other things of temporary or permanent nature required for such execution and maintenance in so far as the necessity for providing these, is specified or is reasonably inferred from the contract. The Contractor shall take full responsibility for adequacy, suitability and safety of all the works and methods of construction.

- All the prescribed Tests as per Central Public Works Department Manual/IS Codes of construction materials shall be carried out from the Govt./ NABL recognized Laboratory as may be approved by WAPCOS without any extra expenditure to WAPCOS.

#### **CLAUSE 12: DEVIATIONS / VARIATIONS EXTENT AND PRICING**

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

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

- (i) In the proportion which the additional cost of the altered, additional or substituted work, bears to the original tendered value plus
- (ii) 25% of the time calculated in (i) above or such further additional time as may be considered reasonable by the Engineer-in-Charge.

##### 12.2(a) Deviations, Extra Items and Pricing

The In the case of extra item(s) (items that are completely new, and are in addition to the items contained in the contract), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis, for the work and the engineer-in-charge shall within prescribed time limit of the receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

##### 12.2(b) Deviations, Substituted Items and Pricing.

In the case of substituted items (items that are taken up with partial substitution or in lieu of items of work in the contract), the rate for the agreement item (to be substituted) and substituted item shall also be determined in the manner as mentioned in the following para.

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

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

#### 12.2(c) Deviations, Deviated Quantities, Pricing

In the case of contract items, substituted items, contract cum substituted items, which exceed the limits laid down in Special Conditions of Contract, the contractor may within fifteen days of receipt of order or occurrence of the excess, claim revision of the rates, supported by proper analysis for the work in excess of the above mentioned limits, provided that if the rates so claimed are in excess of the rates specified in the schedule of quantities, the Engineer-in-Charge shall within prescribed time limit of receipt of the claims supported by analysis, after giving consideration to the analysis of the rates submitted by the contractor, determine the rates on the basis of the market rates and the contractor shall be paid in accordance with the rates so determined.

- a) Tendered value of work is up to Rs. 45 lac 30 days
- b) If the Tendered value of work is more than Rs. 45 lacs and up to Rs. 2.5 Crore 45 days
- c) If the Tendered value of work exceeds Rs. 2.5 Crore: 60 days

12.3 The provisions of the preceding paragraph shall also apply to the decrease in the rates of items for the work in excess of the limits laid down in Special Conditions of Contract, and the Engineer-in-Charge shall after giving notice to the contractor within one month of occurrence of the excess and after taking into consideration any reply received from him within fifteen days of the receipt of the notice, revise the rates for the work in question within one month of the expiry of the said period of fifteen days having regard to the market rates.

12.4 The contractor shall send to the Engineer-in-Charge once every fortnight, an up to date account giving complete details of all claims for additional payments to which the contractor may consider himself entitled and of all additional work ordered by the Engineer-in-Charge which he has executed during the preceding quarter failing which the contractor shall be deemed to have waived his right.

12.5 For the purpose of operation of Special Conditions of Contract, the following works shall be treated as works relating to foundation unless & otherwise defined in the contract:

(i) For Buildings: All works up to 1.2 meters above ground level or up to floor 1 level whichever is lower.

(ii) For abutments, piers and well staining: All works up to 1.2 m above the bed level.

(iii) For retaining walls, wing walls, compound walls, chimneys, overhead reservoirs/ tanks and other elevated structures: All works up to 1.2 meters above the ground level.

(iv) For reservoirs/tanks (other than overhead reservoirs/tanks): All works up to 1.2 meters above the ground level.

(v) For basement: All works up to 1.2 m above ground level or up to floor 1 level whichever is lower.

(vi) For Roads, all items of excavation and filling including treatment of sub base.

**12.6** Any operation incidental to or necessarily has to be in contemplation of tenderer while filing tender, or necessary for proper execution of the item included in the Schedule of quantities or in the schedule of rates mentioned above, whether or not, specifically indicated in the description of the item and the relevant specifications, shall be deemed to be included in the rates quoted by the tenderer or the rate given in the said schedule of rates, as the case may be. Nothing extra shall be admissible for such operations.

**CLAUSE 13: FORECLOSURE OF CONTRACT DUE TO ABANDONMENT OR REDUCTION IN SCOPE OF WORK**

- If at any time after acceptance of the tender, Engineer-in-charge shall decide to abandon or reduce the scope of the works for any reason whatsoever and hence not require the whole or any part of the works to be carried out, the Engineer-in-Charge shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the works in full but which he did not derive in consequence of the foreclosure of the whole or part of the works.
- The contractor shall be paid at contract rates, full amount for works executed at site.

**CLAUSE 14 : CARRYING OUT PART WORK AT RISK & COST OF CONTRACTOR**

- If contractor:
- At any time makes default during currency of work or does not execute any part of the work with due diligence and continues to do so even after a notice in writing of 7 days in this respect from the Engineer-in-Charge; or

- Commits default in complying with any of the terms and conditions of the contract and does not remedy it or takes effective steps to remedy it within 7 days even after a notice in writing is given in that behalf by the Engineer-in-Charge; or
- Fails to complete the work(s) or items of work with individual dates of completion, on or before the date(s) so determined, and does not complete them within the period specified in the notice given in writing in that behalf by the Engineer-in-Charge. The Engineer-in-Charge without invoking action under clause 3 may, without prejudice to any other right or remedy against the contractor which have either accrued or accrue thereafter to WAPCOS, by a notice in writing to take the part work / part incomplete work of any item(s) out of his hands and shall have powers to:

(a) Take possession of the site and any materials, constructional plant, implements, stores, etc., thereon; and/or

(b) Carry out the part work / part incomplete work of any item(s) by any means at the risk and cost of the contractor.

- The Engineer-in-Charge shall determine the amount, if any, is recoverable from the contractor for completion of the part work/ part incomplete work of any item(s) taken out of his hands and execute at the risk and cost of the contractor, the liability of contractor on account of loss or damage suffered by WAPCOS because of action under this clause shall not exceed 10% of the tendered value of the work.
- In determining the amount, credit shall be given to the contractor with the value of work done in all respect in the same manner and at the same rate as if it had been carried out by the original contractor under the terms of his contract, the value of contractor's materials taken over and incorporated in the work and use of plant and machinery belonging to the contractor. The certificate of the Engineer-in-Charge as to the value of work done shall be final and conclusive against the contractor provided always that action under this clause shall only be taken after giving notice in writing to the contractor. Provided also that if the expenses incurred by the WAPCOS are less than the amount payable to the contractor at his agreement rates, the difference shall not be payable to the contractor.
- Any excess expenditure incurred or to be incurred by WAPCOS in completing the part work/ part incomplete work of any item(s) or the excess loss of damages suffered or may be suffered by WAPCOS as aforesaid after allowing such credit shall without prejudice to any other right or remedy available to WAPCOS in law or per as agreement be recovered from any money due to the contractor on any account, and if such money is insufficient, the contractor shall be called upon in writing and shall be liable to pay the same within 30 days.
- If the contractor fails to pay the required sum within the aforesaid period of 30 days, the Engineer-in-Charge shall have the right to sell any or all of the contractors' unused materials, constructional plant, implements, temporary building at site etc.

and adjust the proceeds of sale thereof towards the dues recoverable from the contractor under the contract and if thereafter there remains any balance outstanding, it shall be recovered in accordance with the provisions of the contract.

- In the event of above course being adopted by the Engineer-in-Charge, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased or procured any materials or entered into any engagements or made any advance on any account or with a view to the execution of the work or the performance of the contract.

#### **CLAUSE 15 : SUSPENSION OF WORK**

- The contractor shall, on receipt of the order in writing of the Engineer-in-Charge, (whose decision shall be final and binding on the contractor) suspend the progress of the works or any part thereof for such time and in such manner as the Engineer-in-Charge may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of the following reasons:
  - (a) on account of any default on the part of the contractor or;
  - (b) for proper execution of the works or part thereof for reasons other than the default of the contractor; or
  - (c) for safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works to the extent necessary and carry out the instructions given in that behalf by the Engineer-in-Charge.

- If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:
  - (a) The contractor shall be entitled to an extension of time equal to the period of every such suspension PLUS 25%, for completion of the item or group of items of work for which a separate period of completion is specified in the contract and of which the suspended work forms a part, and;
  - (b) If the total period of all such suspensions in respect of an item or group of items or work for which a separate period of completion is specified in the contract exceeds thirty days, the contractor shall, in addition, be entitled to such compensation as the Engineer-in-Charge may consider reasonable in respect of salaries and/or wages paid by the contractor to his employees and labour at site, remaining idle during the period of suspension, adding thereto 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within fifteen days of the expiry of the period of 30 days.
- If the works or part thereof is suspended on the orders of the Engineer-in-Charge for more than three months at a time, except when suspension is ordered for reason (a) in subpara (i) above, the contractor may after receipt of such order serve a written notice on the Engineer-in-Charge requiring permission within fifteen days from receipt by the Engineer-in-Charge of the said notice, to proceed with the work or part thereof in regard to which progress has been suspended and if such permission is not granted within that time, the contractor, if he intends to treat the suspension, where it affects only a part of the works as an omission of such part by WAPCOS or where it affects whole of the works, as an

abandonment of the works by WAPCOS, shall within ten days of expiry of such period of 15 days give notice in writing of his intention to the Engineer-in-Charge. In the event of the contractor treating the suspension as an abandonment of the contract by WAPCOS, he shall have no claim to payment of any compensation on account of any profit or advantage which he might have derived from the execution of the work in full but which he could not derive in consequence of the abandonment. He shall, however, be entitled to such compensation, as the Engineer-in-Charge may consider reasonable, in respect of salaries and/or wages paid by him to his employees and labour at site, remaining idle in consequence adding to the total thereof 2% to cover indirect expenses of the contractor provided the contractor submits his claim supported by details to the Engineer-in-Charge within 30 days of the expiry of the period of 3 months.

**CLAUSE 15A: COMPENSATION IN CASE DELAY OF SUPPLY OF MATERIAL**

- The contractor shall not be entitled to claim any compensation from WAPCOS for the loss suffered by him on account of delay by WAPCOS in the supply of materials in Special Conditions of Contract where such delay is covered by the difficulties relating to the supply of wagons, force majeure or any reasonable cause beyond the control of the WAPCOS. This clause 15 A will not be applicable for works where no material is stipulated.

**CLAUSE 16: ACTION IN CASE WORK NOT DONE AS PER SPECIFICATIONS**

- All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-In-charge, his authorized subordinates in charge of the work and all the superior officers, officer of the Quality Assurance Unit of the WAPCOS or any organization engaged by the WAPCOS for Quality Assurance and of the Chief Technical Examiner's Office, and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has been given to the contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing, present for that purpose. Orders given to the Contractor's agent shall be considered to have the same force as if they had been given to the contractor himself.
- If it shall appear to the Engineer-in-charge or his authorized subordinates in charge of the work or to the Chief Engineer in charge of Quality Assurance or his subordinate officers or the officers of the organization engaged by the WAPCOS for Quality Assurance or to the Chief Technical Examiner or his subordinate officers, that any work has been executed with unsound, imperfect, or unskillful workmanship, or with materials or articles provided by him for the execution of the work which are unsound or of a quality inferior to that contracted or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months (six months in the case of work costing Rs. 10 Lac and below except road work) of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or remove and reconstruct the work so



specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 2 of the contract (for non-completion of the work in time) for this default.

- In such case the Engineer-in-Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the authority specified in Special Conditions of Contract may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-in-Charge to be conveyed in writing in respect of the same will be final and binding on the contractor.

**CLAUSE 17: CONTRACTOR LIABLE FOR DAMAGES, DEFECTS DURING DEFECT LIABILITY PERIOD**

- If the contractor or his working people or servants shall break, deface, injure or destroy any part of building in which they may be working, or any building, road, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of twelve months (six months in the case of work costing Rs. Ten lacs and below except road work) after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later.
- Provided that in the case of road work, if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient, to meet all liabilities of the contractor under this contract, half of the security deposit will be refundable after six months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.



- The defects liability period will be two years from the date of completion of development and construction works. During this period the Contractor will get the defects rectified without any cost to WAPCOS. For the item of water proofing roof treatment, the Contractor will give guarantee bond for ten years. Similarly, for other items, like electrical/mechanical equipment which have guarantee/warranty period beyond one year, wherever applicable as per manufacturer recommendations, will also be given guarantee bond by the Contractor to WAPCOS.

**CLAUSE 18: CONTRACTOR SUPPLY TOOLS & PLANTS ETC.**

- The contractor shall provide at his own cost all materials (except such special materials, if any, as may in accordance with the contract be supplied from the Engineer-in-Charge's stores), machinery, tools & plants as specified in Special Conditions of Contract. In addition to this, appliances, implements, other plants, ladders, cordage, tackle, scaffolding and temporary works required for the proper execution of the work, whether original, altered or substituted and whether included in the specifications or other documents forming part of the contract or referred to in these conditions or not, or which may be necessary for the purpose of satisfying or complying with the requirements of the Engineer-in-Charge as to any matter as to which under these conditions he is entitled to be satisfied, or which he is entitled to require together with carriage therefore to and from the work. The contractor shall also supply without charge the requisite number of persons with the means and materials, necessary for the purpose of setting out works, and counting, weighing and assisting the measurement for examination at any time and from time to time of the work or materials. Failing his so doing, the same may be provided by the Engineer-in-Charge at the expense of the contractor and the expenses may be deducted, from any money due to the contractor, under this contract or otherwise and/or from his security deposit or the proceeds of sale thereof, or of a sufficient portion thereof.

**CLAUSE 18A : RECOVERY OF COMPENSATION PAID TO WORKMEN**

- In every case in which by virtue of the provisions sub-section (1) of Section 12, of the Workmen's Compensation Act, 1923, WAPCOS is obliged to pay compensation to a workman employed by the contractor, in execution of the works, WAPCOS will recover from the contractor, the amount of the compensation so paid; and, without prejudice to the rights of the WAPCOS under sub-section (2) of Section 12, of the said Act, WAPCOS shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by WAPCOS to the contractor whether under this contract or otherwise. WAPCOS shall not be bound to contest any claim made against it under sub-section (1) of Section 12, of the said Act, except on the written request of the contractor and upon his giving to WAPCOS full security for all costs for which WAPCOS might become liable in consequence of contesting such claim.

**CLAUSE 18B: ENSURING PAYMENT AND AMENITIES TO WORKERS, IF CONTRACTOR FAILS**

- In every case in which by virtue of the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and of the Contract Labour (Regulation and Abolition) Central

Rules, 1971, WAPCOS is obliged to pay any amounts of wages to a workman employed by the contractor in execution of the works, or to incur any expenditure in providing welfare and health amenities required to be provided under the above said Act and the rules under Clause 19H or under the C.P.W.D. Contractor's Labour Regulations, or under the Rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by C.P.W.D. Contractors, WAPCOS will recover from the contractor, the amount of wages so paid or the amount of expenditure so incurred; and without prejudice to the rights of the WAPCOS under sub-section(2) of Section 20, and sub-section (4) of Section 21, of the Contract Labour (Regulation and Abolition) Act, 1970, WAPCOS shall be at liberty to recover such amount or any part thereof by deducting it from the security deposit or from any sum due by WAPCOS to the contractor whether under this contract or otherwise WAPCOS shall not be bound to contest any claim made against it under sub-section (1) of Section 20, sub-section (4) of Section 21, of the said Act, except on the written request of the contractor and upon his giving to the WAPCOS full security for all costs for which WAPCOS might become liable in contesting such claim.

**CLAUSE 19: LABOUR LAWS TO BE COMPLIED BY CONTRACTOR**

- The contractor shall obtain a valid license under the Contract Labour (R&A) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, before the commencement of the work, and continue to have a valid license until the completion of the work. The contractor shall also abide by the provisions of the Child Labour (Prohibition and Regulation) Act, 1986.
- The contractor shall also comply with the provisions of the building and other Construction Workers (Regulation of Employment & Conditions of Service) Act, 1996 and the building and other Construction Workers Welfare Cess Act, 1996.
- Any failure to fulfil these requirements shall attract the penal provisions of this contract arising out of the resultant non-execution of the work.

**CLAUSE 19A**

- No labour below the age of fourteen years shall be employed on the work.

**CLAUSE 19B : PAYMENT OF WAGES**

- The contractor shall pay to labour employed by him either directly or through subcontractors, wages not less than fair wages as defined in the C.P.W.D. Contractor's Labour Regulations or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970 and the contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.
- The contractor shall, notwithstanding the provisions of any contract to the contrary, cause to be paid fair wage to labour indirectly engaged on the work, including any

labour engaged by his sub-contractors in connection with the said work, as if the labour had been immediately employed by him.

- In respect of all labour directly or indirectly employed in the works for performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with the Contractor's Labour Regulations made by WAPCOS from time to time in regard to payment of wages, wage period, deductions from wages recovery of wages not paid and deductions unauthorized made, maintenance of wage books or wage slips, publication of scale of wages and other terms of employment, inspection and submission of periodical returns and all other matters of the like nature or as per the provisions of the Contract Labour (Regulation and Abolition) Act, 1970, and the Contract Labour (Regulation and Abolition) Central Rules, 1971, wherever applicable.
- The Engineer-in-Charge concerned shall have the right to deduct from the moneys due to the contractor any sum required or estimated to be required for making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the contract or non-observance of the Regulations.
- Under the provision of Minimum Wages (Central) Rules, 1950, the contractor is bound to allow to the labours directly or indirectly employed in the works one-day rest for 6 days' continuous work and pay wages at the same rate as for duty. In the event of default, the Engineer-in-Charge shall have the right to deduct the sum or sums not paid on account of wages for weekly holidays to any labours and pay the same to the persons entitled thereto from any money due to the contractor by the Engineer-in-Charge concerned.
- In the case of Union Territory of Delhi, however, as the all-inclusive minimum daily wages fixed under Notification of the Delhi Administration No.F.12(162) MWO/DAB/43884-91, dated 31-12-1979 as amended from time to time are inclusive of wages for the weekly day of rest, the question of extra payment for weekly holiday would not arise.
- The contractor shall comply with the provisions of the Payment of Wages Act, 1936, Minimum Wages Act, 1948, Employees Liability Act, 1938, Workmen's Compensation Act, 1923, Industrial Disputes Act, 1947, Maternity Benefits Act, 1961, and the Contractor's Labour (Regulation and Abolition) Act 1970, or the modifications thereof or any other laws relating thereto and the rules made thereunder from time to time.
- The contractor shall indemnify and keep indemnified WAPCOS against payments to be made under and for the observance of the laws aforesaid and the C.P.W.D. Contractor's Labour Regulations without prejudice to his right to claim indemnity from his sub-contractors.
- The laws aforesaid shall be deemed to be a part of this contract and any breach thereof shall be deemed to be a breach of this contract.
- Whatever is the minimum wage for the time being, or if the wage payable is higher than such wage, such wage shall be paid by the contractor to the workmen directly without the

intervention of Jamadar and that Jamadar shall not be entitled to deduct or recover any amount from the minimum wage payable to the workmen as and by way of commission or otherwise.

- The contractor shall ensure that no amount by way of commission or otherwise is deducted or recovered by the Jamadar from the wage of workmen.

#### CLAUSE 19C

- In respect of all labour directly or indirectly employed in the work for the performance of the contractor's part of this contract, the contractor shall at his own expense arrange for the safety provisions as per C.P.W.D. Safety Code framed from time to time and shall at his own expense provide for all facilities in connection therewith. In case the contractor fails to make arrangement and provide necessary facilities as aforesaid, he shall be liable to pay a penalty of Rs.200/- for each default and in addition, the Engineer-in-Charge shall be at liberty to make arrangement and provide facilities as aforesaid and recover the costs incurred in that behalf from the contractor.

#### CLAUSE 19 D

- The contractor shall submit by the 4th and 19th of every month, to the Engineer-in-Charge, a true statement showing in respect of the second half of the preceding month and the first half of the current month respectively: -
  - (1) the number of labourers employed by him on the work,
  - (2) their working yours,
  - (3) the wages paid to them,
  - (4) the accidents that occurred during the said fortnight showing the circumstances under which they happened and the extent of damage and injury caused by them, and
  - (5) The number of female workers who have been allowed maternity benefit according to Clause 19F and the amount paid to them.
- Failing which the contractor shall be liable to pay to WAPCOS, a sum not exceeding Rs.200/- for each default or materially incorrect statement. The decision of the Engineer-In-Charge shall be final in deducting from any bill due to the contractor; the amount levied as fine and be binding on the contractor.

#### CLAUSE 19 E

- In respect of all labour directly or indirectly employed in the works for the performance of the contractor's part of this contract, the contractor shall comply with or cause to be complied with all the rules framed by Government from time to time for the protection of health and sanitary arrangements for workers employed by the WAPCOS and its contractors.

#### CLAUSE 19 F

Leave and pay during leave shall be regulated as follows: -

##### 1. Leave:

(i) in the case of delivery - maternity leave not exceeding 8 weeks, 4 weeks up to and including the day of delivery and 4 weeks following that day,

(ii) in the case of miscarriage – up to 3 weeks from the date of miscarriage.

2. Pay:

(i) in the case of delivery - leave pay during maternity leave will be at the rate of the women's average daily earnings, calculated on total wages earned on the days when full time work was done during a period of three months immediately preceding the date on which she gives notice that she expects to be confined or at the rate of Rupee one only a day whichever is greater.

(ii) in the case of miscarriage - leave pay at the rate of average daily earning calculated on the total wages earned on the days when full time work was done during a period of three months immediately preceding the date of such miscarriage.

3. Conditions for the grant of Maternity Leave:

No maternity leave benefit shall be admissible to a woman unless she has been employed for a total period of not less than six months immediately preceding the date on which she proceeds on leave.

4. The contractor shall maintain a register of Maternity (Benefit) in the Prescribed Form and the same shall be kept at the place of work.

CLAUSE 19 G

- In the event of the contractor(s) committing a default or breach of any of the provisions of the WAPCOS, Contractor's Labour Regulations and Model Rules for the protection of health and sanitary arrangements for the workers as amended from time to time or furnishing any information or submitting or filing any statement under the provisions of the above Regulations and' Rules which is materially incorrect, he/they shall, without prejudice to any other liability, pay to the Government a sum not exceeding Rs.200/- for every default, breach or furnishing, making, submitting, filing such materially incorrect statements and in the event of the contractor(s) defaulting continuously in this respect, the penalty may be enhanced to Rs.200/- per day for each day of default subject to a maximum of 5 per cent of the estimated cost of the work put to tender. The decision of the Engineer-in-Charge shall be final and binding on the parties.
- Should it appear to the Engineer-in-Charge that the contractor(s) is/are not properly observing and complying with the provisions of the C.P.W.D. Contractor's Labour Regulations and Model Rules and the provisions of the Contract Labour (Regulation and Abolition) Act 1970, and the Contract Labour (R& A) Central Rules 1971, for the protection of health and sanitary arrangements for work-people employed by the contractor(s) (hereinafter referred as "the said Rules") the Engineer-in-Charge shall have

power to give notice in writing to the contractor(s) requiring that the said Rules be complied with and the amenities prescribed therein be provided to the work-people within a reasonable time to be specified in the notice. If the contractor(s) shall fail within the period specified in the notice to comply with and/observe the said Rules and to provide the amenities to the work-people as aforesaid, the Engineer-in-Charge shall have the power to provide the amenities hereinbefore mentioned at the cost of the contractor(s). The contractor(s) shall erect, make and maintain at his/their own expense and to approved standards all necessary huts and sanitary arrangements required for his/their work-people on the site in connection with the execution of the works, and if the same shall not have been erected or constructed, according to approved standards, the Engineer-in-Charge shall have power to give notice in writing to the contractor(s) requiring that the said huts and sanitary arrangements be remodeled and/or reconstructed according to approved standards, and if the contractor(s) shall fail to remodel or reconstruct such huts and sanitary arrangements according to approved standards within the period specified in the notice, the Engineer-in-Charge shall have the power to remodel or reconstruct such huts and sanitary arrangements according to approved standards at the cost of the contractor(s).

#### CLAUSE 19H

- The contractor(s) shall at his/their own cost provide his/their labour with a sufficient number of huts (hereinafter referred to as the camp) of the following specifications on a suitable plot of land to be approved by the Engineer-in-Charge.
  - (a) The minimum height of each hut at the eaves level shall be 2.10m (7 ft.) and the floor area to be provided will be at the rate of 2.7 sq.m. (30 sq.ft.) for each member of the worker's family staying with the labourer.
  - (b) The contractor(s) shall in addition construct suitable cooking places having a minimum area of 1.80m x 1.50m (6'x5') adjacent to the hut for each family.
  - (c) The contractor(s) shall also construct temporary latrines and urinals for the use of the labourers each on the scale of not less than four per each one hundred of the total strength, separate latrines and urinals being provided for women.
  - (d) The contractor(s) shall construct sufficient number of bathing and washing places, one unit for every 25 persons residing in the camp. These bathing and washing places shall be suitably screened.
- All the huts shall have walls of sun-dried or burnt-bricks laid in mud mortar or other suitable local materials as may be approved by the Engineer-in-Charge. In case of sun-dried bricks, the walls should be plastered with mud gobi on both sides. The floor may be kutcha but plastered with mud gobi and shall be at least 15 cm (6") above the surrounding ground. The roofs shall be laid with thatch or any other materials as may be approved by the Engineer-in-Charge and the contractor shall ensure that throughout the period of their occupation, the roofs remain water-tight.
- The contractor(s) shall provide each hut with proper ventilation.

- All doors, windows, and ventilators shall be provided with suitable leaves for security purposes.
- There shall be kept an open space of at least 7.2m (8 yards) between the rows of huts which may be reduced to 6m (20 ft.) according to the availability of site with the approval of the Engineer-in-Charge. Back to back construction will be allowed.
- Water Supply - The contractor(s) shall provide adequate supply of water for the use of labourers. The provisions shall not be less than two gallons of pure and wholesome water per head per day for drinking purposes and three gallons of clean water per head per day for bathing and washing purposes. Where piped water supply is available, supply shall be at stand posts and where the supply is from wells or river, tanks which may be of metal or masonry, shall be provided. The contractor(s) shall also at his/ their own cost make arrangements for laying pipe lines for water supply to his/ their labour camp from the existing mains wherever available, and shall pay all fees and charges therefore.
- The site selected for the camp shall be high ground, removed from jungle.
- **Disposal of Excreta** - The contractor(s) shall make necessary arrangements for the disposal of excreta from the latrines by trenching or incineration which shall be according to the requirements laid down by the Local Health Authorities. If trenching or incineration is not allowed, the contractor(s) shall make arrangements for the removal of the excreta through the Municipal Committee/authority and inform it about the number of labourers employed so that arrangements may be made by such Committee/authority for the removal of the excreta. All charges on this account shall be borne by the contractor and paid direct by him to the Municipality/authority. The contractor shall provide one sweeper for every eight seats in case of dry system.

Drainage - The contractor(s) shall provide efficient arrangements for draining away sullage water so as to keep the camp neat and tidy.

The contractor(s) shall make necessary arrangements for keeping the camp area sufficiently lighted to avoid accidents to the workers.

Sanitation - The contractor(s) shall make arrangements for conservancy and sanitation in the labour camps according to the rules of the Local Public Health and Medical Authorities.

#### CLAUSE 19I

- The Engineer-in-Charge may require the contractor to dismiss or remove from the site of the work any person or persons in the contractors' employ upon the work who may be incompetent or misconduct himself and the contractor shall forthwith comply with such requirements. In respect of maintenance/repair or renovation works etc. where the labour have an easy access to the individual houses, the contractor shall issue identity cards to the labourers, whether temporary or permanent and he shall be responsible for any untoward action on the part of such labour. AE/JE will display a list of contractors working in the colony/Blocks on the notice board in the colony and also at the service Centre, to apprise the residents about the same.

#### CLAUSE 19J



- It shall be the responsibility of the contractor to see that the building under construction is not occupied by anybody unauthorized during construction, and is handed over to the Engineer-in-Charge with vacant possession of complete building. If such building though completed is occupied illegally, then the Engineer-in-Charge shall have the option to refuse to accept the said building/buildings in that position. Any delay in acceptance on this account will be treated as the delay in completion and for such delay, a levy up to 5% of tendered value of work may be imposed by the WAPCOS whose decision shall be final both with regard to the justification and quantum and be binding on the contractor.
- However, WAPCOS, through a notice, may require the contractor to remove the illegal occupation any time on or before construction and delivery.

#### CLAUSE 19K : Employment of Skilled / Semi Skilled Workers

- The contractor shall, at all stages of work, deploy skilled/semi-skilled tradesmen who are qualified and possess certificate in particular trade from Industrial Training Institute/National Institute of construction Management and Research (NICMAR)/ National Academy of Construction, CIDC or any similar reputed and recognized Institute managed/ certified by State/Central Government. The number of such qualified tradesmen shall not be less than 20% of total skilled/semi-skilled workers required in each trade at any stage of work. The contractor shall submit number of man days required in respect of each trade, its scheduling and the list of qualified tradesmen along with requisite certificate from recognized Institute to Engineer in charge for approval. Notwithstanding such approval, if the tradesmen are found to have inadequate skill to execute the work of respective trade, the contractor shall substitute such tradesmen within two days of written notice from Engineer-in-Charge. Failure on the part of contractor to obtain approval of Engineer-in-Charge or failure to deploy qualified tradesmen will attract a compensation to be paid by contractor at the rate of Rs. 100 per such tradesman per day. Decision of Engineer in Charge as to whether particular tradesman possesses requisite skill and amount of compensation in case of default shall be final and binding.
- Provided always, that the provisions of this clause, shall not be applicable for works with estimated cost put to tender being less than Rs. 5 crores.

#### CLAUSE 20: MINIMUM WAGES ACT TO BE COMPLIED WITH

- The contractor shall comply with all the provisions of the Minimum Wages Act, 1948, and Contract Labour (Regulation and Abolition) Act, 1970, amended from time to time and rules framed thereunder and other labour laws affecting contract labour that may be brought into force from time to time.

#### CLAUSE 21: WORK NOT TO BE SUBLET. ACTION IN CASE OF INSOLVENCY

- The contract shall not be assigned or sublet without the written approval of the Engineer-in-Charge. And if the contractor shall assign or sublet his contract, or attempt to do so, or become insolvent or commence any insolvency proceedings or make any composition with



his creditors or attempt to do so, or if any bribe, gratuity, gift, loan, perquisite, reward or advantage pecuniary or otherwise, shall either directly or indirectly, be given, promised or offered by the contractor, or any of his servants or agent to any public officer or person in the employ of WAPCOS in any way relating to his office or employment, or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Engineer-in-Charge on behalf of the WAPCOS shall have power to adopt the course specified in Clause 3 hereof in the interest of WAPCOS and in the event of such course being adopted, the consequences specified in the said Clause 3 shall ensue.

#### **CLAUSE 22 COMPENSATION**

- All sums payable by way of compensation under any of these conditions shall be considered as reasonable compensation to be applied to the use of WAPCOS without reference to the actual loss or damage sustained and whether or not any damage shall have been sustained.

#### **CLAUSE 23 : CHANGES IN FIRM'S CONSTITUTION TO BE INTIMATED**

- Where the contractor is a partnership firm, the previous approval in writing of the Engineer-in-Charge shall be obtained before any change is made in the constitution of the firm. Where the contractor is an individual or a Hindu undivided family business concern, such approval as aforesaid shall likewise be obtained before the contractor enters into any partnership agreement where under the partnership firm would have the right to carry out the works hereby undertaken by the contractor. If previous approval as aforesaid is not obtained, the contract shall be deemed to have been assigned in contravention of Clause 21 hereof and the same action may be taken, and the same consequences shall ensue as provided in the said Clause 21.

#### **CLAUSE 24**

- All works to be executed under the contract shall be executed under the direction and subject to the approval in all respects of the Engineer-in-Charge who shall be entitled to direct at what point or points and in what manner they are to be commenced, and from time to time carried on.

#### **CLAUSE 25: SETTLEMENT OF DISPUTES & ARBITRATION**

"Any dispute, controversy or claims arising out of or relating to this Agreement or the breach, termination or invalidity thereof, shall be settled through following mechanism:

a) Firstly, the aggrieved party shall write a letter to the other party detailing its grievances and calling upon the other party to amicably resolve the dispute by convening a joint meeting. Accordingly, the parties as per their convenience shall jointly convene the said meeting(s). Where in minutes of the said meeting(s) shall be prepared and countersigned by all the parties. It is mandatory to prepare minutes of meeting(s) and to be countersigned by all the parties, irrespective of the outcome of the said meeting(s).

- b) In the event the parties are unable to reach on any settlement in the said meeting(s), then the aggrieved party shall mandatory resort to pre-litigation mediation mechanism with Delhi High Court Mediation Cell, New Delhi.
- c) It is only upon failure of the pre-litigation mediation mechanism with Delhi High Court Mediation Cell, and then the aggrieved party shall resort to resolution of disputes through arbitration of a Sole Arbitrator. The appointing authority of Sole Arbitrator is CMD, WAPCOS Limited, to which neither of the parties have any objection nor they shall ever object.
- d) Subject to the parties agreeing otherwise, the Arbitration proceedings shall be conducted in accordance with the provisions of the Indian Arbitration and Conciliation Act, 1996 (amended as on date).
- e) It is also acknowledged and accepted that WAPCOS is only working as Intermediary between the Associate/Sub-Consultant/Sub-Contractor and the Principal Employer/Client, thus in the event, any dispute arises under the present agreement and referred to Arbitration for adjudication, then subject to corresponding clause in the Contract/Agreement/Work Order/Arrangement between Principal Employer/Client & WAPCOS, Principal Employer/Client shall also be made party to the said Arbitration proceedings. Also, the award including costs if any passed against WAPCOS and costs incurred in the proceedings shall be the sole responsibility of Principal Employer/Client. The said clause if found in applicable, even then the other terms of the Arbitration Clause shall survive and shall be acted upon.
- f) The place/seat of arbitration shall be Delhi and any award whether interim or final, shall be made, and shall be deemed for all purposes between the parties to be made, in Delhi. The arbitral procedure shall be conducted in English language and any award or awards shall be rendered in English. The procedural law of the arbitration shall be Indian Law. The award of the arbitrator shall be final and conclusive and binding upon the Parties.
- g) The Contract and any dispute or claim arising out of or in connection with it or its subject matter or formation (including non-contractual disputes or claims) shall be governed by and construed in accordance with the laws of India and the Parties submit to sole & exclusive jurisdiction of courts at Delhi."

**CLAUSE 26: CONTRACTOR INDEMNIFY WAPCOS AGAINST PATENT RIGHTS**

- The contractor shall fully indemnify and keep indemnified the WAPCOS against any action, claim or proceeding relating to infringement or use of any patent or design or any alleged patent or design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claims made under or action brought against WAPCOS in respect of any such matters as aforesaid, the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expense, to settle any dispute or to conduct any litigation that may arise therefrom, provided that the contractor shall not be liable to indemnify the

WAPCOS if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Engineer-in-Charge in this behalf.

**CLAUSE 27: LUMP SUM PROVISIONS IN TENDER**

- When the estimate on which a tender is made includes lump sum in respect of parts of the work, the contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not, in the opinion of the Engineer-in-Charge payable of measurement, the Engineer-in-Charge may at his discretion pay the lump-sum amount entered in the estimate, and the certificate in writing of the Engineer-in-Charge shall be final and conclusive against the contractor with regard to any sum or sums payable to him under the provisions of the clause.

**CLAUSE 28: ACTION WHERE NO SPECIFICATIONS ARE SPECIFIED**

- In the case of any class of work for which there is no such specifications as referred to in Clause 11, such work shall be carried out in accordance with the Bureau of Indian Standards Specifications. In case there are no such specifications in Bureau of Indian Standards, the work shall be carried out as per manufacturers' specifications, if not available then as per District Specifications. In case there are no such specifications as required above, the work shall be carried out in all respects in accordance with the instructions and requirements of the Engineer-in-Charge.

**CLAUSE 29 : WITHOLDING AND LIEN IN RESPECT OF SUM DUE FROM CONTRACTOR**

- a) Whenever any claim or claims for payment of a sum of money arises out of or under the contract or against the contractor, the Engineer-in-Charge or the WAPCOS shall be entitled to withhold and also have a lien to retain such sum or sums in whole or in part from the security, if any deposited by the contractor and for the purpose aforesaid, the Engineer-in-Charge or the WAPCOS shall be entitled to withhold the security deposit, if any, furnished as the case may be and also have a lien over the same pending finalization or adjudication of any such claim. In the event of the security being insufficient to cover the claimed amount or amounts or if no security has been taken from the contractor, the Engineer-in-Charge or the WAPCOS shall be entitled to withhold and have a lien to retain to the extent of such claimed amount or amounts referred to above, from any sum or sums found payable or which may at any time thereafter become payable to the contractor under the same contract or any other contract with the Engineer-in-Charge of the WAPCOS or any contracting person through the Engineer-in-Charge pending finalization of adjudication of any such claim.

It is an agreed term of the contract that the sum of money or moneys so withheld or retained under the lien referred to above by the Engineer-in-Charge or WAPCOS will be kept withheld or retained as such by the Engineer-in-Charge or WAPCOS till the claim arising out of or under the contract is determined by the arbitrator(if the contract is governed by the arbitration clause) by the competent court, as the case may be and that

the contractor will have no claim for interest or damages whatsoever on any account in respect of such withholding or retention under the lien referred to above and duly notified as such to the contractor. For the purpose of this clause, where the contractor is a partnership firm or a limited company, the Engineer-in-Charge or the WAPCOS shall be entitled to withhold and also have a lien to retain towards such claimed amount or amounts in whole or in part from any sum found payable to any partner/limited company as the case may be, whether in his individual capacity or otherwise.

- b) WAPCOS shall have the right to cause an audit and technical examination of the works and the final bills of the contractor including all supporting vouchers, abstract, etc., to be made after payment of the final bill and if as a result of such audit and technical examination any sum is found to have been overpaid in respect of any work done by the contractor under the contract or any work claimed to have been done by him under the contract and found not to have been executed, the contractor shall be liable to refund the amount of over-payment and it shall be lawful for WAPCOS to recover the same from him in the manner prescribed in sub-clause (i) of this clause or in any other manner legally permissible; and if it is found that the contractor was paid less than what was due to him under the contract in respect of any work executed by him under it, the amount of such under payment shall be duly paid by WAPCOS to the contractor, without any interest thereon whatsoever.

Provided that the Government shall not be entitled to recover any sum overpaid, nor the contractor shall be entitled to payment of any sum paid short where such payment has been agreed upon between the WAPCOS on the one hand and the contractor on the other under any term of the contract permitting payment for work after assessment by WAPCOS.

#### **CLAUSE 29A: LIEN IN RESPECT OF CLAIMS IN OTHER CONTRACTS**

- Any sum of money due and payable to the contractor (including the security deposit returnable to him) under the contract may be withheld or retained by way of lien by the Engineer-in-Charge or the WAPCOS or any other contracting person or persons through Engineer-in-Charge against any claim of the Engineer-in-Charge or WAPCOS or such other person or persons in respect of payment of a sum of money arising out of or under any other contract made by the contractor with the Engineer-in-Charge or the WAPCOS or with such other person or persons.
- It is an agreed term of the contract that the sum of money so withheld or retained under this clause by the Engineer-in-Charge or the WAPCOS will be kept withheld or retained as such by the Engineer-in-Charge or the WAPCOS or till his claim arising out of the same contract or any other contract is either mutually settled or determined by the arbitration clause or by the competent court, as the case may be and that the contractor shall have no claim for interest or damages whatsoever on this account or on any other ground in respect of any sum of money withheld or retained under this clause and duly notified as such to the contractor.

**CLAUSE 30: EMPLOYMENT OF COAL MINING OR CONTROLLED AREA LABOUR NOT PERMISSIBLE**

- The contractor shall not employ coal mining or controlled area labour falling under any category whatsoever on or in connection with the work or recruit labour from area within a radius of 32 km (20 miles) of the controlled area. Subject as above the contractor shall employ imported labour only i.e., deposit imported labour or labour imported by contractors from area, from which import is permitted.
- Where ceiling price for imported labour has been fixed by State or Regional Labour Committees not more than that ceiling price shall be paid to the labour by the contractor.
- The contractor shall immediately remove any labourer who may be pointed out by the Engineer-in-Charge as being a coal mining or controlled area labourer. Failure to do so shall render the contractor liable to pay to WAPCOS a sum calculated at the rate of Rs.10/- per day per labourer. The certificate of the Engineer-in-Charge about the number of coal mining or controlled area labourer and the number of days for which they worked shall be final and binding upon all parties to this contract.
- It is declared and agreed between the parties that the aforesaid stipulation in this clause is one in which the public are interested within the meaning of the exception in Section 74 of Indian Contract Act, 1872.
- **Explanation:** - Controlled Area means the following areas:
- Districts of Dhanbad, Hazaribagh, Jamtara - a Sub-Division under Santhal Pargana Commissionery, Districts of Bankuara, Birbhum, Burdwan, District of Bilaspur.
- Any other area which may be declared a Controlled Area by or with the approval of the Central Government.

**CLAUSE 31: UNFILTERED WATER SUPPLY**

- The contractor(s) shall make his/their own arrangements for water required for the work and nothing extra will be paid for the same. This will be subject to the following conditions.
  - That the water used by the contractor(s) shall be fit for construction purposes to the satisfaction of the Engineer-in-Charge.
  - The Engineer-in-Charge shall make alternative arrangements for supply of water at the risk and cost of contractor(s) if the arrangements made by the contractor(s) for procurement of water are in the opinion of the Engineer-in-Charge, unsatisfactory.

**CLAUSE 31A: WATER SUPPLY, IF AVAILABLE**

Water if available may be supplied to the contractor by the WAPCOS subject to the following conditions: -

- The water charges @ 1 % shall be recovered on gross amount of the work done.

- The contractor(s) shall make his/their own arrangement of water connection and laying of pipelines from existing main of source of supply.
- The WAPCOS do not guarantee to maintain uninterrupted supply of water and it will be incumbent on the contractor(s) to make alternative arrangements for water at his/ their own cost in the event of any temporary break down in the water main so that the progress of his/their work is not held up for want of water. No claim of damage or refund of water charges will be entertained on account of such break down.

**CLAUSE 32: ALTERNATE WATER ARRANGEMENTS**

- Where there is no piped water supply arrangement and the water is taken by the contractor from the wells or hand pump constructed by the Government, no charge shall be recovered from the contractor on that account. The contractor shall, however, draw water at such hours of the day that it does not interfere with the normal use for which the hand pumps and wells are intended. He will also be responsible for all damage and abnormal repairs arising out of his use, the cost of which shall be recoverable from him. The Engineer-in-Charge shall be the final authority to determine the cost recoverable from the contractor on this account and his decision shall be binding on the contractor.
- The contractor shall be allowed to construct temporary wells in the proposed land for Construction for taking water for construction purposes only after he has got permission of the Engineer-in- Charge in writing. No charges shall be recovered from the contractor on this account, but the contractor shall be required to provide necessary safety arrangements to avoid any accidents or damage to adjacent buildings, roads and service lines. He shall be responsible for any accidents or damage caused due to construction and subsequent maintenance of the wells and shall restore the ground to its original condition after the wells are dismantled on completion of the work.

**CLAUSE 33 : RETURN OF SURPLUS MATERIALS**

- Notwithstanding anything contained to the contrary in this contract, where any materials for the execution of the contract are procured with the assistance of WAPCOS either by issue from WAPCOS stocks or purchase made under orders or permits or licenses issued by WAPCOS, the contractor shall hold the said materials economically and solely for the purpose of the contract and not dispose of them without the written permission of the WAPCOS and return, if required by the Engineer-in-Charge, all surplus or unserviceable materials that may be left with him after the completion of the contract or at its termination for any reason whatsoever on being paid or credited such price as the Engineer-in-Charge shall determine having due regard to the condition of the materials. The price allowed to the contractor however shall not exceed the amount charged to him excluding the element of storage charges. The decision of the Engineer-in-Charge shall be final and conclusive. In the event of breach of the aforesaid condition, the contractor shall in addition to throwing himself open to action for contravention of

the terms of the license or permit and/or for criminal breach of trust, be liable to WAPCOS for all moneys, advantages or profits resulting or which in the usual course would have resulted to him by reason of such breach.

**CLAUSE 34: HIRE OF PLANT & MACHINERY**

- i. The contractor shall arrange at his own expense all tools, plant, machinery and equipment (hereinafter referred to as T&P) required for execution of the work except for the Plant & Machinery listed in Schedule 'C' and stipulated for issue to the contractor. If the contractor requires any item of T&P on hire from the T&P available with the WAPCOS over and above the T&P stipulated for issue, the WAPCOS will, if such item is available, hire it to the contractor at rates to be agreed upon between him and the Engineer-in-Charge. In such a case, all the conditions hereunder for issue of T&P shall also be applicable to such T&P as is agreed to be issued.
- ii. Plant and Machinery when supplied on hire charges shown in Schedule 'C' shall be made over and taken back at the WAPCOS equipment yard/shed shown in Schedule 'C' and the contractor shall bear the cost of carriage from the place of issue to the site of work and back. The contractor shall be responsible to return the plant and machinery with condition in which it was handed over to him, and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation and otherwise during transit including damage to or loss of plant and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Engineer-In-Charge shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.
- iii. The plant and machinery as stipulated above will be issued as and when available and if required by the contractor. The contractor shall arrange his programme of work according to the availability of the plant and machinery and no claim, whatsoever, will be entertained from him for any delay in supply by the WAPCOS.
- iv. The hire charges shall be recovered at the prescribed rates from and inclusive of the date the plant and machinery made over up to and inclusive of the date of the return in good order even though the same may not have been working for any cause except major breakdown due to no fault of the contractor or faulty use requiring more than three working days continuously (excluding intervening holidays and Sundays) for bringing the plant in order. The contractor shall immediately intimate in writing to the Engineer-in- Charge when any plant or machinery gets out of order requiring major repairs as aforesaid. The Engineer-in-Charge shall record the date and time of receipt of such intimation in the log sheet of the plant or machinery. Based on this if the breakdown before lunch period or major breakdown will be computed considering half a day's breakdown on the day of complaint. If the breakdown occurs in the post lunch period of major breakdown will be computed starting from the next working day. In case



- of any dispute under this clause, the decision of the WAPCOS shall be final and binding on the contractor.
- v. The hire charges shown above are for each day of 8 hours (inclusive of the one-hour lunch break) or part thereof.
  - vi. Hire charges will include service of operating staff as required and also supply of lubricating oil and stores for cleaning purposes. Power fuel of approved type, firewood, kerosene oil etc. for running the plant and machinery and also the full time chowkidar for guarding the plant and machinery against any loss or damage shall be arranged by the contractor who shall be fully responsible for the safeguard and security of plant and machinery. The contractor shall on or before the supply of plant and machinery sign an agreement indemnifying the WAPCOS against any loss or damage caused to the plant and machinery either during transit or at site of work.
  - vii. Ordinarily, no plant and machinery shall work for more than 8 hours a day inclusive of one hour lunch break. In case of an urgent work however, the Engineer-in-Charge may, at his discretion, allow the plant and machinery to be worked for more than normal period of 8 hours a day. In that case, the hourly hire charges for overtime to be borne by the contractor shall be 50% more than the normal proportionate hourly charges (1/8th of the daily charges) subject to a minimum of half day's normal charges on any particular day. For working out hire charges for over time, a period of half an hour and above will be charged as one hour and a period of less than half an hour will be ignored.
  - viii. The contractor shall release the plant and machinery every seventh day for periodical servicing and/or wash out which may take about three to four hours or more. Hire charges for full day shall be recovered from the contractor for the day of servicing/ wash out irrespective of the period employed in servicing.
  - ix. The plant and machinery once issued to the contractor shall not be returned by him on account of lack of arrangements of labour and materials, etc. on his part, the same will be returned only when they are required for major repairs or when in the opinion of the Engineer-in-Charge, the work or a portion of work for which the same was issued is completed.
  - x. Log Book for recording the hours of daily work for each of the plant and machinery supplied to the contractor will be maintained by the WAPCOS and will be countersigned by the contractor or his authorized agent daily. In case the contractor contests the correctness of the entries and/or fails to sign the Log Book, the decision of the Engineer-in-Charge shall be final and binding on him. Hire charges will be calculated according to the entries in the Log Book and will be binding on the contractor. Recovery on account of hire charges for road rollers shall be made for the minimum number of days worked out on the assumption that a roller can consolidate per day and maximum quantity of materials or area surfacing as noted against each in the annexed statement (see attached annexure).
  - xi. In the case of concrete mixers, the contractors shall arrange to get the hopper cleaned and the drum washed at the close of the work each day or each occasion.  
In case rollers for consolidation are employed by the contractor himself, log book for such rollers shall be maintained in the same manner as is done in case of WAPCOS's rollers, maximum quantity of any items to be consolidated for each roller-day shall also be same as in Annexure to Clause 34(x). For less use of rollers, recovery for the less roller days shall be made at the stipulated issue rate.



- xii. The contractor shall be responsible to return the plant and machinery in the condition in which it was handed over to him and he shall be responsible for all damage caused to the said plant and machinery at the site of work or elsewhere in operation or otherwise or during transit including damage to or loss of parts, and for all losses due to his failure to return the same soon after the completion of the work for which it was issued. The Engineer-In-Charge shall be the sole judge to determine the liability of the contractor and its extent in this regard and his decision shall be final and binding on the contractor.
- xiii. The contractor will be exempted from levy of any hire charges for the number of days he is called upon in writing by the Engineer-in-Charge to suspend execution of the work, provided WAPCOS plant and machinery in question have, in fact, remained idle with the contractor because of the suspension
- xiv. In the event of the contractor not requiring any item of plant and machinery issued by WAPCOS though not stipulated for issue in Schedule 'C' any time after taking delivery at the place of issue, he may return it after two days' written notice or at any time without notice if he agrees to pay hire charges for two additional days without, in any way, affecting the right of the Engineer-in-Charge to use the said plant and machinery during the said period of two days as he likes including hiring out to a third party.

**CLAUSE 35: CONDITION RELATING TO USE OF ASPHALTIC MATERIALS**

- The contractor undertakes to make arrangement for the supervision of the work by the firm supplying the tar or bitumen used.
- The contractor shall collect the total quantity of tar or bitumen required for the work as per standard formula, before the process of painting is started and shall hypothecate it to the Engineer-in-Charge. If any bitumen or tar remains unused on completion of the work on account of lesser use of materials in actual execution for reasons other than authorized changes of specifications and abandonment of portion of work, a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer-in-Charge shall be made and the material return to the contractors. Although the materials are hypothecated to WAPCOS, the contractor undertakes the responsibility for their proper watch, safe custody and protection against all risks. The materials shall not be removed from site of work without the consent of the Engineer-in-Charge in writing.
- The contractor shall be responsible for rectifying defects noticed within a year from the date of completion of the work and the portion of the security deposit relating to asphaltic work shall be refunded after the expiry of this period.

**CLAUSE 36 : EMPLOYMENT OF TECHNICAL STAFF AND EMPLOYEES**

- Contractors Superintendence, Supervision, Technical Staff & Employees
  - The contractor shall provide all necessary superintendence during execution of the work and all along thereafter as may be necessary for proper fulfilling of the obligations under the contract.
- The contractor shall immediately after receiving letter of acceptance of the tender and before commencement of the work, intimate in writing to the Engineer-in-Charge, the name(s), qualifications, experience, age, address(s) and other particulars along with

certificates, of the principal technical representative to be in charge of the work and other technical representative(s) who will be supervising the work. Minimum requirement of such technical representative(s) and their qualifications and experience shall not be lower than specified in Special Conditions of Contract. The Engineer-in-Charge shall within 3 days of receipt of such communication intimate in writing his approval or otherwise of such a representative(s) to the contractor. Any such approval may at any time be withdrawn and in case of such withdrawal, the contractor shall appoint another such representative(s) according to the provisions of this clause. Decision of the tender accepting authority shall be final and binding on the contractor in this respect. Such a principal technical representative and other technical representative(s) shall be appointed by the contractor soon after receipt of the approval from Engineer-in-charge and shall be available at site before start of work.

- All the provisions applicable to the principal technical representative under the Clause will also be applicable to other technical representative(s) The principal technical representative and other technical representative(s) shall be present at the site of work for supervision at all times when any construction activity is in progress and also present himself/themselves, as required, to the Engineer-in-Charge and/or his designated representative to take instructions. Instructions given to the principal technical representative or other technical representative(s) shall be deemed to have the same force as if these have been given to the contractor. The principal technical representative and other technical representative(s) shall be actually available at site fully during all stages of execution of work, during recording/checking/test checking of measurements of works and whenever so required by the Engineer-in-Charge and shall also note down instructions conveyed by the Engineer-in- Charge or his designated representative(s) in the site order book and shall affix his/their signature in token of noting down the instructions and in token of acceptance of measurements/ checked measurements/ test checked measurements. The representative(s) shall not look after any other work. Substitutes, duly approved by Engineer-in-Charge of the work in similar manner as aforesaid shall be provided in event of absence of any of the representative(s) by more than two days.
- If the Engineer-in-Charge, whose decision in this respect is final and binding on the contractor, is convinced that no such technical representative(s) is/are effectively appointed or is/are effectively attending or fulfilling the provision of this clause, a recovery (nonrefundable) shall be effected from the contractor as specified in Special Conditions of Contract and the decision of the Engineer-In-Charge as recorded in the site order book and measurement recorded checked/test checked in Measurement Books shall be final and binding on the contractor. Further if the contractor fails to appoint suitable technical Principal technical representative and/or other technical representative(s) and if such appointed persons are not effectively present or are absent by more than two days without duly approved substitute or do not discharge their

responsibilities satisfactorily, the Engineer-in-Charge shall have full powers to suspend the execution of the work until such date as suitable other technical representative(s) is/are appointed and the contractor shall be held responsible for the delay so caused to the work. The contractor shall submit a certificate of employment of the technical representative(s) (in the form of copy of Form-16 or CPF deduction issued to the Engineers employed by him) along with every on account bill final bill and shall produce evidence if at any time so required by the Engineer-in-Charge.

- The contractor shall provide and employ on the site only such technical assistants as are skilled and experienced in their respective fields and such foremen and supervisory staff as are competent to give proper supervision to the work. The contractor shall provide and employ skilled, semiskilled and unskilled labour as is necessary for proper and timely execution of the work.
- The Engineer-in-Charge shall be at liberty to object to and require the contractor to remove from the works any person who in his opinion misconducts himself, or is incompetent or negligent in the performance of his duties or whose employment is otherwise considered by the Engineer-in-Charge to be undesirable. Such person shall not be employed again at works site without the written permission of the Engineer-in-Charge and the persons so removed shall be replaced as soon as possible by competent substitutes.

#### **CLAUSE 37: LEVY / TAXES PAYABLE BY CONTRACTOR**

- GST/CESS, Building and other Construction Workers Welfare Cess or any other tax or Cess in respect of this contract shall be payable by the contractor and WAPCOS shall not entertain any claim whatsoever in this respect.
- In view of implementation of GST w.e.f. 01.07.17 by Govt. of India, bidders are advised to quote their rates considering the positive (+ve) / negative (-ve) cost impact on their rates in present scenario.
- However, in respect of Goods and Services Tax, same shall be paid by the contractor to the concerned department on demand and it will only be paid/reimbursed to him by the Engineer-in-Charge after satisfying that it has been actually and genuinely paid by the contractor.
- The contractor shall deposit royalty and obtain necessary permit for supply of the red bajri, stone, kankar, etc. from local authorities.
- If pursuant to or under any law, notification or order any royalty, cess or the like becomes payable by the WAPCOS and does not any time become payable by the contractor to the State Government, Local authorities in respect of any material used by the contractor in the works, then in such a case, it shall be lawful to the WAPCOS and it will have the right and be entitled to recover the amount paid in the circumstances as aforesaid from dues of the contractor

**CLAUSE 38: CONDITIONS FOR REIMBURSEMENT OF LEVY/TAXES IF LEVIED AFTER RECEIPT OF TENDERS**

- All tendered rates shall be inclusive of all taxes and levies (except Goods & Service Tax) payable under respective statutes. However, if any further tax or levy or cess is imposed by Statute, after the last stipulated date for the receipt of tender including extensions if any and the contractor thereupon necessarily and properly pays such taxes/levies/cess, the contractor shall be reimbursed the amount so paid, provided such payments, if any, is not, in the opinion of the WAPCOS attributable to delay in execution of work within the control of the contractor.
- The contractor shall keep necessary books of accounts and other documents for the purpose of this condition as may be necessary and shall allow inspection of the same by a duly authorized representative of the WAPCOS and/or the Engineer-in-Charge and shall also furnish such other information/document as the Engineer-in-Charge may require from time to time.
- The contractor shall, within a period of 30 days of the imposition of any such further tax or levy or cess, give a written notice thereof to the Engineer-in-charge that the same is given pursuant to this condition, together with all necessary information relating thereto.

**CLAUSE 39: TERMINATION OF CONTRACT**

- Subject to the other provisions of the Contract, WAPCOS Limited shall have the right to serve a notice of termination of the Contract on the Contractor and forthwith terminate the Contract without prejudice to any of its other rights and remedies against the Contractor and without being liable to pay any loss or compensation if:
  - the Contractor fails to pay any amount due and payable under the Contract within [21 (twenty-one)] days of receipt of notice given by WAPCOS Limited of such non-payment;
  - if any distress or execution is levied upon any of the assets of the Contractor;
  - at any time during the currency of the Contract there is a change in the effective control of the Contractor as at the date of the Contract;
  - (iv) the Contractor fails to complete, test and commission the Contractor's Works/Project Facility within the Time for Completion or commits any other violation/breach of the terms and conditions of the Contract which is not rectified within [14 (fourteen)] days of the date of receipt of notice from WAPCOS Limited in this regard.
  - any of the following events occurs:
    - a. the passing of a resolution by the shareholders of the Contractor for the winding up of the Contractor;
    - b) the appointment of a liquidator in a proceeding for the winding up of the Contractor or the Contractor entering into a compromise with its creditors; or
    - c) the making by the court of an order winding up the Contractor,

d) The Contractor either:

Appoints a subcontractor without the prior approval of WAPCOS Limited, or terminates any of the Subcontractor; or

having terminated any of the Subcontracts with the consent of WAPCOS Limited, appoints a replacement Sub-Contractor without the prior approval of WAPCOS Limited.

e) the Contractor without the consent of WAPCOS Limited assigns or transfers all or any of its rights or obligations under the Contract;

f) the Contractor repudiates the Contract or otherwise evidences an intention not to be bound by the Contract; or

g) the expropriation, confiscation or compulsory acquisition of the Project Facility;

h) as a result of Force Majeure, the Contractor is unable to proceed with the Works for a period of [90(ninety)] consecutive days or [180(One Hundred and Eighty)] days in a year (whichever is less);

i) if the Contractor or any of its servants or agents commit or suffer to be committed or omit or suffer to be omitted any act, deed, matter or thing which in the opinion of WAPCOS Limited Representative whose decision (without an obligation to give reasons therefor) in this regard will be final, is prejudicial to the interests or reputation of WAPCOS Limited.

j) the Contractor offers, gives or promises any payment directly or indirectly to any government, political party, or official thereof, or any candidate for political office, or to WAPCOS Limited in order to influence any substantive decision of, or induce any party or person to use its influence to offset any substantive decision of any Relevant Authority or Statutory Authority or WAPCOS Limited in regard to any aspect of the Contract;

k) the Contractor makes any warranty or representation in or in accordance with the Contract which was materially incorrect when made so as to materially affect WAPCOS Limited interests; or

l) in the event that the Contractor's liability for Liquidated Damages reaches the cap on such damages as set out in Special Conditions of Contract and the Completion Certificate for the whole of the Works has not been issued; or

m) fails to provide, maintain or renew and/or comply with its obligations in relation to the Performance Security; or

- the Contractor has, without valid reason and WAPCOS Limited consent, failed to commence the Works promptly, or fails to progress the Works regularly and/or diligently, or has suspended the progress of the Works for more than [7 (seven) days;] or
- the Contractor has failed to adhere to the Technical Specifications and Drawings and in the reasonable estimation of the WAPCOS Limited Representative, such failure is likely

to mean that Completion of the Works is likely to be delayed beyond the relevant Time for Completion; or

- the Contractor's personnel is/are incompetent, have acted in a manner prejudicial to WAPCOS Limited best interest or have failed to comply with WAPCOS Limited health, safety, environment or other rules or regulations and procedures; or
- he Contractor has failed to achieve two Milestones consecutively.

### **Termination Procedure**

- A notice of termination given pursuant to this Clause 39 [Termination] (each a "Preliminary Termination Notice") shall specify in reasonable detail the circumstances giving rise to the Preliminary Termination Notice. If, within [21 (twenty one)] days following the service by WAPCOS Limited of a Preliminary Termination Notice, the Contractor pays all sums which are due and payable to WAPCOS Limited or remedies the breach to the satisfaction of WAPCOS Limited
- existing as at the date of the Preliminary Termination Notice then: -
  - such Preliminary Termination Notice shall be revoked and all existing rights of termination in favour of WAPCOS Limited under the Contract shall terminate (but without prejudice to any rights of WAPCOS Limited in respect of any future breach of the Contract); and
  - The Contractor shall continue to perform its obligations under the Contract in a diligent and proper manner. Within the period of [21 (twenty one)] days following the receipt of the Preliminary Termination Notice by the Contractor and unless the Parties shall have otherwise agreed or the circumstances giving rise to the Preliminary Termination Notice shall have ceased to exist or shall have not been remedied, WAPCOS Limited may terminate the Contract by giving written notice (a "Termination Notice") to the Contractor and the Contract shall terminate on the date mentioned in the Termination Notice ("Termination Date"). The termination of the Contract by WAPCOS Limited for reasons other than breach can be made by a written notice to the Contractor and nothing herein will obligate WAPCOS Limited to terminate the Contract or be liable for any exercising its right of termination and WAPCOS Limited may pursue all remedies available in law instead of termination.

### **Upon Termination**

Upon Termination for any reason whatsoever, the Contractor shall to the extent instructed by the WAPCOS Limited Representative:

(i) cease all further work as instructed by the WAPCOS Limited 's Representative in the Termination Notice and the Contractor shall carry out works for the sole purpose of securing, preserving and protecting that part of the Works already Executed and any work required to leave the Project Site and the Works in a clean and safe condition;

- (ii) remove all the Contractor's Equipment and Temporary Works;
  - (iii) repatriate the Contractor's and Subcontractor's personnel from any part of
  - (iv) the Project Site and the Works;
  - (v) deliver to WAPCOS Limited the Works Executed by the Contractor as at the Termination Date;
  - (vi) ensure that it and those it is contractually or otherwise responsible for, vacate the Project Site;
  - (vii) deliver to WAPCOS Limited "as built drawings" showing all work carried out since commencement of the Works; and
  - (viii) promptly and in an orderly manner deliver to WAPCOS Limited all documents relating to the Works which are for the time being under the control of the Contractor;
- Without prejudice to Clause [Upon Termination] upon Termination:
- (i) WAPCOS Limited may enter the Project Site and the Works thereof and expel the Contractor there from and WAPCOS Limited may complete the Works itself or by employing any third party;
  - (ii) WAPCOS Limited may, to the exclusion of any right of the Contractor over the same, take over and have free use, without payment to the Contractor, of any Contractor's Equipment and Temporary Works of which have been delivered to the Project Site for such period as the WAPCOS Limited Representative considers necessary for the Execution of the Works, without
  - (iii) being responsible to the Contractor for fair wear and tear thereof and to the exclusion of any right of the Contractor over the same.
  - (iv) WAPCOS Limited may at any time sell any of the said Contractor's Equipment, Temporary Works and any unused materials and apply the proceeds of sale in or towards for satisfaction of any sums due or which may become due to it from the Contractor under the Contract; and
  - (v) WAPCOS Limited shall have the power and authority to prohibit the Contractor and any person claiming through or under the Contractor from entering the Project Site.
  - (vi) In the event of termination of the contract WAPCOS Limited shall be entitled to recover Liquidated Damages up to ten percent (10%) of the contract value and forfeit the Performance Guarantee and Security Deposit made by the Contractor besides getting the work completed by other means at the risk and cost of the Contractor.

#### **TERMINATION OF CONTRACT ON DEATH OF CONTRACTOR**

Without prejudice to any of the rights or remedies under this contract, if the contractor dies, the Engineer-In-Charge on behalf of the WAPCOS shall have the option of terminating the contract without compensation to the contractor.

#### **CLAUSE 40: IF RELATIVE WORKING IN WAPCOS THEN THE CONTRACTOR NOT ALLOWED TO TENDER**

- The contractor shall not be permitted to tender for works in the WAPCOS responsible for award and execution of contracts in which his near relative is posted in WAPCOS. He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Officer in the WAPCOS. Any breach of this condition by the contractor would render him liable to be debarred from tendering in WAPCOS any breach of this condition.



- NOTE: By the term "near relatives" is meant wife, husband, parents and grandparents, children and grandchildren, brothers and sisters, uncles, aunts and cousins and their corresponding in-laws.

**CLAUSE 41: NO GAZETTED ENGINEER TO WORK AS CONTRACTOR WITHIN ONE YEAR OF RETIREMENT**

- No engineer of gazette rank or other gazette officer employed in engineering or administrative duties in an engineering department of the Government of India shall work as a contractor or employee of a contractor for a period of one year after his retirement from government service without the previous permission of Government of India in writing. This contract is liable to be cancelled if either the contractor or any of his employees is found at any time to be such a person who had not obtained the permission of Government of India as aforesaid, before submission of the tender or engagement in the contractor's service, as the case may be.

**CLAUSE 42: RETURN OF MATERIALS & RECOVERY FOR MATERIAL ISSUED**

(i) After completion of the work and also at any intermediate stage in the event of non-reconciliation of materials issued, consumed and in balance - (see Clause 10), theoretical quantity of materials issued by the WAPCOS for use in the work shall be calculated on the basis and method given hereunder: -

(a) Quantity of cement & bitumen shall be calculated on the basis of quantity of cement & bitumen required for different items of work as shown in the Schedule of Rates mentioned in Special Conditions of Contract. In case any item is executed for which standard constants for the consumption of cement or bitumen are not available in the above mentioned schedule/statement or cannot be derived from the same shall be calculated on the basis of standard formula to be laid down by the Engineer-in-Charge.

(b) Theoretical quantity of steel reinforcement or structural steel sections shall be taken as the quantity required as per design or as authorized by Engineer-in-Charge, including authorized lap pages, chairs etc. plus 3% wastage due to cutting into pieces, such theoretical quantity being determined and compared with the actual issues each diameter wise, section wise and category wise separately.

(c) Theoretical quantity of G.I. & C.I. or other pipes, conduits, wires and cables, pig lead and G.I./M.S. sheets shall be taken as quantity actually required and measured plus 5% for wastage due to cutting into pieces (except in the case of G.I./M.S. sheets it shall be 10%), such determination & comparison being made diameter wise & category wise.

(d) For any other material as per actual requirements.

(ii) Over the theoretical quantities of materials so computed a variation shall be allowed as specified in Special Conditions of Contract. The difference in the net quantities of material actually issued to the contractor and the theoretical quantities including such authorized



variation, if not returned by the contractor or if not fully reconciled to the satisfaction of the Engineer-in-Charge within fifteen days of the issue of written notice by the Engineer-in-charge to this effect shall be recovered at the rates specified in Special Conditions of Contract, without prejudice to the provision of the relevant conditions regarding return of materials governing the contract. Decision of Engineer-in-Charge in regard to theoretical quantities of materials, which should have been actually used as per the Annexure of the standard schedule of rates and recovery at rates specified in Special Conditions of Contract, shall be final & binding on the contractor.

For nonscheduled items, the decision of the Engineer-In-Charge regarding theoretical Quantities of materials which should have been actually used, shall be final and binding on the contractor.

(iii) The said action under this clause is without prejudice to the right of the WAPCOS to take action against the contractor under any other conditions of contract for not doing the work according to the prescribed specifications.

**CLAUSE 43: COMPENSATION DURING WARLIKE SITUATION**

- The work (whether fully constructed or not) and all materials, machines, tools and plants, scaffolding, temporary buildings and other things connected therewith shall be at the risk of the contractor until the work has been delivered to the Engineer-in-Charge and a certificate from him to that effect obtained. In the event of the work or any materials properly brought to the site for incorporation in the work being damaged or destroyed in consequence of hostilities or warlike operation, the contractor shall when ordered (in writing) by the Engineer-in-Charge to remove any debris from the site, collect and properly stack or remove in store all serviceable materials salvaged from the damaged work and shall be paid at the contract rates in accordance with the provision of this agreement for the work of clearing the site of debris, stacking or removal of serviceable material and for the works ordered by the Engineer-in-Charge, such payments being in addition to compensation up to the value of the work originally executed before being damaged or destroyed and not paid for. In case of works damaged or destroyed but not already measured and paid for, the compensation shall be assessed by the Engineer-In-Charge up to Rs. 5,000/- and by the WAPCOS for a higher amount. The contractor shall be paid for the damages/destruction suffered and for restoring the material at the rate based on analysis of rates tendered for in accordance with the provision of the contract. The certificate of the Engineer-in-Charge regarding the quality and quantity of materials and the purpose for which they were collected shall be final and binding on all parties to this contract.
- Provided always that no compensation shall be payable for any loss in consequence of hostilities or warlike operations (a) unless the contractor had taken all such precautions against air raid as are deemed necessary by the A.R.P. Officers or the Engineer-in-Charge

(b) for any material etc. not on the site of the work or for any tools, plant, machinery, scaffolding, temporary building and other things not intended for the work.

- In the event of the contractor having to carry out reconstruction as aforesaid, he shall be allowed such extension of time for its completion as is considered reasonable by the Engineer-In-Charge.

**CLAUSE 44: APPRENTICES ACT PROVISIONS TO BE COMPLIED WITH**

- The contractor shall comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued thereunder from time to time. If he fails to do so, his failure will be a breach of the contract and the WAPCOS may, in his discretion, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provisions of the said Act.

**CLAUSE 45: RELEASE OF SECURITY DEPOSIT AFTER LABOUR CLEARANCE**

- Release of Security Deposit of the work shall not be refunded till the contractor produces a clearance deposit after labour certificate from the Labour Officer. As soon as the work is virtually complete, the contractor shall apply for the clearance certificate to the Labour Officer under intimation to the Engineer-in-Charge. The Engineer-in-Charge, on receipt of the said communication, shall write to the Labour Officer to intimate if any complaint is pending against the contractor in respect of the work. If no complaint is pending, on record till after 3 months after completion of the work and/or no communication is received from the Labour Officer to this effect till six months after the date of completion, it will be deemed to have received the clearance certificate and the Security Deposit will be released if otherwise due.

**CLAUSE 46: INSURANCE**

**1. Requirements**

Before commencing execution of works, unless stated otherwise in the special conditions of contract, it shall be obligatory for the contractor to obtain at his own cost stipulated insurance cover under the following requirements:

- a) Contractor's all risk and Third Party Cover.
- b) Liability under the workmen's compensation Act, 1923, Minimum Wages Act, 1948 and Contract Labour (Regulation and Abolition) Act, 1970.
- c) Accidents to staff, Engineers, Supervisors and others who are not governed by workmen's compensation Act.
- d) Damage to material, machinery and works due to fire theft etc.
- e) Any other risk to be covered by insurance as may be specified by the employer in the special conditions of contract.

**2. Policy in Joint Names of Contractor and Employer**

The policy referred to under sub-clause 46(1) above shall be obtained in the joint names of the contractor and the employer and shall inter-alia provide coverage against the following, arising out of or in connection with execution of works, their maintenance and performance of the contract.

- a) Loss of life or injury involving public, employee of the contractor, or that of employer and Engineer, labour etc.
- b) Injury, loss or damage to the works or property belonging to public, government bodies, local authorities, utility organizations, contractors, employer or others.

### **3. Currency of Policy**

The policies shall remain in force throughout the period of execution of the works and till the expiry of the defect liability period. The contractor shall, whenever called upon, produce to the engineer or his representative the various insurance policies obtained by him as also the rates of premia and the premia paid by him to ensure that the policies indeed continue to be in force. If the contractor fails to effect or keep in force or provide adequate cover in the insurance policies mentioned in the sub clause 46(1) or any other insurance he might be required to effect under the contract, then in such cases, the employer may effect and keep in force any such insurance or further insurance and the cost and expenses incurred by him in this regard shall be deductible from payments due to the contractor or from the contractor's performance security.

### **CLAUSE 47: CONDITIONS SPECIFIC TO GREEN BUILDINGS PRACTICES CLAUSE**

The contractor shall strictly adhere to the following conditions as part of his contractual obligations:

#### **1. SITE**

1.1 The contractor shall ensure that adequate measures are taken for the prevention of erosion of the top soil during the construction phase. The contractor shall implement the Erosion and Sedimentation Control Plan (ESCP) provided to him by the Engineer-in-charge as part of the larger Construction Management Plan (CMP). The contractor shall obtain the Erosion and Sedimentation Control Plan (ESCP) Guidelines from the Engineer-in-charge and then prepare "working plan" for the following month's activities as a CAD drawing showing the construction management, staging & ESCP. At no time soil should be allowed to erode away from the site and sediments should be trapped where necessary.

1.2 The contractor shall ensure that all the top soil excavated during construction works is neatly stacked and is not mixed with other excavated earth. The contractors shall take the clearance of the architects / Engineer-in-charge before any excavation. Top soil should be stripped to a depth of 20 cm (centimeters) from the areas to be disturbed, for example proposed area for buildings, roads, paved areas, external services and area required for construction activities etc. It shall be stockpiled to a maximum height of 40 cm in designated areas, covered or stabilized with temporary seeding for erosion prevention and shall be

reapplied to site during plantation of the proposed vegetation. Top soil shall be separated from subsoil, debris and stones larger than 50 mm (millimeter) diameter. The stored top soil may be used as finished grade for planting areas.

1.3 The contractor shall carry out the recommendations of the soil test report for improving the soil under the guidance of the Engineer-in-charge who would also advise on the timing of application of fertilizers and warn about excessive nutrient levels.

1.4 The contractor shall carry out post-construction placement of topsoil or other suitable plant material over disturbed lands to provide suitable soil medium for vegetative growth. Prior to spreading the topsoil, the sub-grade shall be loosened to a depth of 50mm to permit bonding. Topsoil shall be spread uniformly at a minimum compacted depth of 50mm on grade 1:3 or steeper slopes, a minimum depth of 100mm on shallower slopes. A depth of 300mm is preferred on relatively flatter land.

1.5 The Contractor should follow the construction plan as proposed by the Engineer-in-charge to minimize the site disturbance such as soil pollution due to spilling. Use staging and spill prevention and control plan to restrict the spilling of the contaminating material on site. Protect top soil from erosion by collection storage and reapplication of top soil, constructing sediment basin, contour trenching, mulching etc.

1.6 No excavated earth shall be removed from the campus unless suggested otherwise by Engineer-in-charge. All subsoil shall be reused in backfilling/landscape, etc as per the instructions of the Engineer-in-charge

1.7 The contractor shall not change the natural gradient of the ground unless specifically instructed by the architect's / landscape consultant. This shall cover all natural features like water bodies, drainage gullies, slopes, mounds, depressions, rocky outcrops, etc. Existing drainage patterns through or into any preservation area shall not be modified unless specifically directed by the Engineer-in-charge.

1.8 The contractor shall not carry out any work which results in the blockage of natural drainage.

1.9 The contractor shall ensure that existing grades of soil shall be maintained around existing vegetation and lowering or raising the levels around the vegetation is not allowed unless specifically directed by the Engineer-in-charge

1.10 Contractor shall reduce pollution and land development impacts from automobiles use during construction.

1.11 Overloading of trucks is unlawful and creates erosion and sedimentation problems, especially when loose materials like stone dust, excavated earth, sand etc. are moved. Proper covering must take place. No overloading shall be permitted.

## 2. CONSTRUCTION PHASE AND WORKER FACILITIES

2.1 The contractor shall specify and limit construction activity in preplanned/ designated areas and shall start construction work after securing the approval for the same from the Engineer-in-charge. This shall include areas of construction, storage of materials, and material and personnel movement.

### 2.2 Preserve and Protect Landscape during Construction

a) The contractor shall ensure that no trees, existing or otherwise, shall be harmed and damage to roots should be prevented during trenching, placing backfill, driving or parking heavy equipment, dumping of trash, oil, paint, and other materials detrimental to plant health. These activities should be restricted to the areas outside of the canopy of the tree, or, from a safe distance from the tree/plant by means of barricading. Trees will not be used for support; their trunks shall not be damaged by cutting and carving or by nailing posters, advertisements or other material. Lighting of fires or carrying out heat or gas emitting construction activity within the ground, covered by canopy of the tree is not to be permitted.

b) The contractor shall take steps to protect trees or saplings identified for preservation within the construction site using tree guards of approved specification.

c) The contractor shall conserve existing natural areas and restore damaged areas to provide habitat and promote biodiversity. Contractor should limit all construction activity within the specified area as per the Construction Management Plan (CMP) proposed by the Engineer-in-charge. All the existing trees should be preserved, if not possible than compensate the loss by re-planting trees in the proportion of 1:3.

d) The contractor shall avoid cut and fill in the root zones, through delineating and fencing the drip line (the spread limit of a canopy projected on the ground) of all the trees or group of trees. Separate the zones of movement of heavy equipment, parking, or excessive foot traffic from the fenced plant protection zones.

e) The contractor shall ensure that maintenance activities shall be performed as needed to ensure that the vegetation remains healthy. The preserved vegetated area shall be inspected by the Engineer-in-charge at regular intervals so that they remain undisturbed. The date of inspection, type of maintenance or restorative action followed shall be recorded in the logbook.

2.3 Contractor shall be required to develop and implement a waste management plan, quantifying material diversion goals. He shall establish goals for diversion from disposal in landfills and incinerators and adopt a construction waste management plan to achieve these goals. A project-wide policy of "Nothing leaves the Site" should be followed. In such a case when strictly followed, care would automatically be taken in ordering and timing of materials such that excess doesn't become "waste". The Contractor's ingenuity is especially called towards meeting this prerequisite/ credit (GRIHA). Consider recycling cardboard, metal, brick, acoustical tile, concrete, plastic, clean wood, glass, gypsum wallboard, carpet and insulation. Designate a

specific area(s) on the construction site for segregated or commingled collection of recyclable material, and track recycling efforts throughout the construction process. Identify construction haulers and recyclers to handle the designated materials. Note that diversion may include donation of materials to charitable organizations and salvage of materials on-site.

2.4 Contractor shall collect all construction waste generated on site. Segregate these wastes based on their utility and examine means of sending such waste to manufacturing units which use them as raw material or other site which require it for specific purpose. Typical construction debris could be broken bricks, steel bars, broken tiles, spilled concrete and mortar etc.

2.5 The contractor shall provide clean drinking water for all workers

2.6 The contractor shall provide the minimum level of sanitation and safety facilities for the workers at site. The contractor shall ensure cleanliness of workplace with regard to the disposal of waste and effluent; provide clean drinking water and latrines and urinals as per applicable standard. Adequate toilet facilities shall be provided for the workman within easy access of their place of work. The total no. to be provided shall not be less than 1 per 30 employs in any one shift. Toilet facilities shall be provided from the start of building operations, connection to a sewer shall be made as soon as practicable. Every toilet shall be so constructed that the occupant is sheltered from view and protected from the weather and falling objects. Toilet facilities shall be maintained in a sanitary condition. A sufficient quantity of disinfectant shall be provided. Natural or artificial illumination shall be provided.

2.7 The contractor shall ensure that air pollution due to dust/generators is kept to a minimum, preventing any adverse effects on the workers and other people in and around the site. The contractor shall ensure proper screening, covering stockpiles, covering brick and loads of dusty materials, wheel-washing facility, gravel pit, and water spraying. Contractor shall ensure the following activities to prevent air pollution during construction:

- a) Clear vegetation only from areas where work will start right away
- b) Vegetate / mulch areas where vehicles do not ply.
- c) Apply gravel / landscaping rock to the areas where mulching / paving is impractical
- d) Identify roads on-site that would be used for vehicular traffic. Upgrade vehicular roads (if these are unpaved) by increasing the surface strength by improving particle size, shape and mineral types that make up the surface & base. Add surface gravel to reduce source of dust emission. Limit amount of fine particles (smaller than 0.075mm) to 10 – 20%
- e) Water spray, through a simple hose for small projects, to keep dust under control. Fine mists should be used to control fine particulate. However, this should be done with care so as not to waste water. Heavy watering can also create mud, which when tracked onto paved public

roadways, must be promptly removed. Also, there must be an adequate supply of clean water nearby to ensure that spray nozzles don't get plugged. Water spraying can be done on:

- i) Any dusty materials before transferring, loading and unloading
  - ii) Area where demolition work is being carried out
  - iii) Any un-paved main haul road
  - iv) Areas where excavation or earth moving activities are to be carried out
- f) The contractor shall ensure that the speed of vehicles within the site is limited to 10 km/hr.
- g) All material storages should be adequately covered and contained so that they are not exposed to situations where winds on site could lead to dust / particulate emissions.
- h) Spills of dirt or dusty materials will be cleaned up promptly so the spilled material does not become a source of fugitive dust and also to prevent of seepage of pollutant laden water into the ground aquifers. When cleaning up the spill, ensure that the clean-up process does not generate additional dust. Similarly, spilled concrete slurries or liquid wastes should be contained / cleaned up immediately before they can infiltrate into the soil / ground or runoff in nearby areas
- i) Provide hoardings of not less than 3m high along the site boundary, next to a road or other public area
- j) Provide dust screens, sheeting or netting to scaffold along the perimeter of the building Cover stockpiles of dusty material with impervious sheeting
- k) Cover dusty load on vehicles by impervious sheeting before they leave the site

2.8 Contractor shall be required to provide an easily accessible area that serves the entire building and is dedicated to the separation, collection and storage of materials for recycling including (at a minimum) paper, corrugated cardboard, glass, plastics, and metals. He shall coordinate the size and functionality of the recycling areas with the anticipated collections services for glass, plastic, office paper, newspaper, cardboard, and organic wastes to maximize the effectiveness of the dedicated areas. Consider employing cardboard balers, aluminum can crushers, recycling chutes, and collection bins at individual workstations to further enhance the recycling program.

2.9 The contractor shall ensure that no construction leach ate (Ex: cement slurry), is allowed to percolate into the ground. Adequate precautions are to be taken to safeguard against this including, reduction of wasteful curing processes, collection, basic filtering and reuse. The contractor shall follow requisite measures for collecting drainage water run-off from construction areas and material storage sites and diverting water flow away from such polluted



areas. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to the treatment device or facility (municipal sewer line).

2.10 Staging (dividing a construction area into two or more areas to minimize the area of soil that will be exposed at any given time) should be done to separate undisturbed land from land disturbed by construction activity and material storage.

2.11 The contractor shall Comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 \_Constructional practices and safety, 2005, National Building code of India, Bureau of Indian Standards. A copy of all pertinent regulations and notices concerning accidents, injury and first-aid shall be prominently exhibited at the work site. Depending upon the scope & nature of work, a person qualified in first-aid shall be available at work site to render and direct first-aid to casualties. A telephone may be provided to first-aid assistant with telephone numbers of the hospitals displayed. Complete reports of all accidents and action taken thereon shall be forwarded to the competent authorities.

2.12 The contractor shall ensure the following activities for construction workers safety, among other measures:

- a) Guarding all parts of dangerous machinery.
- b) Precautionary signs for working on machinery
- c) Maintaining hoists and lifts, lifting machines, chains, ropes, and other lifting tackles in good condition.
- d) Durable and reusable formwork systems to replace timber formwork and ensure that formwork where used is properly maintained.
- e) Ensuring that walking surfaces or boards at height are of sound construction and are provided with safety rails or belts.
- f) Provide protective equipment; helmets etc.
- g) Provide measures to prevent fires. Fire extinguishers and buckets of sand to be provided in the fire-prone area and elsewhere.
- h) Provide sufficient and suitable light for working during night time.

2.13 Adopt additional best practices, prescribed norms in construction industry.

2.14 The storage of material shall be as per standard good practices as specified in Part 7, Section 2 – Storage, Stacking and Handling practices, NBC 2005 and shall be to the satisfaction of the Engineer-in-charge to ensure minimum wastage and to prevent any misuse, damage, inconvenience or accident. Watch and ward of the Contractor's materials shall be his own responsibility. There should be a proper planning of the layout for stacking and storage of different materials, components and equipment's with proper access and proper



maneuverability of the vehicles carrying the materials. While planning the layout, the requirements of various materials, components and equipment's at different stages of construction shall be considered. The Owner shall not take any responsibility on any account.

2.15 The contractor shall provide for adequate number of garbage bins around the construction site and the workers facilities and will be responsible for the proper utilization of these bins for any solid waste generated during the construction. The contractor shall ensure that the site and the workers facilities are kept litter free. Separate bins should be provided for plastic, glass, metal, biological and paper waste and labelled in both Hindi and English.

2.16 The contractor shall prepare and submit 'Spill prevention and control plans' before the start of construction, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, and petroleum products.

2.17 Contractor shall collect the relevant material certificates for materials with high recycled (both post-industrial and post-consumer) content, including materials for structural use like TMT steel rolled with high percentage of recycled steel, and RMC mix with fly-ash etc.

2.18 Contractor shall collect the relevant material certificates for rapidly renewable materials such as bamboo, wool, cotton insulation, agrifiber, linoleum, wheat board, strawboard and cork.

2.19 Contractor shall adopt an IAQ (Indoor Air Quality) management plan to protect the system during construction, control pollutant sources, and interrupt pathways for contamination. He shall sequence installation of materials to avoid contamination of absorptive materials such as insulation, carpeting, ceiling tile, and gypsum wallboard. He shall also protect stored on-site or installed absorptive materials from moisture damage.

2.20 The contractor shall ensure that a flush out of all internal spaces is conducted prior to and over. This shall comprise an opening of all doors and windows for 14 days to vent out any toxic fumes due to paints, varnishes, polishes, etc.

2.21 Contractor shall make efforts to reduce the quantity of indoor air contaminants that are dorous or potentially irritating harmful to the comfort and well-being of installer and building occupants. Contractor shall ensure that the VOC (Volatile Organic Compounds) content of paints, coatings and primers used must not exceed the VOC content limits mentioned below:

**Paints**

Non-flat - 150 g/L

Flat (Mat) - 50 g/L

Anti-corrosive/ anti rust - 250 g/L

**Coatings**

Clear wood finishes

Varnish - 350 g/L  
Lacquer - 550 g/L  
Floor coatings - 100 g/L  
Stains - 250 g/L

**Sealers**

Waterproofing sealer - 250 g/L  
Sanding sealer - 275 g/L  
Other sealers - 200 g/L

The VOC (Volatile Organic Compounds) content of adhesives and sealants used must be less than **VOC content limits mentioned:**

Architectural Applications VOC Limit (g/l less water)

Indoor Carpet adhesives - 50

Carpet Pad Adhesives - 50

Wood Flooring Adhesive - 100

Rubber Floor Adhesives - 60

Sub Floor Adhesives - 50

Ceramic Tile Adhesives - 65

VCT and Asphalt Tile adhesives - 50

Dry Wall and Panel Adhesives - 50

Structural Glazing Adhesives - 100

Multipurpose Construction Adhesives - 70

Substrate Specific Application VOC Limit (g/l less water)

Metal to Metal - 30

Plastic Foams - 50

Porous material (except wood) - 50

Wood - 30

Fiber Glass – 80

2.22 Wherever required, Contractor shall meet and carry out documentation of all activities on site, supplementation of information, and submittals in accordance with GRIHA program standards and guidelines. Towards meeting the aforementioned building environmental rating standard(s) expert assistance shall be provided to him up on request.

2.23 Water Use during Construction

Contractor should spray curing water on concrete structure and shall not allow free flow of water. After liberal curing on the first day, all the verticals surfaces of concrete structures should be painted with curing chemical to save water nothing extra shall be paid. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water ponding on all sunken slabs using cement and sand mortar.

2.24 The Contractor shall remove from site all rubbish and debris generated by the Works and keep Works clean and tidy throughout the Contract Period. All the serviceable and non-service

able (malba) material shall be segregated and stored separately. The malba obtained during construction shall be collected in well-formed heaps at properly selected places, keeping in a view safe condition for workmen in the area. Materials which are likely to cause dust nuisance or undue environmental pollution in any other way, shall be removed from the site at the earliest and till then they shall be suitable covered. Glass & steel should be dumped or buried separately to prevent injury. The work of removal of debris should be carried out during day. In case of poor visibility artificial light may be provided.

## 2.25 MATERIALS & FIXTURES FOR THE PROJECT

2.26 The contractor shall endeavor to source most of the materials for construction at this project within a distance of 800 km radius from the project site. Contractor shall collect the relevant material certificates to prove the same

- a) Any material that is to be sourced from outside the prescribed radius shall be done after securing the necessary approval from the Engineer-in-charge.
- b) All cement used at site for reinforced concrete, precast members, mortar, plaster, building blocks, etc shall be OPC (Ordinary Portland Cement). The OPC must meet the requirements of IS IS : 8112.
- c) As a measure to reduce wastage and water consumption during construction, the contractor shall source or set up the infrastructure for a small scale ready mix concrete, all concreting works at site shall utilise only batch mix concrete.
- d) The contractor has to comply as per MoEF issued notification 8.0.763(E) dated 14<sup>th</sup> Sept.1999 containing directive for greater fly ash utilization, where it stipulates that ii. Every construction agency engaged in the construction of buildings within a radius of 50 km radius of a Thermal Power Plant, have to use of 100% fly ash based bricks/blocks in their construction. Any brick/block containing more than 25% fly ash is designated as fly ash brick/block. As per GRIHA credits, bricks / blocks should contain more than 40% fly ash.
- e) The contractor shall ensure that sand from approved source is used in place of sand in an all concreting works unless specifically instructed otherwise by the Engineer-in-charge.
- f) Timber and aluminum use should be minimized in the project. If used, timber shall constitute of reclaimed timber and aluminum shall constitute recycled content. The source of such reclaimed timber shall be approved by the Engineer-in-charge.
- g) The contractor shall ensure that nontoxic anti-termite and other pest control is strictly used.
- h) The contractor shall ensure that all paints, polishes, adhesives and sealants used both internally and externally, on any surface, shall be Low VOC products. The contractor shall get prior approval from the Engineer-in-charge before the application of any such material.

- i) All plumbing and sanitary fixtures installed shall be as per the requirement of the of the GRIHA and shall adhere to the minimum LPM and LPF mentioned.
- j) The contractor shall employ 100% zero ODP (ozone depletion potential) insulation; HCFC hydro-chlorofluorocarbon)/ and CFC (chlorofluorocarbon) free HVAC and refrigeration equipment's and/halon-free fire suppression and fire extinguishing systems.
- k) The contractor shall ensure that all composite wood products/agro-fiber products used for cabinet work, etc do not contain any added urea formaldehyde resin.

#### 2.28 CONSTRUCTION WASTE

- a) Contractor shall ensure that wastage of construction material is kept to a maximum of 3%.
- b) All construction debris generated during construction shall be carefully segregated and stored in a demarcated waste yard. Clear, identifiable areas shall be provided for each waste type. Employ measures to segregate the waste on site into inert, chemical, or hazardous wastes.
- c) All construction debris shall be used for road preparation, back filling, etc, as per the instructions of the Engineer-in-charge, with necessary activities of sorting, crushing, etc.
- d) No construction debris shall be taken away from the site, without the prior approval of the Engineer-in-charge.
- e) The contractor shall recycle the unused chemical/hazardous wastes such as oil, paint, batteries, and asbestos
- f) If and when construction debris is taken out of the site, after prior permissions from the Project Manager, then the contractor shall ensure the safe disposal of all wastes and will only dispose of any such construction waste in approved dumping sites.
- g) Inert waste to be disposed off by Municipal Corporation/ local bodies at landfill sites.

#### 2.29 Documentation

- a) The contractor shall, during the entire tenure of the construction phase, submit the following records to the Engineer-in-charge on a monthly basis:
  - i) Water consumption in liters
  - ii) Electricity consumption in 'kwh' units
  - iii) Diesel consumption in liters
  - iv) Quantum of waste generated at site and the segregated waste types divided into inert, chemical and hazardous wastes.

- v) Digital photo documentation to demonstrate compliance of safety guidelines as specified here.
- b) The contractor shall, during the entire tenure of the construction phase, submit the following records to the Engineer-in-charge on a weekly basis:
  - i) Quantities of material brought into the site, including the material issued to the contractor by the client.
  - ii) Quantities of construction debris (if at all) taken out of the site
  - iii) Digital photographs of the works at site, the worker's facilities, the waste and other material storage yards, pre-fabrication and block making works, etc as guided by the Engineer-in-charge.
- c) The contractor shall submit one document after construction of the buildings, a brief description along with photographic records to show that other areas have not been disrupted during construction. The document should also include brief explanation and photographic records to show erosion and sedimentation control measures adopted. (Document CAD drawing showing site plan details of existing vegetation, existing buildings, existing slopes and site drainage pattern, staging and spill prevention measures, erosion and sedimentation control measures and measures adopted for top soil preservation during construction)
- d) The contractor shall submit to the Engineer-in-charge after construction of the buildings, a detailed as built quantification of the following:
  - i) Total materials used,
  - ii) Total top soil stacked and total reused
  - iii) Total earth excavated,
  - iv) Total waste generated,
  - v) Total waste reused,
  - vi) Total water used,
  - vii) Total electricity, and
  - viii) Total diesel consumed.
- e) The contractor shall submit to the Engineer-in-charge, before the start of construction, a site plan along with a narrative to demarcate areas on site from which top soil has to be gathered, designate area where it will be stored, measures adopted for top soil preservation and indicate areas where it will be reapplied after construction is complete.

- f) The contractor shall submit to the Engineer-in-charge, a detailed narrative (not more than 250 words) on provision for safe drinking water and sanitation facility for construction workers and site personnel.
- g) Provide supporting document from the manufacturer of the cement specifying the fly-ash content in PPC used in reinforced concrete.
- h) Provide supporting document from the manufacturer of the pre-cast building blocks specifying the fly ash content of the blocks used in an infill wall system.
- i) The contractor shall, at the end of construction of the buildings, submit to the Engineer-in-charge, submit following information, for all material brought to site for construction purposes, including manufacturer's certifications, verifying information, and test data, where Specifications sections require data relating to environmental issues including but not limited to:
- i) Source of products: Supplier details and location of the supplier and brand name.
  - ii) Project Recyclability: Submit information to assist Owner and Contractor in recycling materials involved in shipping, handling, and delivery, and for temporary materials necessary for installation of products.
  - iii) Recycled Content: Submit information regarding product postindustrial recycled and post-consumer recycled content. Use the "Recycled Content Certification Form", to be provided by the Commissioning Authority appointed for the Project.
  - iv) Product Recyclability: Submit information regarding product and product's component's recyclability including potential sources accepting recyclable materials.
  - v) Clean tech: Provide pollution clearance certificates from all manufacturers of materials
- vi) Indoor Air quality and Environmental Issues: Submit following certificates:
- a. Certifications from manufacturers of Low VOC paints, adhesives, sealant and polishes used at this particular project site.
  - b. Certification from manufacturers of composite wood products/agro fibre products on the absence of added urea formaldehyde resin in the products supplied to them to this particular site.
  - c. Submit environmental and pollution clearance certificates for all diesel generators installed as part of this project.
- j) Provide total support to the Engineer-in-charge appointed by the owner in completing all Green Building Rating related formalities, including signing of forms, providing signed letters in the contractor's letterhead.

## 2.30 EQUIPMENT

a) To ensure energy efficiency during and post construction all pumps, motors and engines used during construction or installed, shall be subject to approval and as per the specifications of the architects.

b) All lighting installed by the contractor around the site and at the labour quarters during construction shall be CFL/LED bulbs of the appropriate illumination levels. This condition is a must, unless specifically prescribed.

The contractor is expected to go through all other conditions of the GRIHA rating stipulations, which can be provided to him by the architects.

Failure to adhere to any of the above mentioned items, without necessary clearances from the architects and the Engineer-in-charge, shall be deemed as a violation of contract and the contractor shall be held liable for penalty as determined by the architects.

### **CLAUSE 48: PAYMENT**

#### **1. Payment Schedule**

The Payment Schedule includes a schedule setting out each Milestone Event to be achieved in a month for the Works.

#### **2. Contractor's Application for Payment**

From the date of issue of the Notice to Proceed, on the 5th (fifth) Business Day of any month, the Contractor may submit a Request for Payment, to WAPCOS Limited Representative in respect of the preceding month.

Within each Request for Payment the Contractor shall show separately:

- (i) the amounts which the Contractor claims to be payable as the cost of the Works completed during that month; and
- (ii) the cumulative amount of all prior payments made by WAPCOS Limited; and
- (iii) any amounts to which the Contractor considers are due and payable to it in accordance with the provisions of the Contract.

The Contractor's Request for Payment shall:

- (i) be prepared on forms in the form and in a number advised by WAPCOS Limited Representative; and
- (ii) contain confirmation of the relevant Milestone Events which, in the opinion of the Contractor have been achieved in that month which applies to each such Milestone Event; and
- (iii) be accompanied by:

- (a) Copy of relevant records of measurement of works, jointly taken and signed by both the parties;
- (b) A status report describing in such detail as may reasonably request, the percentage of any uncompleted Milestone Event for the month in question and the work to be undertaken by the Contractor prior to the next Request for Payment;
- (c) Certification by WAPCOS Limited Representative confirming that the Milestone Events referred to in the Request for Payment have been achieved.
- (d) Confirmation by the Contractor of any amounts due and owing from the Contractor to WAPCOS Limited pursuant to the Contract;
- (e) The Contractor's certification that the quality of all completed Works accords with the requirements of the Contract;
- (f) The Contractor's certification that each obligation, item of cost or expense mentioned in that Request for Payment has not been the basis of any previous payment.
- (g) The Contractor's certification that it has reviewed all financial and budget data contained in the Request for Payment;
- (h) The Contractor's certification that the quality of all completed Works accords with the requirements of the Contract;
- (i) The Contractor's certification that each obligation, item of cost or expense mentioned in that Request for Payment has not been the basis of any previous payment; and
- (j) The Contractor's certification that each Subcontractor who performed part of the Works which was included in the immediately preceding Certificates of Payment was paid all amounts then due to it for such Works
- (k) The Contractor providing evidence of the validity of the Contractor's Insurances.

### **3. Certificates of Payment**

Within [21 (Twenty-One)] Business Days of receipt of the Contractor's Request for Payment under Clause 48(2) [Contractor's Application for Payment], WAPCOS Limited and WAPCOS Limited Representative shall review such request and, shall issue to the Contractor, a Certificate of Payment certifying what amounts WAPCOS Limited shall pay. Each Certificate of Payment shall be for an amount which in the opinion of WAPCOS Limited, is the basis of the Request for Payment and pursuant to the Contract, is properly due to the Contractor (the "Gross Certifiable Amount") less (i) the cumulative amounts of payments previously certified as due to the Contractor, (ii) any deduction on account of recovery of Advance Payment, and (iii) Retention Amount.



In the event that the Contractor fails to achieve any Milestone Event specified in the Payment Schedule, the Contractor shall not be entitled to the payment value attributable to that Milestone Event until the relevant Milestone Event has been achieved. When the relevant Milestone Event is achieved, the Contractor may include the payment value attributable to the Milestone Event in the next Request for Payment.

No sum shall be included in the Certificate of Payment in respect of Materials yet to be incorporated into the Permanent Works unless the WAPCOS Limited Representative is satisfied that:

- (i) such Materials have been properly acquired and properly and not prematurely delivered to the Project Site;
- (ii) such Materials have been properly stored on the Project Site and fully protected against loss, damage or deterioration;
- (iii) the Contractor's records of the requisitions, orders, receipts and use of any Materials are kept in a form approved by the WAPCOS Limited Representative, and such records are available for inspection by the WAPCOS Limited Representative; and
- (iv) The Contractor has submitted a proper statement of the cost of acquiring the Materials together with such documents as may be required for evidencing such cost.

Without prejudice to any other rights of WAPCOS Limited to withhold payment to the Contractor, WAPCOS Limited may withhold from any payment due to the Contractor such amount as WAPCOS Limited deems reasonably necessary or appropriate:

- (i) if in the opinion of the WAPCOS Limited Representative the progress of the Works at the time of the Request for Payment is behind the progress of the Works as set out in the Programme; and/or
- (ii) to protect it from any losses, expenses, costs or liability because of any one or more of the following reasons:
  - (a) defects and deficiencies in any Works, whether or not payment has been made;
  - (b) unsatisfactory performance of the Contract;
  - (c) the filing of third party claims relating to the Works or any of its commitment parts for which the Contractor is liable;
  - (d) the Contractor's failure to make payments to Subcontractors;
  - (e) failure by the Contractor to provide or procure replacement Performance Security in accordance with the Contract;

(f) failure by the Contractor to provide evidence of insurance coverage in accordance with the Contract;

(g) reasonable evidence that Completion will not occur by the Time for Completion;

(h) any overpayments made by WAPCOS Limited with respect to a previous payment;

(i) failure by the Contractor to submit a properly updated monthly Programme and

(j) failure by the Contractor to provide satisfactory evidence that the costs of all labour and Materials and other obligations arising out of the Contract have been fully satisfied and discharged by the Contractor and/or to otherwise fail to submit adequate supporting documentation for any Request for Payment.

Any Provisional Sum Works shall only be executed in whole or part upon the WAPCOS Limited Representative's instruction. If the WAPCOS Limited Representative issues no such instruction, the Provisional Sum Works shall not form part of the Works and the Contractor shall not be entitled to payment for it. The Contractor shall be deemed to have allowed the necessary time and resources to enable design and Execution of the Provisional Sum Works in so far as the scope and nature of the Provisional Sum Works was reasonably foreseeable.

The Contractor shall be entitled only to such amount in respect of the Provisional Sum Works as the WAPCOS Limited Representative determines in accordance with this Clause 48(3). The WAPCOS Limited Representative shall notify the Contractor of any such determination. The WAPCOS Limited Representative shall have the authority to issue instructions to the Contractor for every Provisional Sum Works for which the Contractor shall be entitled to a part of the Provisional Sum as determined by the WAPCOS Limited Representative.

The Contractor shall produce to the WAPCOS Limited Representative all quotations, vouchers, invoices, accounts or receipts in connection with the expenditure in respect of the Provisional Sum Works, except where the Provisional Sum Works is valued in accordance with the item wise rates quoted by the Contractor in its bid submitted to the Employer.

In respect of every Provisional Sum the WAPCOS Limited Representative shall have authority to issue instructions for the execution of work or for the supply of goods, materials, Plant Sums or services by the Contractor, in which case the Contractor shall be entitled to an amount equal to the value thereof determined in accordance with Clause 48(3).

#### **4. Payment**

WAPCOS Limited shall pay the amount certified in a Certificate of Payment less the amount paid earlier in accordance with Clause 48(3) [Certificate of Payment], no later than [21 (Twenty One)] Business Days from the date of such Certificate of Payment.

**For & on behalf of Tenderer**

## SECTION– IV: SPECIAL CONDITIONS OF CONTRACT

### 1.0 SPECIAL CONDITIONS OF CONTRACT

The Special Condition of Contract (SCC) shall be followed by the contractor in addition to the General Condition of Contract (GCC) of tender Document. The following General Condition of Contract of this tender are modified as detailed below. In case of any discrepancy between GCC and SCC, the SCC will succeed over GCC.

Clause No.	Description	Applicability/Modified/ Added
------------	-------------	----------------------------------

#### GENERAL RULES AND DIRECTIONS

4	Any Person----- Process of the work	Not Applicable
8	Schedule of Materials to be issued to the Contractor	Not Applicable
10	In the case----- executed accordingly	Applicable
11	In the case----- disqualified and rejected	Applicable
19	List of works form	Not Applicable

#### DEFINITIONS

Add2(ii)(a)	<b>Owner shall mean Registrar, GNLU</b>	
2(iii)	<b>Work Means:</b> Construction of Director's Bungalow at GNLU	
2(iv)	<b>Site Means</b> Gujarat National Law University	
2 (vi)	<b>Engineer-In-Charge</b> Will be intimated to the successful bidder at the time of issue of Notice to Proceed the works.	
2 (x)	<b>Market Rate</b> Percentage on cost of materials and labour to cover all overheads and profits	15 %
2(xi)	<b>Standard Schedule of Rates</b>	R&B (SOR), GWSSB (SOR), CPWD

	Schedule of Rates (Electrical)	
	Schedule of Rates (Civil)	
2(xvi)	<b>Date of Commencement of work</b>	Within 7 days after Award of Work
9	<b>Signing of Contract</b>	The Successful tenderer will have to execute an agreement in stamp paper worth 0.1% of contract agreed amount in prescribed form.

#### CLAUSES OF CONTRACT

<b>Clause 1</b>	<b>Performance Guarantee</b>	Applicable
	<b>i. Performance Guarantee</b>	5% of Contract Value (This guarantee shall be in the form of Deposit at call receipt of any Nationalized Bank/Banker's cheque of any Nationalized Bank/Demand Draft of any Nationalized Bank /Pay order of any Nationalized Bank (in case guarantee amount is less than Rs. 1,00,000/-) or Government Securities or Fixed Deposit Receipts or Guarantee Bonds of any Nationalized Bank or the State Bank of India in accordance with the prescribed form
	<b>ii. Time allowed for submission of Performance Guarantee from the date of issue of letter of acceptance</b>	14 days
	<b>iii. Validity of Performance Guarantee</b>	The Performance Guarantee shall be valid up to the 90

		days beyond the stipulated date of completion of Work.
		The Performance Bank Guarantee shall be valid up to 90 days beyond the duration of the work. After the completion period, the Bank Guarantee will be returned and the final 2.5% of the Contract Value will be reserved as a Security Deposit
	<b>iv. Return of Performance Guarantee</b>	Successful completion of Work, Taking over of Work by the Engineer-In-Charge and Start of DLP period.
<b>Clause 1A</b>	<b>Security Deposit</b>	Applicable
		2.5% of Gross amount of each RA Bill deducted from each Running Bill and Final Bill.
	<b>Release of security Deposit</b>	After Successful completion of Defect Liability Period and issuance of certificate by Engineer-In-Charge.
Clause 2	Compensation for Delay	Applicable
Clause 2A	INCENTIVE FOR EARLY COMPLETION	Not Applicable
Clause 3A	Start of Work	Applicable and modified as Time period mentioned in Letter of Commencement.
Clause 5	Time and Extension for Delay	Applicable
	Number of days from the date of issue of letter of acceptance for reckoning date of	As per date mentioned in Letter of Commencement.

	start	As Mentioned in NIT
	Stipulated time of completion of project	
Clause 6	Measurements of Work Done	Applicable
Clause 6A	Computerized Measurement Book	Applicable
Clause 7	Payment on Intermediate Certificate to be Regarded as advance	Not Applicable
		Modified As
		It is clearly agreed and understood by the Contractor that notwithstanding anything to the contrary that may be stated in the agreement between WAPCOS and the Contractor; the contractor shall become entitled to payment only after WAPCOS has received the corresponding payment(s) from the Owner for the work done by the contractor. Any delay in the release of payment by the Owner to WAPCOS leading to a delay in the release the corresponding payment by WAPCOS to the contractor shall not entitle the contractor to any compensation/ interest from WAPCOS. All payments shall be released by way of e-transfer through RTGS in India directly to their Bank account by WAPCOS.
		The Security Deposit (2.5% of Total amount of Bill Paid)

		shall be release after Successful completion of Defect Liability Period and issuance of certificate by Engineer-In-Charge
Clause 9	Payment of final bill	Interest clause is not applicable
Clause 10	Materials Supplied by WAPCOS	Not Applicable
Clause 10 B(i)	Secured Advance On Non-Perishable Materials	Not Applicable
Clause 10 B(ii)	Mobilization Advance	Applicable 5% of the tendered value on submission of Bank Guarantee Bond from Scheduled Bank.
Clause 10 B(iii)	Plant Machinery & Shuttering Material Advance	Not Applicable
Clause 10 B(iv)	Recovery of Mobilization advance	Not Applicable
Clause 10 C	Payment on Account of Increase in Price / Wages due to Statutory Order	Not Applicable
Clause 10 CA	Payment due to Variation in Prices of Materials after Receipt of Tender	Not Applicable
Clause 10 CC	Payment due to Increase/Decrease in Prices/Wages (Excluding Materials covered under Clause 10 CA) after Receipt of Tender for Works	Not Applicable
Clause 11	Works to be Executed in Accordance with Specifications, Drawings, Orders Etc. Specifications to be followed for execution of work	Applicable All works are to be executed in accordance with the specifications, BIS Standards and Codes, Indian Electricity Rules 1956, Indian Electricity Act 2003 and Fire Safety Regulations pertaining to



		Electric applications. Specification with up to date correction on the last date of submission of tender for work.
		In case specification of any item is not clear, CPWD Specifications , Indian Standards(IS), NBPDC Specifications with up to date correction slips issued on the last date of submission of tender for work is applicable
Clause 12	Deviations / Variations Extent and Pricing	Only first paragraph “The Engineer in charge----- work except as hereafter provided” will be applicable.
	Clause 12.1	Not Applicable
	Clause 12.2(a)	Modified as “In the case of extra item(s) (items that are completely new), the contractor may within fifteen days of receipt of order or occurrence of the item(s) claim rates, supported by proper analysis on the basis of the market rates and the contractor shall be paid in accordance with rate approved by WAPCOS.  In case the extra item being the Scheduled Item (R&B SOR & GWSSB SOR, Gujarat), these shall be paid as per the schedule rate.
	Clause 12.2(b)	Modified as “The specification mentioned in

Tender may be substituted as per the requirement of Owner/ WAPCOS.

In this case of substituted item(s) being R&B & GWSSB SOR item, these shall be paid as per the R&B & GWSSB SOR rate plus applicable cost index (at the time of tender) as issued by CPWD.

In this case of substituted item(s) being Non R&B & GWSSB SOR item, the contractor may within fifteen days of receipt of order or occurrence of the item(s) assess the rates supported by proper analysis on the basis of the market rates.

The rate of tendered item to be substituted will also be assessed by same above manner.

The plus/minus difference of rates of mutually substituted items will be submitted by Contractor and approved by WAPCOS.

Clause 12.2(c)

Not Applicable

Deviation Limit beyond which clauses 12.2 & 12.3 shall apply for all items other than foundation work (except earthwork) as mentioned in clause 12.5

Clause 12.5

Not Applicable

(i) Deviation limit beyond which clause

12.2 & 12.3 shall apply for foundation work (except earth work)

Deviation limit for items in 100% earth work sub head of R&B & GWSSB SOR or related items.

	Clause 12.4, 12.6	Not Applicable
Clause 15A	Compensation in case delay supply of material	Not Applicable
Clause 17	Contractor liable for Damages, Defects during Defect Liability Period	Applicable  Added/Modified: One from the date of successful completion and commissioning of the project in all respect and handing over of the work with full satisfaction of Client. As WAPCOS is liable to the Client, the contractor is liable to WAPCOS till the Defect Liability Period.
Clause 27	Lumpsum Provisions in Tender	Not Applicable
Clause 30	Employment of coal mining or controlled area labour not permissible	Not Applicable
Clause 31 A	Water supply	Applicable
Clause 32	Alternate water arrangements	Applicable
Clause 33	Return of surplus material	Not Applicable
Clause 34	Hire of plant and Machinery	Not Applicable
Clause 36(i)	Requirement of Technical Representative(s)	

Sr. No.	Requirement of Technical Staff	Minimum Experience (years)	Designation of Technical Staff
---------	--------------------------------	----------------------------	--------------------------------

	Minimum Qualification	Nos.		
1	B.Tech (Civil, Mechanical & Electrical)	1	7	Project Manager (Civil)
2	Diploma (Civil, Electrical & Mechanical)	2	3	Engineer/ Billing Engineer/ Quality Control
Clause 42	Return of Material & Recovery for Material Issued			Not Applicable
Clause 46	Insurance			<b>Applicable</b>

## 2.0 ADDITIONAL CONDITIONS

1. The Contractor shall be responsible for consequential effects arising out during the inspection done by the Chief Technical Examiner Cell, Central Vigilance Commission or by the Building Works Committee or third party authorized by WAPCOS or any statutory committee or by any duly authorized representative of WAPCOS, during the progress or any time after the construction and development of project up to the defect liability period, and will take appropriate action for rectification of defective work. Rectification of defective works or replacement of sub-standard materials or articles, as pointed out by the Chief Technical Cell, Central Vigilance Commission, Building Works Committee or authorized representative of WAPCOS or third party authorized by WAPCOS or any statutory committee, will be carried out or replaced by the Contractor at his own risk and cost. WAPCOS will not pay any extra amount for such rectification or replacement.

2. Handing Over of the Project: Contractor will hand over the project to Owner /Client after successful completion of each component of the project in all respect and complete satisfaction of Engineer-In-charge. The partial handing over of building components shall not be considered. Contractor shall also provide necessary Completion Certificate/NOC from all local Government/ Statuary Authorities including Fire, Forest, Electrical, Environment, Lift, DG Set, required before handing over the project to the client. The defect liability period will be one year after such handing over.

3. The contractor shall provide fully equipped office for Contractor's Staff, Engineers along with facility of 24 hours electric and drinking water supply, sanitary facilities, furniture and desktop computer of latest version along with printer and internet connection at construction site for finalizing immediate technical solutions/decisions on the site in consultation with Engineer In-Charge so that the work progress may not be hampered."

4. The Contractor shall render all help and assistance in documenting the total sequence of this project by way of photography, slides, audio-video recording etc. nothing extra shall be payable to the agency on this account.
5. Contractor should provide R.O. Plant sufficient for workers employed at site, his technical staff and site staff.
6. The work will be commenced by the Contractor only after the approval of drawings from the concerned local authorities including fire fighting's department or any other department as per statutory requirement.
7. The Contractor shall be solely responsible to follow the general clauses of the contract including labour regulations, registration of contractor, obtaining labour license from labour department, safety precautions, etc. and all other statutory provisions related to labor/works as per the prevailing General Clauses of Contract amended from time to time. The Contractor shall stick to the schedule of all activities and carry out it with mutually agreed time frame.
8. Rates and amount Quoted by contractor shall be firm and fixed for entire contract period as well as extended period for completion of the works. No escalation shall be applicable on this contract.
9. Unless otherwise provided in the schedule of quantities the rates tendered by the contractor shall be all inclusive and shall apply to all heights lifts, leads and depths of the structure and nothing extra shall be payable on this account.
10. The contractor shall make his own arrangements for obtaining electric connection and water Connection/arrangement (if required) and make necessary payments directly to the department concerned. No dispute in this regard shall be entertained.
11. Other agencies doing works related to this project will also simultaneously execute the work and the contractor shall provide necessary facilities for the same. The contractor shall leave such necessary holes opening etc. for burying in the work pipes, cables, conduits, clamps, boxes and hooks for fan clamps etc. as may be required for other agencies. Conduits for electrical wiring / cables will be laid in a way that they leave enough space for concreting and do not adversely effect the structural members. Nothing extra over the agreement rates shall be paid for the same.
12. Some restrictions may be imposed by the security staff etc. on the working and for movement for labour materials etc. The contractor shall be bound to follow all such restrictions / instructions and nothing extra shall be payable on this account.
13. (a) The Project work will be carried out in the manner complying in all respects with the requirements of relevant bye laws of the local body under the jurisdiction of which the work is to be executed or as directed by the Engineer in charge and nothing extra will be paid on this account.

(b) The contractor shall comply with proper and legal orders and directions of the local or public authority or municipality and abide by their rule and regulations and pay all fees and charges which he may be liable.

14. The contractor shall give a performance test of the entire installation (s) as per standing specification before the work is finally accepted and nothing extra whatsoever shall be payable to the contractor for the test.

15. Any cement slurry added over base surface (or) for continuation of concreting for better bond is deemed to have been in-built in the items and nothing extra shall be payable (or) extra cement considered in consumption on this account.

16. Samples of various materials required for testing shall be provided free of charges by the contractor. Testing charges, if any, unless otherwise provided shall be borne by the Contractor. All other expenditure required to be incurred for taking the samples, conveyance, packing etc. shall be borne by the contractor himself.

17. The work shall be carried out in accordance with the Architectural drawings and structural drawings, to be issued from time to time, by the Engineer-in-Charge. Before commencement of any item of work the contractor shall correlate all the relevant architectural and structural drawings, nomenclature of items and specifications etc. issued for the work and satisfy himself that the information available there from is complete and unambiguous. The figure and written dimension of the drawings shall be superseding the measurement by scale. The discrepancy, if any, shall be brought to the notice of the Engineer-in-charge before execution of the work. The contractor alone shall be responsible for any loss or damage occurring by the commencement of work on the basis of any erroneous and/ or incomplete information and no claim whatsoever shall be entertained on this account.

18. The contractor shall bear all incidental charges for cartage, storage and safe custody of materials issued by WAPCOS.

19. In the case of items of which abbreviated nomenclature is not available in the above cited publication and also in case of extra and substituted items of works for which abbreviated nomenclature is not provided in the agreement, the full nomenclature of items shall be reproduced in the measurements books and bill forms for running account bill.

The full nomenclature of the items shall be adopted in preparing abstract of final bill in the measurement book and also in the bill form for final bill.

20. The contractor shall have to make approaches to the site, if so required and keep them in good condition for transportation of labour and materials as well as inspection of works by the Engineer in charge. Nothing extra shall be paid on this account.

21. No payment will be made to the contractor for damage caused by rains, or other natural calamities during the execution of the works and no such claim on this account will be entertained.
22. Various factory made materials shall be procured from reputed and approved manufacturers or their authorized dealers. List of such approved manufacturers is available at Annexure IX. For the items / materials not appearing in the list the decision of Engineer in charge shall be final and binding.
23. Contractor shall have to execute a Guarantee Bond in respect of Water Proofing works as per Performa attached in this N.I.T. at Annexure II. He shall also have to execute guarantee bonds for water supply and sanitary installations work on the proforma available at Annexure I.
24. The terms machine batched, machine mixed and machine vibrated concrete used elsewhere in agreement shall mean the concrete produced in concrete batching and mixing plant and if necessary transported by transit concrete mixers, placed in position by the concrete pumps, tower crane and vibrated by surface vibrator /needle vibrator / plate vibrator, as the case may be to achieve required strength and durability.
25. Wherever work is specified to be done or material procured through specialized agencies, their names shall be got approved well in advance from Engineer in charge. Failure to do so shall not justify delay in execution of work. It is suggested that immediately after award of work, contractor should negotiate with concerned specialist agencies and send their names for approval to Engineer in charge. Any material procured without prior approval of Engineer in charge in writing is liable to be rejected. Engineer in charge reserves right to get the materials tested in laboratories of his choice before final acceptance. Nonstandard materials shall not be accepted.
26. Doors and frames shall be procured from specialist firms and name of such agencies shall be got approved from the Engineer in charge well in advance.
27. The construction joints shall be provided in predetermined locations only as decided by Engineer in charge. The cost of shuttering for these construction joints shall be included in item of Concrete work / RCC work and nothing extra shall be payable on this account to the contractor.
28. The gradation of fine sand to be used in plaster work, shall be strictly as per Table 3.1 (clause 3.1.3) of CPWD Specification 2009 Vol. - I conforming to IS 1542-1977. The plastered surface shall be fairly smooth without any undulation of any kind for applying paint/white wash.
29. No chase cutting/dismantling of plaster/RCC/CC shall be allowed, so contractor has to execute the electrical work accordingly.



30. The contractor shall invariably prepare the samples of finishing items as per direction of Engineer-in-charge. The contractor shall proceed with further finishing items only after getting the samples of these items approved in writing from Engineer-in-charge. No extra claim whatsoever beyond the payments due at agreement rates will be entertained from the contractor on this account.

31. The contractor shall take instruction from the Engineer in charge for stacking of materials at any place. No excavated earth or Project material shall be stacked on areas where other buildings, roads, services or compound walls are to be constructed.

32. If as per municipal rules, the huts for labour are not be created at the site of work by the contractors, the contractor are required to provide such accommodation as is acceptable to local bodies and nothing extra shall be paid on this account.

33. Royalty at the prevalent rates shall be payable by the contractor on all the boulders, metals, shingle, sand and bajri etc. collected by him for the execution of the work, direct to the Revenue authority or authorized agent of the state Government concerned or Central Government. No such claim of Contractor on royalty shall be entertained by the WAPCOS.

34. All relevant tests for BMC / RMC as per prescribed IS codes in order to enable the Engineer in charge to conduct field tests to ensure that the quality is consistent with the prescribed specifications and nothing extra shall be paid on this account.

35. The contractor or his authorized representative shall associate in collection, preparation, forwarding and testing of such samples. In case, he or his authorized representative is not present or does not associate himself, the results or such tests and consequences thereon shall be binding on the contractor.

36. The contractor shall get the water tested with regard to its suitability of use in the works and get written approval from the Engineer in charge before he proceeds with the use of same of execution of works. If the tubewell water is not suitable, the contractor shall arrange Municipal water or from any other sources at his own cost and nothing extra shall be paid to the contractor on this account. The water shall be got tested at frequency specified in latest CPWD specifications/BIS code.

37. The material shall conform to the quality and make as per attached list in Annexure IX. However, for the items not appearing in the list preference shall be given to those articles which bear ISI certification marks. In case articles bearing ISI certification marks are not available the quality of sample brought by the Contractor shall be judged by the standard laid down in the relevant ISI specification/CPWD specification. All materials and articles brought by the contractor to the site for use shall conform to the samples approved, which shall be preserved till the completion of the work. However, such articles which bear ISI mark but stand banned by CPWD will not be used. Notwithstanding the case of materials of "Preferred Make"

as given in Annexure IX, provisions of Clause 10A of the General Conditions of Contract for Central PWD works shall be applicable on the materials of "Preferred Make" also.

38. It must be ensuring that all materials to be used in work bear BIS certification mark. In cases where BIS certification system is available for a particular material/product but not even a single producer has so far approached BIS for certification the material can be used subject to the condition that it should confirm to CPWD specification and relevant BIS codes. In such case written approval of the Engineer-In-Charge may be obtained before use of such material in the work.

39. The final approval of the brand to be used shall be as per the direction of Engineer-in-Charge. The brand used shall be one of the brands in case specified in the list of preferred make / materials annexure-IX.

40. In case of non-availability of material of the brands specified in the list of approved materials an equivalent brand may be used after getting written approval of WAPCOS giving details to indicate that the brand proposed to be used is equivalent to the brands mentioned in the agreement.

#### **41. Special conditions for Cement**

The contractor shall procure 53 grade Ordinary Portland Cement (conforming to IS: 8112), Portland pozzolona cement (confirming to IS: 1489: Part –I) as required in the work, from reputed manufacturers of cement such as ACC, Ultratech, Ambuja, Jaypee Cement, and or from any other reputed cement manufacturer, having a production capacity not less than one million tons per annum as approved by WAPCOS. The tenderers may also submit a list of names of cement manufacturers which they propose to use in the work. The tender accepting authority reserves right to accept or reject name(s) of cement manufacture(s) which the tenderer proposes to use in the work. No change in the tendered rates will be accepted if the tender accepting authority does not accept the list of cement manufactures, given by the tenderer, fully or partially. The cement brought to the site for execution of work shall be in bags bearing manufacturer's name & ISI marking. Weight of cement in each bag shall be 50 kg. Samples of cement arranged by the contractor shall be taken by the Engineer- in-Charge and got tested in accordance with provisions of relevant BIS codes. In case the test results indicate that the cement arranged by the contractor does not conform to the relevant BIS codes, the same shall stand rejected and it shall be removed from the site by the contractor at his own cost within 7 days of written order from the Engineer-in-Charge to do so.

#### **42. Special Conditions for Steel: -**

The contractor shall procure TMT bars of Fe500/Fe500D/Fe550/Fe550D grade (the grade to be procured is to be specified) from primary steel producers such as SAIL, Tata Steel Ltd., RINL, Jindal Steel & Power Ltd. and JSW Steel Ltd. or any other producer as approved by WAPCOS

who are using iron ore as the basic raw material / input and having crude steel capacity of 2.0 Million tonnes per annum and above.

**43. Removal of rejected/sub-standard materials.**

The following procedure shall be followed for the removal of rejected/sub-standard materials from the site of work:

(i) Whenever any material brought by the contractor to the site of work is rejected, entry thereof should invariably be made in the Site Order Book under the signature of the Engineer-In-Charge, giving the approximate quantity of such materials.

(ii) As soon as the material is removed, a certificate to that effect shall be recorded by the Engineer-In-Charge against the original entry, giving, the date of removal and mode of removal, i.e., whether by truck, carts, or by manual labour. If the removal is by truck, the registration number of the truck should be recorded.

(iii) When it is not possible for the Engineer-In-Charge to be present at the site of work at the time of actual removal of the rejected/sub-standard materials from the site, the required certificate should be recorded by the Authorized Representative of WAPCOS, and the Engineer-In-Charge should countersign the certificate recorded by the Authorized Representative.

44. If the work is carried out in more than one shift or during night, no claim on this account shall be entertained. The contractor has to take permission from the police & local authorities etc. if required for work during night hours. No claim / hindrance on this account shall be considered if work is not allowed during night time. The requisite supervision shall be made available by the WAPCOS along with necessary issue of material under joint custody.

45. Contractor should provide R.O. Plant sufficient for workers employed at site, his technical staff and site staff of WAPCOS free of charge.

46. The contractor shall provide & maintain (1 No.) desktop Computer of latest version along with printer, operator and internet connection at site of work as per direction of Engineer-in-charge.

47. Once the Project is completed and the contractor shall be responsible to attend defect pointed out by WAPCOS and then hand over the Project to the client.

48. Contractor should hand over the warranty of the specialized items to the WAPCOS.

49. The contractor is required to deploy resources as per availability of site. However, no claim will be entertained for idle labour, idle machinery, idle technical/no-technical staff, idle T&P etc.

50. Contractor shall not divert any advance payments or part thereof for any work other than that needed for completion of the contracted work. All advance payments received as per

terms of the contract (i.e. mobilization advance, secured advance against materials brought at site, secured advance against plant & machinery and/or for work done during interim stages, etc) are required to be re-invested in the contracted work to ensure advance availability of resources in terms of materials, Labour, plant & machinery needed for required pace of progress for timely completion of work.

51. All running account bills preferred by the contractor for advance payments shall be processed only if Engineer-in-charge is satisfied that up to date investments (excluding security deposit & performance guarantee, which are not considered as investments) made by the contractor against contracted work are more than the payments received. Accordingly, all running account bills shall be supported with an account of up-to-date payments received vis-a-vis up to date investments made on the work to enable engineer-in-charge to check to his satisfaction that the payments made by engineer-in-charge are properly utilized only on the work and nowhere else.

### **3.0 Arbitration:**

"Any dispute, controversy or claims arising out of or relating to this Agreement or the breach, termination or invalidity thereof, shall be settled through following mechanism:

a) Firstly, the aggrieved party shall write a letter to the other party detailing its grievances and calling upon the other party to amicably resolve the dispute by convening a joint meeting. Accordingly, the parties as per their convenience shall jointly convene the said meeting(s). wherein minutes of the said meeting(s) shall be prepared and countersigned by all the parties. It is mandatory to prepare minutes of meeting(s) and to be countersigned by all the parties, irrespective of the outcome of the said meeting(s).

b) In the event the parties are unable to reach on any settlement in the said meeting(s), then the aggrieved party shall mandatory resort to pre-litigation mediation mechanism with Delhi High Court Mediation Cell, New Delhi.

c) It is only upon failure of the pre-litigation mediation mechanism with Delhi High Court Mediation Cell, then the aggrieved party shall resort to resolution of disputes through arbitration of a Sole Arbitrator. The appointing authority of Sole Arbitrator is CMD, WAPCOS Limited, to which neither of the parties have any objection nor they shall ever object.

d) Subject to the parties agreeing otherwise, the Arbitration proceedings shall be conducted in accordance with the provisions of the Indian Arbitration and Conciliation Act, 1996 (amended as on date).

e) It is also acknowledged and accepted that WAPCOS is only working as Intermediary between the Associate/Sub-Consultant/Sub-Contractor and the Principal Employer/Client, thus in the event, any dispute arises under the present agreement and referred to Arbitration for adjudication, then subject to corresponding clause in the Contract/Agreement/Work Order/Arrangement between Principal Employer/Client & WAPCOS, Principal Employer/Client

shall also be made party to the said Arbitration proceedings. Also, the award including costs if any passed against WAPCOS and costs incurred in the proceedings shall be the sole responsibility of Principal Employer/Client. The said clause if found inapplicable, even then the other terms of the Arbitration Clause shall survive and shall be acted upon.

f) The place/seat of arbitration shall be Delhi and any award whether interim or final, shall be made, and shall be deemed for all purposes between the parties to be made, in Delhi. The arbitral procedure shall be conducted in English language and any award or awards shall be rendered in English. The procedural law of the arbitration shall be Indian Law. The award of the arbitrator shall be final and conclusive and binding upon the Parties.

g) The Contract and any dispute or claim arising out of or in connection with it or its subject matter or formation (including non-contractual disputes or claims) shall be governed by and construed in accordance with the laws of India and the Parties submit to sole & exclusive jurisdiction of courts at Delhi."

#### **4.0 Variation in Quantities**

The quantities for ancillary works given in the schedule and / or in drawings are for the guidance of the tenderer. The contractor shall be paid on the basis of actual quantities of works carried out. However, the contractor shall check these quantities before quoting and will bring to the notice of Consultants / Engineer-In charge for any major variation. Drawings issued with the tender are diagrammatic only and indicate the general arrangement only. The data given in the drawings and specifications is as exact as could be secured, but its accuracy is not guaranteed. Contractor shall carry out his own computations and provide all such equipment, as required to achieve the specified conditions. Employer reserves the right to add / delete any items of work during the currency of contract.

#### **5.0 Performance Bound Contract**

The contract will be a performance bound contract and therefore the Bidder shall make their independent check for selection of equipment's etc. The drawings enclosed with the tender documents shall be only tentative layout plans and for guidance purpose only. The detailed working / shop drawings shall be prepared and submitted for approval to the Department /Engineer-in-Charge / Consultant.

The contractor shall guarantee that the capacity of various equipment's as well as the whole system shall be in line with the required capacity.

**For & on behalf of Tenderer**

## SECTION– V: ANNEXURES

---

### **Annexure –I: GUARANTEE TO BE EXECUTED BY THE CONTRACTOR FOR REMOVAL OF DEFECTS AFTER COMPLETION IN RESPECT OF WATER SUPPLY AND SANITARY INSTALLATIONS**

The agreement made this \_\_\_\_\_ day of \_\_\_\_\_ two thousand and \_\_\_\_\_ between \_\_\_\_\_ S/o \_\_\_\_\_ (hereinafter called the GUARANTOR of the one part) and the WAPCOS LIMITED (hereinafter called the WAPCOS of the other part).

WHEREAS THIS agreement is supplementary to a contract. (Herein after called the Contract) dated \_\_\_\_\_ and made between the GUARANTOR OF THE ONE PART AND the WAPCOS of the other part, whereby the contractor interalia, under look to render the work in the said contract recited structurally stable workmanship and use of sound materials.

AND WHEREAS THE GUARANTOR agreed to give a guarantee to the effect that the said work will remain structurally stable and guarantee against faulty workmanship, finishing, manufacturing defects of materials and leakages etc.

NOW THE GUARANTOR hereby guarantee that work executed by him will remain structurally stable, after the expiry of maintenance period prescribed in the contract for the minimum life of ten years, to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

The decision of the Engineer-in-charge with regard to nature and cause of defects shall be final. During the period of guarantee the guarantor shall make good all defects to the satisfaction of the Engineer in charge calling upon him to rectify the defects, failing which the work shall be got done by the WAPCOS by some other contractor at the guarantor's cost and risk. The decision of the Engineer in charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to make good all the defects, commits breach thereunder then the guarantor will indemnify the Principal and his successor against all loss, damage cost expense or otherwise which may be incurred by him by reason of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or damage and / or cost incurred by the WAPCOS the decision of the Engineer-in-charge will be final and binding on the parties.

IN WITHNES WHEREOF those presents have been executed by the obligator \_\_\_\_\_ and \_\_\_\_\_ by for and on behalf of the WAPCOS LIMITED on the day, month and year first above written.

Signed sealed and delivered by OBLIGATOR in presence of:

1. \_\_\_\_\_

2. \_\_\_\_\_

SIGNED FOR AND ON BEHALF OF THE WAPCOS LIMITED BY \_\_\_\_\_ in  
the presence of:

1. \_\_\_\_\_

2. \_\_\_\_\_

## **Annexure –II: GUARANTEE BOND TO BE EXECUTED BY THE CONTRACTOR FOR WATER PROOFING TREATMENT FOR TOILETS**

The agreement made this \_\_\_\_\_ day of \_\_\_\_\_ two thousand and \_\_\_\_\_ between \_\_\_\_\_ S/o \_\_\_\_\_ (hereinafter called the GUARANTOR of the one part) and the WAPCOS Limited (hereinafter called the WAPCOS of the other part).

WHEREAS THIS agreement is supplementary to a contract. (Herein after called the Contract) dated \_\_\_\_\_ and made between the GUARANTOR OF THE ONE PART AND the WAPCOS of the other part, whereby the contractor inter alia, undertook to render the structures in the said contract the work in the said contract recited completely water and leak proof.

THE GUARANTOR hereby guarantee that the water proofing treatment given by him will render the structures completely leak proof and the minimum life of such water proofing treatment shall be ten years to be reckoned from the date after the expiry of maintenance period prescribed in the contract.

Provided that the guarantor will not be responsible for leakage caused by earthquake or structural defects.

The decision of the Engineer in charge with regard to cause of leakage shall be final.

During the period of guarantee the guarantor shall make good all defects and in case of any defects being found render the structure water proof to the satisfaction of the Engineer in charge at his cost and shall commence the work for such rectification within seven days from the date of issue of notice from the Engineer in charge calling upon him to rectify the defects, failing which the work shall be got done by the WAPCOS through some other contractor at the guarantor's cost and risk. The decision of the Engineer in charge as to the cost payable by the Guarantor shall be final and binding.

That if the guarantor fails to execute the water proofing, or commits breach thereunder then the guarantor will indemnify the Principal and his successor against all loss, damage, cost of expenses or otherwise which may be incurred by him by reason of any of any default on the part of the GUARANTOR in performance and observance of this supplementary agreement. As to the amount of loss and / or cost incurred by the WAPCOS on the decision of the Engineer-in-charge will be final and binding on the parties.

IN WITNES WHEREOF those presents have been executed by the obligator \_\_\_\_\_ and \_\_\_\_\_ by for and on behalf of the WAPCOS LIMITED on the day, month and year first above written.

Signed sealed and delivered by OBLIGATOR in presence of:

1. \_\_\_\_\_



2. \_\_\_\_\_

SIGNED FOR AND ON BEHALF OF THE WAPCOS LIMITED BY \_\_\_\_\_ in the presence of :

1. \_\_\_\_\_

2. \_\_\_\_\_

**Annexure –III: BANK GUARANTEE FORMAT FOR EMD (Not Applicable)**

WHEREAS, M/s ..... having their Registered/Head Office at ..... (hereinafter called "the Bidder") has submitted his Bid dated ..... for the ..... [hereinafter called "the Bid"] to M/s WAPCOS Limited (hereinafter called the Employer)

KNOW ALL PEOPLE by these presents that we ..... (name of the Bank) having our head office at ..... (hereinafter called "the Bank") are bound unto Employer in the sum of ..... for which payment well and truly to be made to the Employer, the Bank binds itself, its successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ..... day of ..... 2019.

THE CONDITIONS of this obligation are:

- (1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified;OR
- (2) If the Bidder having been notified of the acceptance of his bid by ..... during the period of Bid Validity:

We undertake to pay to the ..... up to the above amount upon receipt of his first written demand, without the Employer having to substantiate his demand, provided that in his demand the Bidder will note that the amount claimed by him is due to him owing to the occurrence of one or any of the above mentioned two conditions and specify the occurred condition or conditions.

This Guarantee will remain in force up to and including the date ..... after the deadline for submission of Bids as is stated in the instructions to Bidders or as it may be extended by the ..... notice of which extension(s) to the Bank is hereby waived and notice to the bidder would constitute sufficient notice to the Bank. Any demand in respect of this guarantee should reach the Bank not later than the above date.

Notwithstanding anything contained herein

- i) Liability under this guarantee shall not exceed .....
- ii) This bank guarantee shall be valid upto .....and;
- iii) Our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee only and only if you serve upon us a written claim or demand in terms of the guarantee on or before ..... (indicate a period twelve months after the date of issue of Bank Guranttee).

DATE:	<b>SIGNATURE:</b>
(Signature of Witness)	SEAL

#### **Annexure –IV: FORM OF PERFORMANCE SECURITY**

WAPCOS Limited,  
515, 5th Floor, Shree UGATI Corporate Park  
Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421

In consideration of \_\_\_\_\_ (Employer's name) (hereinafter referred to as "the Employer") which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to \_\_\_\_\_ (Contractor's name & address) (hereinafter referred to as "the Contractor " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a contract, by issue of Employer's Notification of Award No. \_\_\_\_\_ dt. \_\_\_\_\_ and the same having been unequivocally accepted by the Contractor, resulting into a contract valued at Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) for \_\_\_\_\_ (name of work) (hereinafter called " the contract") and the Contractor having agreed to provide a Contract Performance Guarantee for the faithful performance of the entire contract equivalent to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) (5 % of the said value of the Contract to the Employer.

We, \_\_\_\_\_ (name & address of bank) (hereinafter referred to as "the Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer, on demand any or, all monies payable by the Contractor to the extent of Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) as aforesaid at any time upto \_\_\_\_\_ without any demur, reservation, contest , recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. The Bank undertakes not to revoke this guarantee during its currency without previous consent of the Employer and further agrees that the guarantee herein contained shall continue to be enforceable till the Employer discharges this guarantee.

We the said Bank further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the said contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the said Contract have been fully and properly carried out by the said Contractor and accordingly discharges the guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from, time to time to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to

postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor and to exercise the same at any time in any manner and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The bank shall not be released of its obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision, have the effect of relieving the Bank. The guarantee shall not be affected by a change in the constitution of the bank or of the employer.

The bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance, without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

We The Said Bank do hereby declare that we have absolute and unconditional power to issue this guarantee in your favour under the Memorandum and Articles of Association or such other constitutional documents of the Bank and the undersigned have full power to execute this guarantee under the Power of Attorney/ Post Approval Authorization dated \_\_\_\_\_ of the bank granted to him / us by the Bank. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the powers of the bank or its officials and the guarantee shall be deemed to have been issued as if the bank and its officials have all the powers and authorization to give this guarantee on behalf of the bank.

We the said bank do hereby certify the genuineness and appropriateness of the Stamp paper and stamp value used for issuing the guarantee. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the stamp paper or its stamp value.

We the said bank do hereby declare that our payments hereunder shall be made to you , free and clear of and without and deduction, reduction on account of any reasons including any and all present and future taxes, levies, charges of withholding whatsoever imposed or collected with respect thereto.

Notwithstanding anything contained hereinabove our liability under this guarantee is restricted to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) and it shall remain in force upto and including \_\_\_\_\_ and shall be extended from time to time for such period as may be desired by M/S WAPCOS Limited on whose behalf this bank guarantee has been given.

Notwithstanding anything contained herein

i) Our liability under this guarantee shall not exceed Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only);

ii) This bank guarantee shall be valid upto \_\_\_\_\_; and

iii) our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee, only and only if you serve upon us a written claim or demand in terms of the guarantee on or before \_\_\_\_\_ (**indicate a date twelve months after validity of guarantee**).

Dated this \_\_\_\_\_ day of \_\_\_\_\_ at Gandhinagar.

**For & on behalf of Tenderer**

**Annexure – V : FORMAT FOR AFFIDAVIT**

I / We have submitted a bank guarantee for the work (Name of work) Agreement No. \_\_\_\_\_ Dated \_\_\_\_\_ from \_\_\_\_\_ (Name of the Bank with full address) to the WAPCOS Limited, New Delhi with a view to seek exemption from payment of performance guarantee in cash. This Bank guarantee expires on \_\_\_\_\_ I / We undertake to keep the validity of the bank guarantee intact by getting it extended from time to time at my / our own initiative up to a period of \_\_\_\_\_ months after the recorded date of completion of the work or as directed by the WAPCOS.

I / We also indemnify the WAPCOS against any losses arising out of non-encasement of the bank guarantee if any.

**(Deponent)**

**Signature of Contractor**

Note: The affidavit is to be given by the Executants before a first class Magistrate.

## Annexure –VI: FORM OF ADVANCE PAYMENT GUARANTEE

M/s WAPCOS Limited,  
.....  
.....

In consideration of WAPCOS LTD. (hereinafter referred to as "the Employer") which expression shall, unless repugnant to the context or meaning thereof include its successors, administrators and assigns) having awarded to \_\_\_\_\_(Contractor's name) with its Registered /Head Office at \_\_\_\_\_(hereinafter referred to as "the Contractor " which expression shall unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) a contract, by issue of Employer's Notification of Award No. \_\_\_\_\_dt. \_\_\_\_\_and the same having been unequivocally accepted by the Contractor, resulting into a contract valued at Rs. \_\_\_\_\_(Rupees \_\_\_\_\_only) for \_\_\_\_\_(hereinafter called " the contract") and the Employer having agreed to make an advance payment to the Contractor for performance of the above Contract amounting to Rs. \_\_\_\_\_(Rupees \_\_\_\_\_only) as an advance against bank guarantee to be furnished by the Contractor.

We, \_\_\_\_\_(name & address of bank) having its Head Office at \_\_\_\_\_(hereinafter referred to as "the Bank" which expression shall, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns) do hereby guarantee and undertake to pay the Employer immediately on demand any or, all monies payable by the Contractor to the extent of Rs. \_\_\_\_\_(Rupees \_\_\_\_\_only) as aforesaid at any time up to \_\_\_\_\_without any demur, reservation, contest, recourse or protest and/or without any reference to the Contractor. Any such demand made by the Employer on the bank shall be conclusive and binding notwithstanding any difference between the Employer and the Contractor or any dispute pending before any Court, Tribunal, Arbitrator or any other authority. We agree that the Guarantee herein contained shall be irrevocable and shall continue to be enforceable till the Employer discharges this guarantee. We further agree that no change in the constitution of the Bank or of the Employer shall affect this guarantee.

The Employer shall have the fullest liberty without affecting in any way the liability of the Bank under this guarantee, from time to time, to vary the advance or to extend the time for performance of the Contract by the Contractor. The Employer shall have the fullest liberty without affecting this guarantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Contractor and to exercise the same at any time in any manner, and either to enforce or to forbear to enforce any covenants, contained or implied, in the Contract between the Employer and the Contractor or any other course or remedy or security available to the Employer. The bank shall not be released of its

obligations under these presents by any exercise by the Employer of its liberty with reference to the matters aforesaid or any of them or by reason of any other act or forbearance or other acts of omission or commission on the part of the Employer or any other indulgence shown by the Employer or by any other matter or thing whatsoever which under law would but for this provision, have the effect of relieving the Bank.

The bank also agrees that the Employer at its option shall be entitled to enforce this Guarantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractor and notwithstanding any security or other guarantee that the Employer may have in relation to the Contractor's liabilities.

We The Said Bank do hereby declare that we have absolute and unconditional power to issue this guarantee in your favour under the Memorandum and Articles of Association or such other constitutional documents of the Bank and the undersigned have full power to execute this guarantee under the Power of Attorney/ Post Approval Authorization dated \_\_\_\_\_ of the bank granted to him / us by the Bank. We the said bank do hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the powers of the bank or its officials and the guarantee shall be deemed to have been issued as if the bank and its officials have all the powers and authorization to give this guarantee on behalf of the bank.

We the said bank does hereby certify the genuineness and appropriateness of the Stamp paper and stamp value used for issuing the guarantee. We the said bank does hereby declare and undertake that your claim under the guarantee shall not be affected by any deficiency or other defect in the stamp paper or its stamp value.

We the said bank do hereby declare that our payments hereunder shall be made to you , free and clear of and without and deduction, reduction on account of any reasons including any and all present and future taxes, levies, charges of withholding whatsoever imposed or collected with respect thereto.

Notwithstanding anything contained hereinabove our liability under this guarantee is limited to Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only) and it shall remain in force upto and including \_\_\_\_\_ and shall be extended from time to time for such period (not exceeding one year), as may be desired by M/S \_\_\_\_\_ on whose behalf this bank guarantee has been given.

Notwithstanding anything contained herein

ii) Our liability under this guarantee shall not exceed Rs. \_\_\_\_\_ (Rupees \_\_\_\_\_ only);

iii) This bank guarantee shall be valid up to \_\_\_\_\_ and



iv) our liability to make payment shall arise and we are liable to pay the guaranteed amount or any part thereof under this guarantee, only and only if you serve upon us a written claim or demand in terms of the guarantee on or before \_\_\_\_\_ **(indicate a date twelve months after the validity of the guarantee).**

Dated this \_\_\_\_\_ day of \_\_\_\_\_ at Gandhinagar.

WITNESS

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Name)

\_\_\_\_\_

(Official address)

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Name)

\_\_\_\_\_

\_\_\_\_\_

(Signature)

\_\_\_\_\_

(Name)

\_\_\_\_\_

(Designation with bank stamp)

Attorney as Power of Attorney

No. \_\_\_\_\_ dt. \_\_\_\_\_

## **ANNEXURE – VII: FORM OF INTEGRITY PACT**

To

The Regional Project Director (Western Region)

WAPCOS Limited

515, 5th Floor, Shree UGATI Corporate Park

Opp. Pratik Mall, Koba-Gandhinagar Road,

Kudasan, Dist: Gandhinagar, Gujarat-382421

**Sub: Submission of Tender for the work of “Selection of contractor for construction of Director's bungalow at Gujarat National Law University”**

Dear Sir,

I/We acknowledge that WAPCOS is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that the Making of the Bid shall be regarded as an Unconditional and absolute Acceptance of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by WAPCOS. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, WAPCOS shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully

(Duly authorized signatory of the Bidder)

**To be signed by the bidder and same signatory competent / authorized to sign the relevant contract on behalf of WAPCOS**

**FORMAT FOR INTEGRITY PACT**

This Integrity Agreement is made at ..... on this ..... day of ..... 20.....

**BETWEEN**

WAPCOS Limited, New Delhi (Hereinafter referred as the '**Principal/Owner**', which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

AND

.....  
(Name and Address of the Individual/firm/Company)

through ..... (Hereinafter referred to as the

(Details of duly authorized signatory)

**"Bidder/Contractor"** and which expression shall unless repugnant to the meaning or context hereof include its successors and permitted assigns)

**Preamble**

WHEREAS the Principal / Owner has floated the Tender (NIT No. ....) (Hereinafter referred to as "Tender/Bid") and intends to award, under laid down organizational procedure, contract for..... (Name of work) hereinafter referred to as the "Contract".

AND WHEREAS the Principal/Owner values full compliance with all relevant laws of the land, rules, regulations, economic use of resources and of fairness/transparency in its relation with its Bidder(s) and Contractor(s).

AND WHEREAS to meet the purpose aforesaid both the parties have agreed to enter into this Integrity Agreement (hereinafter referred to as "Integrity Pact" or "Pact"), the terms and conditions of which shall also be read as integral part and parcel of the Tender/Bid documents and Contract between the parties.

NOW, THEREFORE, in consideration of mutual covenants contained in this Pact, the parties hereby agree as follows and this Pact witnesses as under:

**Article 1: Commitment of the Principal/Owner**

(1) The Principal/Owner commits itself to take all measures necessary to prevent corruption and to observe the following principles:

(a) No employee of the Principal/Owner, personally or through any of his/her family members, will in connection with the Tender, or the execution of the Contract, demand, take a promise for or accept, for self or third person, any material or immaterial benefit which the person is not legally entitled to.

(b) The Principal/Owner will, during the Tender process, treat all Bidder(s) with equity and reason. The Principal/Owner will, in particular, before and during the Tender process, provide to all Bidder(s) the same information and will not provide to any Bidder(s) confidential / additional information through which the Bidder(s) could obtain an advantage in relation to the Tender process or the Contract execution.

(c) The Principal/Owner shall endeavour to exclude from the Tender process any person, whose conduct in the past has been of biased nature.

(2) If the Principal/Owner obtains information on the conduct of any of its employees which is a criminal offence under the Indian Penal code (IPC)/Prevention of Corruption Act, 1988 (PC Act) or is in violation of the principles herein mentioned or if there be a substantive suspicion in this regard, the Principal/Owner will inform the Chief Vigilance Officer and in addition can also initiate disciplinary actions as per its internal laid down policies and procedures.

#### **Article 2: Commitment of the Bidder(s)/Contractor(s)**

(1) It is required that each Bidder/Contractor (including their respective officers, employees and agents) adhere to the highest ethical standards, and report to the WAPCOS all suspected acts of fraud or corruption or Coercion or Collusion of which it has knowledge or becomes aware, during the tendering process and throughout the negotiation or award of a contract.

(2) The Bidder(s)/Contractor(s) commits himself to take all measures necessary to prevent corruption. He commits himself to observe the following principles during his participation in the Tender process and during the Contract execution:

(a) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm, offer, promise or give to any of the Principal/Owner's employees involved in the Tender process or execution of the Contract or to any third person any material or other benefit which he/she is not legally entitled to, in order to obtain in exchange any advantage of any kind whatsoever during the Tender process or during the execution of the Contract.

(b) The Bidder(s)/Contractor(s) will not enter with other Bidder(s) into any undisclosed agreement or understanding, whether formal or informal. This applies in particular to prices, specifications, certifications, subsidiary contracts, submission or non-submission of bids or any other actions to restrict competitiveness or to cartelize in the bidding process.

(c) The Bidder(s)/Contractor(s) will not commit any offence under the relevant IPC/PC Act. Further the Bidder(s)/Contractor(s) will not use improperly, (for the purpose of competition or personal gain), or pass on to others, any information or documents provided by the Principal/Owner as part of the business relationship, regarding plans, technical proposals and business details, including information contained or transmitted electronically.

(d) The Bidder(s)/Contractor(s) of foreign origin shall disclose the names and addresses of agents/representatives in India, if any. Similarly, Bidder(s)/Contractor(s) of Indian Nationality shall disclose names and addresses of foreign agents/representatives, if any. Either the Indian agent on behalf of the foreign principal or the foreign principal directly could bid in a tender but not both. Further, in cases where an agent participates in a tender on behalf of one manufacturer, he shall not be allowed to quote on behalf of another manufacturer along with the first manufacturer in a subsequent/parallel tender for the same item.

(e) The Bidder(s)/Contractor(s) will, when presenting his bid, disclose any and all payments he has made, is committed to or intends to make to agents, brokers or any other intermediaries in connection with the award of the Contract.

(3) The Bidder(s)/Contractor(s) will not instigate third persons to commit offences outlined above or be an accessory to such offences.

(4) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm indulge in fraudulent practice means a wilful misrepresentation or omission of facts or submission of fake/forged documents in order to induce public official to act in reliance thereof, with the purpose of obtaining unjust advantage by or causing damage to justified interest of others and/or to influence the procurement process to the detriment of the WAPCOS interests.

(5) The Bidder(s)/Contractor(s) will not, directly or through any other person or firm use Coercive Practices (means the act of obtaining something, compelling an action or influencing a decision through intimidation, threat or the use of force directly or indirectly, where potential or actual injury may befall upon a person, his/her reputation or property to influence their participation in the tendering process).

### **Article 3: Consequences of Breach**

Without prejudice to any rights that may be available to the Principal/Owner under law or the Contract or its established policies and laid down procedures, the Principal/Owner shall have the following rights in case of breach of this Integrity Pact by the Bidder(s)/Contractor(s) and the Bidder/Contractor accepts and undertakes to respect and uphold the Principal/Owner's absolute right:

(1) If the Bidder(s)/Contractor(s), either before award or during execution of Contract has committed a transgression through a violation of Article 2 above or in any other form, such as to put his reliability or credibility in question, the Principal/Owner after giving 14 days' notice to

the contractor shall have powers to disqualify the Bidder(s)/Contractor(s) from the Tender process or terminate/determine the Contract, if already executed or exclude the Bidder/Contractor from future contract award processes. The imposition and duration of the exclusion will be determined by the severity of transgression and determined by the Principal/Owner. Such exclusion may be forever or for a limited period as decided by the Principal/Owner.

(2) Forfeiture of EMD/Performance Guarantee/Security Deposit: If the Principal/Owner has disqualified the Bidder(s) from the Tender process prior to the award of the Contract or terminated/determined the Contract or has accrued the right to terminate/determine the Contract according to Article 3(1), the Principal/Owner apart from exercising any legal rights that may have accrued to the Principal/Owner, may in its considered opinion forfeit the entire amount of Earnest Money Deposit, Performance Guarantee and Security Deposit of the Bidder/Contractor.

(3) Criminal Liability: If the Principal/Owner obtains knowledge of conduct of a Bidder or Contractor, or of an employee or a representative or an associate of a Bidder or Contractor which constitutes corruption within the meaning of IPC Act, or if the Principal/Owner has substantive suspicion in this regard, the Principal/Owner will inform the same to law enforcing agencies for further investigation.

#### **Article 4: Previous Transgression**

(1) The Bidder declares that no previous transgressions occurred in the last 5 years with any other Company in any country confirming to the anticorruption approach or with Central Government or State Government or any other Central/State Public Sector Enterprises in India that could justify his exclusion from the Tender process.

(2) If the Bidder makes incorrect statement on this subject, he can be disqualified from the Tender process or action can be taken for banning of business dealings/ holiday listing of the Bidder/Contractor as deemed fit by the Principal/ Owner.

(3) If the Bidder/Contractor can prove that he has resorted / recouped the damage caused by him and has installed a suitable corruption prevention system, the Principal/Owner may, at its own discretion, revoke the exclusion prematurely.

#### **Article 5: Equal Treatment of all Bidders/Contractors/Subcontractors**

(1) The Bidder(s)/Contractor(s) undertake(s) to demand from all subcontractors a commitment in conformity with this Integrity Pact. The Bidder/Contractor shall be responsible for any violation(s) of the principles laid down in this agreement/Pact by any of its Subcontractors/sub-vendors.

(2) The Principal/Owner will enter into Pacts on identical terms as this one with all Bidders and Contractors.

(3) The Principal/Owner will disqualify Bidders, who do not submit, the duly signed Pact between the Principal/Owner and the bidder, along with the Tender or violate its provisions at any stage of the Tender process, from the Tender process.

#### **Article 6- Duration of the Pact**

This Pact begins when both the parties have legally signed it. It expires for the Contractor/Vendor 12 months after the completion of work under the contract or till the continuation of defect liability period, whichever is more and for all other bidders, till the Contract has been awarded.

If any claim is made/lodged during the time, the same shall be binding and continue to be valid despite the lapse of this Pacts as specified above, unless it is discharged/determined by the Competent Authority, WAPCOS

#### **Article 7- Other Provisions**

(1) This Pact is subject to Indian Law, place of performance and jurisdiction is the Headquarters of the Principal/Owner, who has floated the Tender.

(2) Changes and supplements need to be made in writing. Side agreements have not been made.

(3) If the Contractor is a partnership or a consortium, this Pact must be signed by all the partners or by one or more partner holding power of attorney signed by all partners and consortium members. In case of a Company, the Pact must be signed by a representative duly authorized by board resolution.

(4) Should one or several provisions of this Pact turn out to be invalid; the remainder of this Pact remains valid. In this case, the parties will strive to come to an agreement to their original intentions.

(5) It is agreed term and condition that any dispute or difference arising between the parties with regard to the terms of this Integrity Agreement / Pact, any action taken by the Owner/Principal in accordance with this Integrity Agreement/ Pact or interpretation thereof shall not be subject to arbitration.

#### **Article 8- LEGAL AND PRIOR RIGHTS**

All rights and remedies of the parties hereto shall be in addition to all the other legal rights and remedies belonging to such parties under the Contract and/or law and the same shall be deemed to be cumulative and not alternative to such legal rights and remedies aforesaid. For the sake of brevity, both the Parties agree that this Integrity Pact will have precedence over the Tender/Contact documents with regard any of the provisions covered under this Integrity Pact.

IN WITNESS WHEREOF the parties have signed and executed this Integrity Pact at the place and date first above mentioned in the presence of following witnesses:

.....

(For and on behalf of Principal/Owner)

.....

(For and on behalf of Bidder/Contractor)

WITNESSES:

1. ....

(signature, name and address)

2. ....

(signature, name and address)

Place:

Dated:



**ANNEXURE – VIII: FORMAT OF RESUME OF PROPOSED PERSONNEL**

The bidder shall provide all the information requested below:

Position		
Personnel information	Name	Date of birth
	Professional qualifications	
Present employment	Name of Employer	
	Address of Employer	
	Telephone	Contact (manager / personnel officer)
	Fax	E-mail
	Job title	Years with present Employer

Summarize professional experience in reverse chronological order. Indicate particular technical and managerial experience relevant to the project.

From	To	Company, Project , Position, and Relevant Technical and Management Experience

**Certification:**

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and I am available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by the Bank.

<b>Name of Personnel</b>	<b>Signature</b>	<b>Date</b> {day/month/year}
<b>Name of authorized Representative of the Contractor</b>	<b>Signature</b>	<b>Date</b>

**ANNEXURE – IX: ACCEPTABLE MAKES OF MATERIALS**

Acceptable makes of materials to be used in the work are enclosed. In case of non-availability of these makes, after the approval of WAPCOS, the Contractor can use the alternative makes only BIS marked materials. Non BIS marked materials may be permitted by the WAPCOS only when BIS marked materials are not manufactured.

**List of Approved Make for Civil Works**

S.No.	MATERIAL	MAKES
1	Ordinary Portland Cement	Ultratech, Ambuja ,Sanghi
2	White Cement	Birla, J.K.
3	TMT "Fe – 500 D" Ribbed bars	Tata, RINL. (VIZAG). SAIL, sanghi
4	Structural Rolled Steel sections-beams, channels, tee,flats, angles, bars(round, square, hexagonal)	Tata, SAIL, RINL.appolo
5	Structural Hollow steel sections (Square & Rectangular)	Tata, Asian, Jindal, Surya, Appolo.
6	Structural tubular sections	Tata, Asian, Jindal, Surya, Appolo.
7	Coarse Aggregates (machine cut) 6mm to 40mm sizes (Hard black trap stone)	Approved quarry from Sevalia.
8	Stone Rubbles & Gravels (Hard black trap stone)	Approved quarry from Sevalia.
9	Shuttering plywood	Kitply, Anchor, Green, Pragati, Mayur.
10	Water proof/Marine grade plywood as per – IS – 710 (BWP)	Green, Archid, Kitply, Anchor, Uniply.
11	Commercial Plywood – IS – 303 (BWR)	Green, Archid, Kitply, Anchor, Uniply.
12	Decorative ply (Veneer)	Green, Durian, Century, Archid.
13	MDF	Nuwood, Duratuff (exterior grade only)
14	Prelam particle board	Novapan, Bhutan. (exterior grade only)
15	Laminate sheet	Green lam , royal touch , sunmica ,bloom
16	Cement bonded particle board	Shera ,NCL (Bison board), Everest (Eternite).
17	Calcium silicate board / Gypsum Board.	Saint Gobain (India Gypsum), Hilux ,Lafartz.
18	Flush door – decorative / non decorative	KIT, Anchor, Green, Uniply.
19	Compact lamiante sheet	Green lam ,Royal touch ,.
20	Dead Locks/ Mortise locks/ Narrow stile dead locks/ Tubular locks	Kich, Dorma, Dorset, kiran , europa
21	Float Glass / wired Glass, Mirror	Modi guard, Saint Gobain, Asahi, HNG
22	Reflective Glass	Saint Gobain, PPG, Asahi, Emirates, Pilkington.
23	Paver block / Grass paver block	Vyara, Kesarjan,amdavad enviro project.
24	MS Rolling shutter	Sona, Sagar, Suryoday, Gandhi,.
25	Precast terrazo tiles & skirting (Mosaic)	Royal (rajkot) ,Alcock, Vyara, Nitco,.
26	Glazed tiles	RAK, Simpolo ,Kajaria

27	Ceramic tiles	RAK, Simpolo ,Kajaria
28	All type Vitrified tiles	RAK, Simpolo ,Kajaria
29	Non-metallic floor hardener	Ironite, BASF
30	Glass mosaic	Bisazza, Palladio
31	<b>Construction chemicals</b> Plasticizer's, Bonding agents, , SBR latex, micro concrete	BASF, Fosroc, Sikka, kerakoll ,
	<b>Water proofing chemicals</b> Chemical Water proofing & Integral water proofing compound	Cico, BASF, Fosroc, Sikka,
	Crystalline water proofing	Penetron or Kryton
33	Silicon sealant/ Silicon paint	Wacker, Dowcorning, GE, Soudal, Bostik
	Poly-sulphide sealant	Pidilite, Chawksey,
	P.U sealant/	Sika (Exterior grade - UV resistant)
34	Pre-coated steel roofing/ walling sheets 550 Mpa	Tata bluescope, Interarch, Nippon Dendro (poly steel) Shree Precoated (Meta color)
35	Polypropylene fibers	Nina concrete, Reliance, Kasturi Fibers
36	Paint, primer, putty	Asian, Berger, ICI, Birla (putty), JK (Putty), Jotul, Serwinn Williams
37	Liquor /Melamine /PU polish	MRF, Asian, ICI, Taralac
38	PVC Water stop	Arti Cables Baroda, Fixopan, Maruti.
39	Door Window Hardware,	Kich, Dorma, EPPW ,Palladium, Magnum
40	Floor spring	Dorma.Mab ,Hafle
41	Door closer	Dorma. Yale.,Hafle
42	Adhesives Wooden Adhesives Tile adhesives & grouting material	Fevicol, Blue coat, Araldite. BAL, Laticrete, Kerakoll.
43	Oil & water finish	Double boiled CAT brand linseed oil & MTO of reliance
44	Fire door	Shaktimat, AGEW, Radiant.
45	Aluminum sections	Jindal, Hindalco (Indal), Banco,
46	Aluminum finish Interior works	Super durable powder coated (Akzonobel, Jotun, Fuller AG), Sapa Aluminium
	Façade exteriors	PVDF finish (Valspar, PPG, Akzonobel), Sapa aluminium
	Lime finish and lime finishing product	amdavad enviro project, Kesarjan ,
47	Aluminum Window locks , handle , friction stays	Alualpha, Securestyle, Giessee, Roto, Geze, Savio, Frikstay
47a	Rough ground for Aluminum works IS 710	IS 710 ply, 6mm to 8mm thick or Ghana teak, compact sheet

48	EPDM or silicone Gasket of infill panel for Aluminum	Amee rubber, gold seal, Osaka rubber, Maharashtra polymer, Maharashtra tyre & rubber industries.
49	Anchor Fasteners	Axel, Hilti, Fischer, Kundan, Mungo, Corroshield, Buildex, Power
50	Spandrel Insulation	Glass wool, Rockwool
51	Wool felt/weather strip	Anand, reddiplex ltd.
52	Rust Remover/converter	Feovert (Krishna Conchem), Roff Rust Clear (Pidilite Industries)
53	Non-shrink general purpose grout	Fosroc, BASF
54	Anchoring chemical for rebar dowell bar	Hilti, Fischer, Axel
55	Roll down mosquito curtain ( Soft close)	Netmos
56	Baker Rod, Expansion joint pre-moulded filler board	Supreme.
57	SS clamps for cladding	Hilti, Axel.
58	Aluminium operable Louvers	Technal, Domal, Sai Aluminium work
59	Spacer tape	Norton, tremco, bow.
60	Anodising	Bhoruka alum, Alufit, alum, Ajit India, Alufin
61	Glass Processor For HS/HT,	Bulletproof, DGU, Toughness, lamination etc. Impact safety, sejal, Glasstech, GSC, Asahi, FG Glass, Goldplus, Emirates, Jazoo Glass
62	Smoke seal Intumecent	Hilti/3M.
63	Metal fabrication of any shape	Kailash fabrication, shree sidhivinayak fabricator pvt ltd
64	Precast jail block/precast element (any type )	Vyara, Kesarjan,amdavad enviro project.
66	Metal section	Tata , Jindal , Apollo,
67	Children play area equipment	Rushbh enterprise, OKindiapvt.ltd, hannyfun pvt .ltd
68	Geo textile	MAHARSHEE GEOMEMBRANE (INDIA) PVT.LTD, Mayur wovens
69	EXPOSED WIRE CUT BRICK	amdavad enviro project, Kesarjan , jalaram

**Note:**

All the Materials/Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect/Engineer-in-charge.

**List of Approved Make for Plumbing Works**

S.No.	MATERIAL	MAKES
1.	Sanitary ware and accessories	RAK,Kohler ,UFC Jaquel
2.	Seat covers (Heavy Duty)	RAK ,Kohler ,UFC Jaquel
3.	C.P fittings & Bathroom	RAK ,Kohler ,UFC Jaquel

	C.P Fitting & Bathroom accessories	
4.	C.P. Grating for Floor Trap	GMGR/Chilly/Player/Carmry/ EBAX-Amro / Jayna
5.	Cast Brass clean Out Plugs	GMGR/Neer
6.	G.I. Pipes / M.S. Pipes	Tata / Jindal (Hissar) / Prakash Surya / Zenith / GST / CST / JST / Applo / SAIL / Bansal
7.	C.P fittings & Bathroom G.I. Fittings (malleable cast iron)	Unik / R Brand / Zoloto M /Jain sons / DRP/ICS/Kirti/HB/UI /MB/KS
8.	(Heavy Duty) Ball Valve	Audco / RB (Italy) / VB /SANT & SBM/CIM/SKS / Zoloto
9.	GM Peet Valve	Leader / Zoloto
10.	GM Wheel Valve	Leader / Zoloto /SAINT / CG/Harrison
11.	Pressure Reducing Valve	Hawa / Kirloskar / Sant / VB /CIM/SKS/ Zoloto
12.	Butterfly Valve	Audco / VB/ CIM/SKS/RB/ Zoloto
13.	G.M. Non return valve	RB / VB/ CIM/SKS/Flovel make/Normex/ Zoloto
14.	C.I. Non return valve	C&R /Castle / Intervalve/ Zoloto
15.	Solenoid valve	Aveon/ Danfoss, Airmex, Aira
16.	Flush Valve	Hindware ,Kohler ,UFC Jaquel
17.	Foot Valve	Normex/CIM/RB/SANT
18.	Ball Valve with Float	Prayag / SAINT /Leader /Jayco
19.	Centrifugally CI Pipes/fittings (LA Class)	Electrosteel/Keshoram/IISCO or Equivalent
20.	CI Pipes/fittings (I.S: 3989-1984)	NECO/Equivalent
21.	CI Pipe / fittings (IS:1729)	NECO/RIF/SKF/Kapilansh/HEPCO/HIF/Kesoram/SKIF Bengal or Equivalent
22.	CI Hubless Pipes/fittings (EN: 877)	Saint-Gobain-PAM /Equivalent
23.	C.I Manhole Cover (IS: 1726–1991)	NECO/RIF/BC/SKF/Kapilansh/HEPCO/BIC/SBI/DN/Sinha
24.	C.I. Grating	NECO/RIF/BC/ SKF/Kapilansh/
25.	CI pipes 'Class LA'	Kesoram/Electrosteel/Kapilansh
26.	Stoneware pipes/Gully traps	Perfect / R.K / Anand / BURN / Tecal / Hind / BIS Marked pipe
27.	UPVC SWR pipes/fittings/Low Noise pipe	Supreme / Finolex / Ashirvad
28.	CPVC Pipes and Fittings	Astral, Supreme, Ashirvad
29.	Copper Pipes	Rajco, Maxflow / Electrosteel /Keshoram /IISCO /Viega
30.	PVC Pain Water Pipe & Fitting	Finolax, Classic of Kisan / Supreme / Prince or equivalent
31.	Welding Rods	Advani Oerlikon
32.	Pressure Gauge	H. Guru / Jack Tech / Forbes Marshall / Waaree
33.	RCC Grating	Pratibha / Alcock
34.	Aluminum Ladder	Simplex
35.	Electronic Flow Meter	Rockwin / Aquamate/SKs

36.	Water Level Controller	Technica / Waaree /Minilec/Radar
37.	Water Level Indicator	Technica / Waaree /Minilec/Radar
38.	Oil Level Indicator	Mineclec
39.	Irrigation Accessories	Supreme, Finolex
40.	SFRC Manhole Cover/Grating	K.K.Manhole/Jain spun pipe/Pragati/ACFI
41.	Water Meter	Kay Cee / Kent / Desmesh / SANT / Actires / Aquatech / Kranti Accuflow / Laxmi
42.	R.C.C Pipe	Jain Spun Pipe/Pragati/Daya Spun Pipe/Alcock BIS Marked Sood & Sood/Laxmi
43.	Automatic Flushing Cistern	Angash International/Utec/TOSHI/AOS
44.	Low level PVC Flushing Cistern(Single/Dual Flush)	Sleekmodel of indware / Parryware / Commander / Jaquar / Cera / Coral / Duralite
45.	Hand Drier	TOSHI / UTEC / KOPAL / Automat / Euronics / Cera / Kholer
46.	Liquid Soap Dispenser	Jaquar / Cera / Chilly / Euronics / Carmy /Jayna / Parry ware / Plumber
47.	Pipe Supports, Hangers	Intello Tech / GMGR
48.	Air Vent Valve	Oven trop (Germany) / CIM/SANT, SKS, Varie
49.	Flanges	Table 'H'/Class 150
50.	Insulation	Thermafex / Armafex / Kiflex/Vidoflex/Superlon/ Suprem -Insuflex
51.	Anti-Corrosive Bitumastic Paint	Asian / Burger / J&N / ICI
52.	Epoxy Paint	Asian / Berger / J&N / ICI
53.	C.I S&S / Double Flanged fittings	Kartar / National / Kesoram
54.	PVC Water Tank	Sintex /Fusion /Sheetal /Polycon /Rhino Tanks
55.	Strainer(POT Type & Y Type)	Sant/ Sun/ CIM or equivalent
56.	Hydro pneumatic system	Kirloskar / Lubi / Grundfos

Note:

All the Materials/Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect/Engineer-in-charge.

#### List of Approved Make for Electrical Works

S.No.	MATERIAL	MAKES
1	PVC pipe MMS type and accessories ,UPVC Trunking, casing-caping	NIHIR / PRECISION ELECTRIC / POLYCAB
2	HDPE Flexible pipe ( ISI )	JAIN / DUTRON
3	DWC Pipes ( Anti Rodent Type only )	Tirupati Plasto, Rex, Duraline
4	Modular Switches and Accessories	Legrand Mosaic, ABB , Schneider, Anchor-ROMA,L&T
5	Cu flexible wires FRLS	AVOCAB, POLYCAB, FINOLEX, ANCHOR, RR-KABEL
6	MCBs , MCBDBs and Contactor	SCHNEIDER Acti-9, ABB , Legrand-DX3

7	MCCB	SCHNEIDER –Easy pact, ABB , Legrand-DX3
8	PVC Tape	Steelgrip, Anchor
9	XLPE- Cable 1.1KV as per IS 1554	POLYCAB, FINOLEX, HAVELLS
10	GLANDS ( Brass compression type, Heavy duty )	HMI , COMET , JAINSON
11	Cable Lugs	Dowells, 3-D , Raychem
12	M.S.Boxes	Fabricated from 16 S.W.G. with powder coating
13	L.E.D. Light Fixtures /LED Driver	Philips , Crompton, Bajaj , K-Lite, futura
14	L.E.D. Post-Top Lanterns	Bajaj, Crompton, K-Lite, Philips ,futura
15	HIGH Mast	Crompton , Bajaj , Philips
16	Chemical Earthing	LPI , ASHLOCK
17	Digital Meters and Load Manager	Rushabh , L & T , Conserve, Schneider
18	AMETER / Voltmeter Digital	ELMEASURE / CONSERVE/ IMP / TRINITY
19	Selector Switch, Push button	KAYCEE / C & S / L & T / TEKNIC,
20	LED Indication Lamps	AE / C & S / VAISHNOV / VINAY LED
21	CURRENT TRANSFORMERS	AE / KAPPA / MECO / PRAGATI / UNIVERSAL
22	Digital TIMER	THEBEN , LEGRAND, Indo-ASIAN
23	POWER CONTACTORS	L & T / SIEMENS / C & S
24	Panel Fabricators	C.P.R.I. Approved
25	Ceiling fans	(Crompton ,Usha, Orient, Bajaj , Havelles) all five star rating
26	Exhaust Fans / Bracket Fans	Crompton , Havells, Usha, Bajaj
27	CCTV Camera	PANASONIC /DAHUA / HONEY WELL / PELCO/ HIKVISION
28	Network Switch	CISCO / D-Link / Edimax
29	32CH/64CH NVR	PANASONIC/DAHUA/HONEYWELL/PELCO/HIKVISION
30	Full HD Display	SAMSUNG / LG / SONY
31	Networking Rack	RITTAL / Elixer / Delta
32	PVC Junction Box	Gewiss , Hensel , Spelsberg
33	CAT-6 UTP Cable	Finolex , Delton , Molex , Legrand,Digi-Link
34	Rack	Elixir / Audiotech/ Valrack
35	HDMI Cable	MX / KRAMER / SONY
36	Batteries	Exide, AMCO,PRESTOLITE,AMRON
37	PUSH BUTTON STATION	L & T, C & S , INDO-ASIAN
38	Submersible pump vertical/ Horizontal	Kirloskar,KSB, KALAMA,AMRUT,PRIMA
39	PUMPS	KIRLOSKAR, CG,KSB,JYOTI
40	Pump Starter ( DOL or star/Delta )	L & T, SIEMENS, Schneider
41	Water cooler / RO + Purifier	Bluestar, USHA,Voltas
42	G.R.P. Poles	, BAJAJ , ,K-Lite, future
43	Capacitor (MPPH Gas filled Type )	L & T, EPCOS, Areva, NEPTUNE
44	Relay	Alsthom, Siemens, Schneider, ABB, L&T.
45	APFC Relay	Conserve, Secure, Schneider, BCH, Ducati, Electronicon.
46	SOLAR PANEL	ADANI, VARI, green tech
47	AC UNIT	BLUE STAR ,RECONNECT ,HITACHI

**Note:**

All the Materials/Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect/Engineer-in-charge.

**List of Approved Make for Landscaping Works**

S.No.	MATERIAL	MAKES
1.0	Piping Network: Providing of PVC pipes (IS:4985- 88), and fittings & Accessories like tees, elbows, bends, junctions, Reducers etc; as required / directed at site	Finolex / Supreme / TruFlow / Jain
1.1	PVC Pipe 75mm x 10kg/cm2	
1.2	PVC Pipe 63mm x 10kg/cm2	
1.3	PVC Pipe 040mm x 10 kg/cm2	
2.1	Providing of Pop up 4" Pro Sprayer (3 to 5.2 Mtr Radius) with pressure regulator & check valve complete with required accessories.	Hunter / Toro / Nelson
2.2	Providing of Swing Joint 1/2" with PP Clamp Saddle with Chromed Nut Bolt & Nitrile Rubber Gasket	Hunter / Toro / Nelson and Astore
3.1	Providing of Automatic Disc/Screen Filter of 25-30 m3/hr. discharge with required accessories	Jain / Netafim / Amiad
3.2	Providing of customized Header Assembly of uPVC 3" SCH 40 Pipe with GM Non-Return Valve & other required accessories.	Finolex / Supreme / TruFlow / Jain
3.4	Providing of Pressure Relief Valve 2" - Plastic	Jain / Netafim
4.1	PVC Double Union Ball Valve 63mm PN 16	Jain / Astore / Finolex
4.3	PVC Double Union Ball Valve 75 mm - Isolation Valve	Jain / Astore / Finolex
4.4	1" Double Acting Air cum Vacuum Release Valve with GM Valve	Jain / ARI / Finolex
4.5	Lockable Quick Coupling Hydrant valve 1" with Four Sets of Key & Swivel Elbow	Hunter / Toro / Automat
4.7	Round Valve Box 10"	Rain Bird / Jain
4.8	Round Valve Box 6"/7"	Rain Bird / Jain
4.9	Water Meter 2.5"	
5.1	Pump Station - Providing, of VFD Based Pump Station giving flow of 5 lps at 35-40 m head complete Set (1 working+ 1 stand by) with Panel & all required accessories.	Kirloskar / Lubi / Grundfos

Note: All the Materials/Makes listed above and other than as specified above shall be used after obtaining prior approval from the Architect/Engineer-in-charge.



## ANNEXURE –X : SAFETY CODES

1. Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and hand-hold shall be provided on the ladder and the ladder shall be given an inclination not steeper than  $\frac{1}{4}$  to 1 ( $\frac{1}{4}$  horizontal and 1 vertical).
2. Scaffolding of staging more than 3.6 m (12ft.) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached or bolted, braced and otherwise secured at least 90 cm. (3ft.) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
3. Working platforms, gangways and stairways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6 m (12ft.) above ground level or floor level, they should be closely boarded, should have adequate width and should be suitably fastened as described in (2) above.
4. Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent the fall of person or materials by providing suitable fencing or railing whose minimum height shall be 90 cm. (3ft.).
5. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m. (30ft.) in length while the width between side rails in rung ladder shall in no case be less than 29 cm. (11½") for ladder up to and including 3 m. (10 ft.) in length. For longer ladders, this width should be increased at least  $\frac{1}{4}$ " for each additional 30 cm. (1 foot) of length. Uniform step spacing of not more than 30 cm shall be kept. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites or work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit; action or proceedings to any such person or which may, with the consent of the contractor, be paid to compensate any claim by any such person

6. (a) Excavation and Trenching - All trenches 1.2 m. (4ft.) or more in depth, shall at all times be supplied with at least one ladder for each 30 m. (100 ft.) in length or fraction thereof, Ladder shall extend from bottom of the trench to at least 90 cm. (3ft.) above the surface of the ground. The side of the trenches which are 1.5 m. (5ft.) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides collapsing.

The excavated materials shall not be placed within 1.5 m. (5ft.) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.

(b) Safety Measures for digging bore holes: -

i. If the bore well is successful, it should be safely capped to avoid caving and collapse of the bore well. The failed and the abandoned ones should be completely refilled to avoid caving and collapse;

ii. During drilling, sign boards should be erected near the site with the address of the drilling contractor and the Engineer in-charge of the work;

iii. Suitable fencing should be erected around the well during the drilling and after the installation of the rig on the point of drilling, flags shall be put 50m all-round the point of drilling to avoid entry of people;

iv. After drilling the bore well, a cement platform (0.50m x 0.50m x 1.20m) 0.60m above ground level and 0.60m below ground level should be constructed around the well casing;

v. After the completion of the bore well, the contractor should cap the bore well properly by welding steel plate, cover the bore well with the drilled wet soil and fix thorny shrubs over the soil. This should be done even while repairing the pump;

vi. After the bore well is drilled the entire site should be brought to the ground level.

7. Demolition - Before any demolition work is commenced and also during the progress of the work,

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

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

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

8. All necessary personal safety equipment as considered adequate by the Engineer-in-Charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate steps to ensure proper use of equipment by those concerned. The following safety equipment shall invariably be provided.

(i) Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.

(ii) Those engaged in white washing and mixing or stacking of cement bags or any material which is injurious to the eyes, shall be provided with protective goggles.

(iii) Those engaged in welding works shall be provided with welder's protective eye shields.

(iv) Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

(v) When workers are employed in sewers and manholes, which are in active use, the contractors shall ensure that the manhole covers are opened and ventilated at least for an hour before the workers are allowed to get into the manholes, and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to the public. In addition, the contractor shall ensure that the following safety measure are adhered to:-

(a) Entry for workers into the line shall not be allowed except under supervision of the JE or any other higher officer.

(b) At least 5 to 6 manholes upstream and downstream should be kept open for at least 2 to 3 hours before any man is allowed to enter into the manhole for working inside.

(c) Before entry, presence of Toxic gases should be tested by inserting wet lead acetate paper which changes colour in the presence of such gases and gives indication of their presence.

(d) Presence of Oxygen should be verified by lowering a detector lamp into the manhole. In case, no Oxygen is found inside the sewer line, workers should be sent only with Oxygen kit.

(e) Safety belt with rope should be provided to the workers. While working inside the manholes, such rope should be handled by two men standing outside to enable him to be pulled out during emergency.

(f) The area should be barricaded or cordoned off by suitable means to avoid mishaps of any kind. Proper warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.

(g) No smoking or open flames shall be allowed near the blocked manhole being cleaned.

(h) The malba obtained on account of cleaning of blocked manholes and sewer lines should be immediately removed to avoid accidents on account of slippery nature of the malba.

(i) Workers should not be allowed to work inside the manhole continuously. He should be given rest intermittently. The Engineer-in-Charge may decide the time up to which a worker may be allowed to work continuously inside the manhole.

(j) Gas masks with Oxygen Cylinder should be kept at site for use in emergency.

(k) Air-blowers should be used for flow of fresh air through the manholes. Whenever called for, portable air blowers are recommended for ventilating the manholes. The Motors for these shall be vapour proof and of totally enclosed type. Non sparking gas engines also could be used but they should be placed at least 2 metres away from the opening and on the leeward side protected from wind so that they will not be a source of friction on any inflammable gas that might be present.

(l) The workers engaged for cleaning the manholes/sewers should be properly trained before allowing to work in the manhole.

(m) The workers shall be provided with Gumboots or non-sparking shoes bump helmets and gloves non sparking tools safety lights and gas masks and portable air blowers (when necessary). They must be supplied with barrier cream for anointing the limbs before working inside the sewer lines.

(n) Workmen descending a manhole shall try each ladder stop or rung carefully before putting his full weight on it to guard against insecure fastening due to corrosion of the rung fixed to manhole well.

(o) If a man has received a physical injury, he should be brought out of the sewer immediately and adequate medical aid should be provided to him.

(p) The extent to which these precautions are to be taken depend on individual situation but the decision of the Engineer-in-Charge regarding the steps to be taken in this regard in an individual case will be final.

(vi) The Contractor shall not employ men and women below the age of 18 years on the work of painting with products containing lead in any form. Wherever men above the age of 18 are employed on the work of lead painting, the following precaution should be taken: -

(a) No paint containing lead or lead products shall be used except in the form of paste or readymade paint.

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

(c) Overalls shall be supplied by the contractors to the workmen and adequate facilities shall be provided to enable the working painters to wash during and on the cessation of work.

9. The Contractor shall not employ women and men below the age of 18 on the work of painting with product containing lead in any form, wherever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use:

(i) White lead, sulphate of lead or product containing these pigment, shall not be used in painting operation except in the form of pastes or paint ready for use.

(ii) Measures shall be taken, wherever required in order to prevent danger arising from the application of a paint in the form of spray.

(iii) Measures shall be taken, wherever practicable, to prevent danger arising out of from dust caused by dry rubbing down and scraping.

(iv) Adequate facilities shall be provided to enable working painters to wash during and on cessation of work.

(v) Overall shall be worn by working painters during the whole of working period.

(vi) Suitable arrangement shall be made to prevent clothing put off during working hours being spoiled by painting materials.

(vii) Cases of lead poisoning and suspected lead poisoning shall be notified and shall be subsequently verified by medical man.

(viii) WAPCOS may require, when necessary medical examination of workers.

(ix) Instructions with regard to special hygienic precautions to be taken in the painting trade shall be distributed to working painters.

10. When the work is done near any place where there is risk of drowning, all necessary equipment's should be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision, should be made for prompt first aid treatment of all injuries likely to be obtained during the course of the work.

11. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions: -

(i) (a) These shall be of good mechanical construction, sound materials and adequate strength and free from patent defects and shall be kept repaired and in good working order.

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

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

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

(iv) In case of departmental machines, the safe working load shall be notified by the Electrical Engineer-in-Charge. As regards contractor's machines the contractors shall notify the safe working load of the machine to the Engineer-in-Charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.

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

13. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities should be provided at or near places of work.

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

15. To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer or Engineer-in-Charge of the department or their representatives.

16. Notwithstanding the above clauses from (1) to (15), there is nothing in these to exempt the contractor from the operations of any other Act or Rule in force in the Republic of India.

**For & on behalf of Tenderer**

## **ANNEXURE – XI: MODEL RULES FOR THE PROTECTION OF HEALTH AND SANITARY ARRANGEMENTS FOR WORKERS EMPLOYED BY CONTRACTORS**

### **1. APPLICATION**

These rules shall apply to all buildings and construction works in which twenty or more workers are ordinarily employed or are proposed to be employed in any day during the period during which the contract work is in progress.

### **2. DEFINITION**

Work place means a place where twenty or more workers are ordinarily employed in connection with construction work on any day during the period during which the contract work is in progress.

### **3. FIRST-AID FACILITIES**

(i) At every work place, there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

(ii) The first-aid box shall be distinctly marked with a red cross on white back ground and shall contain the following equipment: -

(a) For work places in which the number of contract labour employed does not exceed 50- Each first-aid box shall contain the following equipment's: -

1. 6 small sterilized dressings.
2. 3 medium size sterilized dressings.
3. 3 large size sterilized dressings.
4. 3 large sterilized burn dressings.
5. 1 (30 ml.) bottle containing a two per cent alcoholic solution of iodine.
6. 1 (30 ml.) bottle containing Sal volatile having the dose and mode of administration indicated on the label.
7. 1 snakebite lancet.
8. 1 (30 gms.) bottle of potassium permanganate crystals.
9. 1 pair scissors.
10. 1 copy of the first-aid leaflet issued by the Director General, Factory Advice Service and Labour Institutes, Government of India.
11. 1 bottle containing 100 tablets (each of 5 gms.) of aspirin.
12. Ointment for burns.
13. A bottle of suitable surgical antiseptic solution

(b) For work places in which the number of contract labour exceed 50. Each first-aid box shall contain the following equipment's.

1. 12 small sterilized dressings.
  2. 6 medium size sterilized dressings.
  3. 6 large size sterilized dressings.
  4. 6 large size sterilized burn dressings.
  5. 6 (15 gms.) packets sterilized cotton wool.
  6. 6. 1 (60 ml.) bottle containing a two per cent alcoholic solution iodine.
  7. 1 (60 ml.) bottle containing Sal volatile having the dose and mode of administration indicated on the label
  8. 1 roll of adhesive plaster.
  9. 1 snake bite lancet.
  10. 1 (30 gms.) bottle of potassium permanganate crystals.
  11. 1 pair scissors.
  12. 1 copy of the first-aid leaflet issued by the Director General Factory Advice Service and Labour Institutes /Government of India.
  13. A bottle containing 100 tablets (each of 5 gms.) of aspirin.
  14. Ointment for burns.
  15. A bottle of suitable surgical antiseptic solution.
- (iii) Adequate arrangements shall be made for immediate recoupment of the equipment when necessary
- (iv) Nothing except the prescribed contents shall be kept in the First-aid box.
- (v) The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.
- (vi) A person in charge of the First-aid box shall be a person trained in First-aid treatment in the work places where the number of contract labour employed is 150 or more.
- (vii) In work places where the number of contract labour employed is 500 or more and hospital facilities are not available within easy distance from the works. First-aid posts shall be established and run by a trained compounder. The compounder shall be on duty and shall be available at all hours when the workers are at work.
- (viii) Where work places are situated in places which are not towns or cities, a suitable motor transport shall be kept readily available to carry injured person or person suddenly taken ill to the nearest hospital.



#### **4. DRINKING WATER**

(i) In every work place, there shall be provided and maintained at suitable places, easily accessible to labour, a sufficient supply of cold water fit for drinking.

(ii) Where drinking water is obtained from an intermittent public water supply, each work place shall be provided with storage where such drinking water shall be stored.

(iii) Every water supply or storage shall be at a distance of not less than 50 feet from any latrine drain or other source of pollution. Where water has to be drawn from an existing well which is within such proximity of latrine, drain or any other source of pollution, the well shall be properly chlorinated before water is drawn from it for drinking. All such wells shall be entirely closed in and be provided with a trap door which shall be dust and waterproof.

(iv) A reliable pump shall be fitted to each covered well, the trap door shall be kept locked and opened only for cleaning or inspection which shall be done at least once a month.

#### **5. WASHING FACILITIES**

(i) In every work place adequate and suitable facilities for washing shall be provided and maintained for the use of contract labour employed therein.

(ii) Separate and adequate cleaning facilities shall be provided for the use of male and female workers.

(iii) Such facilities shall be conveniently accessible and shall be kept in clean and hygienic condition.

#### **6. LATRINES AND URINALS**

(i) Latrines shall be provided in every work place on the following scale namely: -

(a) Where female is employed, there shall be at least one latrine for every 25 females.

(b) Where males are employed, there shall be at least one latrine for every 25 males.

Provided that, where the number of males or females exceeds 100, it shall be sufficient if there is one latrine for 25 males or females as the case may be upto the first 100, and one for every 50 thereafter.

(ii) Every latrine shall be under cover and so partitioned off as to secure privacy, and shall have a proper door and fastenings.

(iii) The inside walls shall be constructed of masonry or some suitable heat-resisting non-absorbent materials and shall be cement washed inside and outside at least once a year, Latrines shall not be of a standard lower than borehole system.

(iv) (a) Where workers of both sexes are employed, there shall be displayed outside each block of latrine and urinal, a notice in the language understood by the majority of the workers "For Men only" or "For Women Only" as the case may be.

(b) The notice shall also bear the figure of a man or of a woman, as the case may be.

(v) There shall be at least one urinal for male workers up to 50 and one for female workers up to fifty employed at a time, provided that where the number of male or female workmen, as the case may be exceeds 500, it shall be sufficient if there is one urinal for every 50 males or females up to the first 500 and one for every 100 or part thereafter.

(vi) (a) The latrines and urinals shall be adequately lighted and shall be maintained in a clean and sanitary condition at all times.

(b) Latrines and urinals other than those connected with a flush sewage system shall comply with the requirements of the Public Health Authorities.

(vii) Water shall be provided by means of tap or otherwise so as to be conveniently accessible in or near the latrines and urinals.

(viii) Disposal of excreta: - Unless otherwise arranged for by the local sanitary authority, arrangements for proper disposal of excreta by incineration at the work place shall be made by means of a suitable incinerator. Alternately, excreta may be disposed off by putting a layer of night soil at the bottom of a pucca tank prepared for the purpose and covering it with a 15 cm. layer of waste or refuse and then covering it with a layer of earth for a fortnight (when it will turn to manure).

(ix) The contractor shall at his own expense, carry out all instructions issued to him by the Engineer-in-Charge to effect proper disposal of night soil and other conservancy work in respect of the contractor's workmen or employees on the site. The contractor shall be responsible for payment of any charges which may be levied by Municipal or Cantonment Authority for execution of such on his behalf.

## **7. PROVISION OF SHELTER DURING REST**

At every place there shall be provided, free of cost, four suitable sheds, two for meals and the other two for rest separately for the use of men and women labour. The height of each shelter shall not be less than 3 meters (10 ft.) from the floor level to the lowest part of the roof. These shall be kept clean and the space provided shall be on the basis of 0.6 sq.m. (6 sft) per head.

Provided that the Engineer-in-Charge may permit subject to his satisfaction, a portion of the building under construction or other alternative accommodation to be used for the purpose.

## **8. CRECHES**

- (i) At every work place, at which 20 or more women worker are ordinarily employed, there shall be provided two rooms of reasonable dimensions for the use of their children under the age of six years. One room shall be used as a play room for the children and the other as their bedroom. The rooms shall be constructed with specifications as per clause 19H (ii) a,b& c.
- (ii) The rooms shall be provided with suitable and sufficient openings for light and ventilation. There shall be adequate provision of sweepers to keep the places clean.
- (iii) The contractor shall supply adequate number of toys and games in the play room and sufficient number of cots and beddings in the bed room.
- (iv) The contractor shall provide one ayaa to look after the children in the crèche when the number of women workers does not exceed 50 and two when the number of women workers exceed 50.
- (v) The use of the rooms earmarked as crèches shall be restricted to children, their attendants and mothers of the children.

## 9. CANTEENS

- i. In every work place where the work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering one hundred or more are ordinarily employed, an adequate canteen shall be provided by the contractor for the use of such contract labour.
- ii. The canteen shall be maintained by the contractor in an efficient manner.
- iii. The canteen shall consist of at least a dining hall, kitchen, storeroom, pantry and washing places separately for workers and utensils.
- iv. The canteen shall be sufficiently lighted at all times when any person has access to it.
- v. The floor shall be made of smooth and impervious materials and inside walls shall be lime washed or colour washed at least once in each year. Provided that the inside walls of the kitchen shall be lime-washed every four months.
- vi. The premises of the canteen shall be maintained in a clean and sanitary condition.
- vii. Waste water shall be carried away in suitable covered drains and shall not be allowed to accumulate so as to cause a nuisance.
- viii. Suitable arrangements shall be made for the collection and disposal of garbage.
- ix. The dining hall shall accommodate at a time 30 per cent of the contract labour working at a time.
- x. The floor area of the dining hall, excluding the area occupied by the service counter and any furniture except tables and chairs shall not be less than one square meter (10 sft) per diner to be accommodated as prescribed in sub-Rule 9.
- xi. (a) A portion of the dining hall and service counter shall be partitioned off and reserved for women workers in proportion to their number. (b) Washing places for women shall be separate and screened to secure privacy.

- xii. Sufficient tables stools, chair or benches shall be available for the number of diners to be accommodated as prescribed in sub-Rule 9.
- xiii. (a) 1. There shall be provided and maintained sufficient utensils crockery, furniture and any other equipment's necessary for the efficient running of the canteen.
- xiv. 2. The furniture utensils and other equipment shall be maintained in a clean and hygienic condition.
  - (b) 1. Suitable clean clothes for the employees serving in the canteen shall be provided and maintained.2. A service counter, if provided, shall have top of smooth and impervious material.3. Suitable facilities including an adequate supply of hot water shall be provided for the cleaning of utensils and equipment's.
- xv. The food stuffs and other items to be served in the canteen shall be in conformity with the normal habits of the contract labour.
- xvi. The charges for food stuffs, beverages and any other items served in the canteen shall be based on 'No profit, no loss' and shall be conspicuously displayed in the canteen.
- xvii. In arriving at the price of foodstuffs, and other article served in the canteen, the following items shall not be taken into consideration as expenditure namely: -
  - (a) The rent of land and building.
  - (b) The depreciation and maintenance charges for the building and equipment provided for the canteen.
  - (c) The cost of purchase, repairs and replacement of equipment including furniture, crockery, cutlery and utensils.
  - (d) The water charges and other charges incurred for lighting and ventilation
  - (e) The interest and amounts spent on the provision and maintenance of equipment provided for the canteen.
- xviii. The accounts pertaining to the canteen shall be audited once every 12 months by registered accountants and auditors.

#### **10. ANTI-MALARIAL PRECAUTIONS**

The contractor shall at his own expense, conform to all anti-malarial instructions given to him by the Engineer-in-Charge including the filling up of any borrow pits which may have been dug by him.

11. The above rules shall be incorporated in the contracts and in notice inviting tenders and shall form an integral part of the contracts.

#### **12. AMENDMENTS**

Government may, from time to time, add to or amend these rules and issue directions - it may consider necessary for the purpose of removing any difficulty which may arise in the administration thereof.

**For & on behalf of Tenderer**

**Annexure –XII- Information Required to Calculate the BID Capacity**

**1. To Calculate the Value of “A”**

A table containing value of Civil Engineering Works in respect to Projects (Turnkey Projects/ Item rate contract/ Construction works) undertaken by the Bidder during the last 5 Years is as follows:

Sl.No.	Year	Value of Civil Engineering Works undertaken w.r.t projects (Rs. In Crores)
1	2019-20	
2	2018-19	
3	2017-18	
4	2016-17	
5	2015-16	

Maximum Value of projects that have been undertaken during the F.Y..... out of the last 5 Years and value thereof is Rs. Crore (Rupees.....)

Further, value updated to the price level of the Year indicated in Appendix is as follows:

Rs..... Crores X ...(Updation Factor as per Appendix) = Rs..... Crores (Rupees.....)

<p>.....</p> <p>.....</p> <p>Authorized Signatory For and on behalf of .....(Name Signatory) of the Bidder )</p>	<p>Name of the Statutory Auditor’s Firm Seal of the audit firm: (Signature, name and designation and Membership No. of authorized Signatory)</p>
--	--

**2. To calculate the value of "B"**

A table containing value of all the existing commitments and on-going workings to be completed during the next Years is as follows:

Sl. No	Name of project / work	Percentage of participation of Bidder in the project	Date of start / appointed date of project	Value of contract as per Agreement / LOA (Rs. In Crore)	Value of work completed (Rs. In Crore)	Balance value of work to be completed (Rs. In Crore)	Anticipated date of completion	Balance value of work at 2018-19 price level (Rs. In Crore)
1	2	3	4	5	6	7=(5-6)	8	9=(3X7X#)
#								

Updation Factor as given below

For Year	F.Y / Calendar Year	Updation Factor
1	2019-20	1.00
2	2018-19	1.05
3	2017-18	1.10
4	2016-17	1.15
5	2015-16	1.20

The Statement showing the value of all existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works mentioned above is verified from the certificate issued that has been countersigned by the client or its Engineer-in-charge not below the rank of Executive Engineer or equivalent in respect of projects or Concessionaire / Authorised Signatory of SPV in respect of BOT Projects. No awarded / ongoing works has been left in the aforesaid statement which has been awarded to M/s..... individually / and other member M/s ..... and M/s ....., as on due date of this tender.

<p>.....</p> <p>.....</p> <p>Authorized Signatory For and on behalf of .....(Name Signatory) of the Bidder )</p>	<p>Name of the Statutory Auditor's Firm Seal of the audit firm: (Signature, name and designation and Membership No. of authorized Signatory)</p>
--	--

**SECTION– VI- FORMS:**

LETTER OF TRANSMITTAL	
FORM-A :	FINANCIAL INFORMATION
FORM-B :	SOLVENCY CERTIFICATE
FORM-C :	STRUCTURE & ORGANISATION
FORM-D :	NO CONVICTION CERTIFICATE
FORM-E :	UNDERSTANDING THE PROJECT SITE
FORM-F :	NO DEVIATION CERTIFICATE
FORM-G :	INTEGRITY PACT
FORM-H :	PRELIMINARY AGREEMENT
FORM-I :	LIST OF EQUIPMENTS



**SECTION– VI: FORMS**

**LETTER OF TRANSMITTAL**

**To**

**The Regional Project Director (Western Region)**

**WAPCOS Limited**

**515, 5th Floor, Shree UGATI Corporate Park**

**Opp. Pratik Mall, Koba-Gandhinagar Road,**

**Kudasan, Dist: Gandhinagar, Gujarat-382421**

Subject: Submission of bids for the work of

Sir,

Having examined the details given in the bid document for the above work, I/we hereby submit the relevant information.

1. I/we hereby certify that all the statement made and information supplied in the enclosed forms A to Hand accompanying statement are true and correct.
2. I/we have furnished all information and details necessary for eligibility and have no further pertinent information to supply.
3. I/we submit the following certificates in support of our suitability, technical knowledge and capability for having successfully completed the following eligible similar works:

Sr. No.	Name of Work	Certificate From

Certificate: It is certified that the information given in the enclosed eligibility bid are correct. It is also certified that I / We shall be liable to be debarred, disqualified / cancellation of enlistment in case any information furnished by me / us is found to be incorrect.

Enclosures: Seal of bidder

Date of submission:

Signature(s) of Bidder(s).

**FORM ‘A’: FINANCIAL INFORMATION**

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

<b>Years</b>	<b>Gross Annual turnover on construction works</b>	<b>Profit/Loss (After Tax)</b>
<b>2019-20</b>		
<b>2018-19</b>		
<b>2017-18</b>		
<b>2016-17</b>		
<b>2015-16</b>		

- 2) Financial arrangements for carrying out the proposed work.  
 3) Solvency Certificate from Bankers of the bidder in the prescribed Form “B”.

**Signature of Chartered Accountant  
(with Seal)**

**Signature of Bidder(s).  
(with Seal)**

**FORM "B": FORM OF BANKERS' CERTIFICATE FROM A SCHEDULED BANK**

This is to certify that to the best of our knowledge and information that M/s. Sh..... having marginally noted address, a customer of our bank are/is respectable and can be treated as good for any engagement up to a limit of Rs..... (Rupees.....).

This certificate is issued without any guarantee or responsibility on the bank or any of the officers.

**(Signature)**

**For the Bank**

**NOTE:**

1. Banker's certificates should be on letter head of the Bank, sealed in cover addressed to tendering authority.
2. In case of partnership firm, certificate should include names of all partners as recorded with the Bank.

**FORM "C": STRUCTURE & ORGANISATION**

<b>S.No.</b>	<b>Particulars</b>	<b>Details Submitted by Bidder</b>
1.	Name & address of the bidder	
2.	Telephone no./Telex no./Fax no.	
3.	Legal status of the bidder (attach copies of original document defining the legal status) (a) An Individual (b) A proprietary firm (c) A firm in partnership (d) A limited company or Corporation	
4.	Particulars of registration with various Government Bodies (attach attested photocopy)	
	Organization/Place of Registration 1. 2. 3.	Registration No.
5.	Names and titles of Directors & Officers with designation to be concerned with this work.	
6.	Designation of individuals authorized to act for the organization	
7.	Has the bidder, or any constituent partner in case of partnership firm Limited Company/ Joint Venture, ever been convicted by the court of law? If so, give details.	
8.	In which field of Electrical Engineering construction the bidder has specialization and interest?	
9.	Any other information considered necessary but not included above.	

**Signature of Bidder(s)**

**FORM-D: FORMAT FOR No-Conviction Certificate**

[On the letter head of the Organization]

**Subject: No-Conviction Certificate for --- (Name of the work / project)**

This is to certify that \_\_\_\_\_ (Name of the organization), having registered office at \_\_\_\_\_ (Address of the registered office) has never been blacklisted or restricted to apply for any such activities by any Central / State Government Department or Court of law anywhere in the country.

This is also to certify that M/s \_\_\_\_\_ (Name of Organization), is not involved in any form of Corrupt and Fraudulent practices in past and will never be involved in future.

Yours faithfully, Date:

(Signature, name and designation  
of the Authorized signatory)

Place:

Name and seal of Bidder

## FORM-E: FORMAT FOR UNDERSTANDING THE PROJECT SITE

(On Bidder Letter Head)

To,

**The Regional Project Director (Western Region)**

**WAPCOS Limited**

**515, 5th Floor, Shree UGATI Corporate Park**

**Opp. Pratik Mall, Koba-Gandhinagar Road,**

**Kudasan, Dist: Gandhinagar, Gujarat-382421**

**Subject: Undertaking of the Site Visit for --- (Name of the work / project)**

Sir,

I/we hereby certify that I/we have examined & inspected the site & its surrounding satisfactorily, where the project is to be executed as per the scope of works. I/ We are well aware about the following

- Location of the proposed building and its allied works.
- Site clearance and no cutting off the matured trees.
- Topography and contouring of the land where the project is to be executed to understand the cutting & filling during the construction and about depth of column/foundation below the plinth beam.
- Nature of the ground & sub-soil of the site and accessibility to the site.
- Existing surrounding road level to finalize plinth beam level as per standard norms.
- Location of Existing Sewer line & Water pipe line network to connect the proposed building and allied works to make the building functional.
- Location of existing Electric Sub-Station to supply the electricity for the proposed building and allied works to make the building functional.

I / We hereby submit our BID considering above all facts gathered during site visit and each & every aspect have been considered in the Quoted cost of the project since it is Engineering, Procurement and Construction (EPC) Contract. I / We hereby confirm that no extra/additional cost shall be claimed on above aspects

Yours faithfully,

Date:

(Signature, name and designation  
of the Authorized signatory)

Place:

**Name and seal of Bidder**

**FORM-F: FORMAT FOR NO DEVIATION CERTIFICATE**

[To be submitted on Bidder's Letter Head]

To,  
**The Regional Project Director (Western Region)**  
**WAPCOS Limited**  
**515, 5th Floor, Shree UGATI Corporate Park**  
**Opp. Pratik Mall, Koba-Gandhinagar Road,**  
**Kudasan, Dist.: Gandhinagar, Gujarat-382421**

**Subject: No Deviation Certificate for ----- (name of Work /Project)**

Dear Sir,

With reference to above this is to confirm that as per Tender conditions we have visited site before submission of our Offer and noted the job content and site condition etc. We also confirm that we have not changed/modified the above tender document and in case of observance of the same at any stage it shall be treated as null and void.

We hereby also confirm that we have not taken any deviation from Tender Clause together with other reference as enumerated in the above referred Notice Inviting Tender and we hereby convey our unconditional acceptance to all terms & conditions as stipulated in the Tender Document.

In the event of observance of any deviation in any part of our offer at a later date whether implicit or explicit, the deviations shall stand null and void.

Thanking you,

Yours faithfully,

Date:

(Signature, name and designation  
of the Authorized signatory)

Place:

**Name and seal of Bidder**

## FORM-G: FORMAT FOR INTEGRITY PACT

**To,  
The Regional Project Director (Western Region)  
WAPCOS Limited  
515, 5th Floor, Shree UGATI Corporate Park  
Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421**

**Sub: Integrity Pact for ----- (Name of Work / Project)**

Dear Sir,

I/We acknowledge that WAPCOS is committed to follow the principles thereof as enumerated in the Integrity Agreement enclosed with the tender/bid document.

I/We agree that the Notice Inviting Tender (NIT) is an invitation to offer made on the condition that I/We will sign the enclosed integrity Agreement, which is an integral part of tender documents, failing which I/We will stand disqualified from the tendering process. I/We acknowledge that THE MAKING OF THE BID SHALL BE REGARDED AS AN UNCONDITIONAL AND ABSOLUTE ACCEPTANCE of this condition of the NIT.

I/We confirm acceptance and compliance with the Integrity Agreement in letter and spirit and further agree that execution of the said Integrity Agreement shall be separate and distinct from the main contract, which will come into existence when tender/bid is finally accepted by WAPCOS. I/We acknowledge and accept the duration of the Integrity Agreement, which shall be in the line with Article 1 of the enclosed Integrity Agreement.

I/We acknowledge that in the event of my/our failure to sign and accept the Integrity Agreement, while submitting the tender/bid, WAPCOS shall have unqualified, absolute and unfettered right to disqualify the tenderer/bidder and reject the tender/bid in accordance with terms and conditions of the tender/bid.

Yours faithfully,

Date:

(Signature, name and designation  
of the Authorized signatory)

Place:

**Name and seal of Bidder**



## FORM-H: PRELIMINARY AGREEMENT

(To be executed on stamp per Rs.200/-)

Preliminary Agreement entered into on this ..... day of.....  
Two thousand and ..... Between .....<Tender Inviting Authority> for and on behalf of WAPCOS LIMITED, of the one part and Sri..... (Here enter full name and address of the Bidder) hereinafter called the Bidder of the other part for the execution of the agreement as well as for the execution of the work .....  
WHEREAS the WAPCOS LIMITED invited tenders for the work of..... (here enter name of the work) by Notification No..... Dated .....in the .....

I/We undersigned hereby offer to construct the proposed work in strict accordance with the contract/bid document for the consideration to be calculated in terms of the priced schedule of quantities.

I/We undertake to complete the whole of the works as per the attached schedule from the date of issue of intimation by you that our tender has been accepted and upon being permitted to enter site. I/We further undertake that on failure, subject to the conditions of the contract relating to extension of time, I/We shall pay agreed 'Liquidated Damages' for the period during which the work shall remain incomplete.

I/We hereby deposit with you as Earnest money Rs. \_\_\_\_\_ /- (Rupees \_\_\_\_\_) [carrying no interest] as mentioned in Tender Document in favour of <tender inviting authority> and I/We agree that this sum shall be forfeited in the event of the Employer accepting my/our tender and I/We fail to take up the contract when called upon to do so as per the bid document. I/We further agree for the applicable deduction from the 'Interim Payment/RA Bill' towards the 'Performance Security Deposit', which will be returned as per the relevant clauses in the agreement.

I/We will furnish the Performance Guarantee Bond as per the approved format, if our bid is accepted. Bid Security deposit shall be treated as security for the proper fulfillment of the same and shall execute an agreement for the work in the prescribed form. If I/We fails to do this or maintain a specified rate of progress (as specified in the Milestone details of contract data in the bid document), the performance guarantee (both treasury fixed deposit and irrevocable bank Guarantee) and Performance Security Deposit if any deducted from the RA Bills shall be forfeited to Government and fresh tenders shall be called for or the matter otherwise disposed off. If as a result of such measures due to the default of the Bidder to pay the requisite deposit, sign contract or take possession of the work any loss to Government due to the same will be

recovered from me/us as arrears of revenue, but should it be a saving to Government. I/We shall have no claim

Whatever to the difference. Recoveries on this or any other account will be made from the sum that may be due to us on this or any or other subsisting contracts or under the Revenue Recovery act or otherwise the Government may decide.

I/We further agrees that, in the case of becoming the lowest bidder in this tender and in the event of failure on part of me/us to produce any of the original documents, or submit the performance guarantee, or enter into agreement with the first part within the specified time limit, the first part may take appropriate action as provided in the bid document. In such a situation, if the second lowest bidder gets awarded with the work at his quoted rate, I shall agree to pay to the first part compensation towards the loss on account of award of work at a higher amount. Recoveries on this or any other account will be made from the sum that may be due to us on this or any or other subsisting contracts or under the Revenue Recovery act or otherwise the Government may decide.

NOW THEREFOR IN THE PRESENCE OF WITNESS it is mutually agreed as follows.

1) The terms and conditions for the said contract having been stipulated in the said tender document and forms to which the I/We have agreed and a copy of which is here to be appended which forms the part of this agreement, it is agreed that the terms and conditions stipulated therein shall bind the parties to this agreement except to the extent to which they are abrogated or altered by express terms and conditions herein agreed to and in which respect the express provisions herein shall supersede those of said tender form.

2) The I/We hereby agreed and undertake to perform and fulfill all the operations and obligations connected with the execution of the said contract work .....  
..... (hereinafter the name of the work) if awarded in favour of the me/us.)

3) If the Bidder does not come forward and to execute the original agreement after the said work is awarded and selection notice issued in his favour or commits breach of any of the conditions of the contract as stipulated in clause of the notice inviting tenders as quoted above, within the period stipulated then the Government may rearrange the work otherwise or get it done departmentally at the risk and the cost of the Bidder and the loss so sustained by the WAPCOS LIMITED can be realized from the Bidder under the Revenue recovery Act as if arrears of land revenue as assessed quantified and fixed by an adjudicating authority consisting of the Secretary Public works, Chief Engineer (Admn) or any other officer or officers authorized by Government in this behalf, taking into consideration the prevailing P.W.D rates and after giving due notice to the Bidder. The decision taken by such authority officer or officers shall be final and conclusive and shall be binding on the Bidder.

4) The Bidder further agrees that any amount found due to the Government under or by virtue of this agreement shall be recoverable from the Bidder from his EMD and his properties movable and immovable as arrears of Land Revenue under the provision of the Revenue Recovery Act for the time being in force or in any other manner as the Government may deem fit in this regard.

5) The Bidder further assures that it is clearly understood that the settlement of claims either by part bills or by final bills will be made only according to the availability of budget provision and allotment of funds of the work under the respective heads of account in which the work is sanctioned and arranged and also subject to the seniority of such bills. No claims for interest or for damages whatsoever shall be made for the related settlement of claims of bills.

IN WITNESS THERE OF SRI..... (here enter the name of the officers of the Department) for on behalf of the WAPCOS LIMITED and ..... the Bidder have set their hand on the day and year first above written Signed by Sri.....

In the presence of witnesses:

**FORM-I: LIST OF EQUIPMENTS**

<b>S.No</b>	<b>Equipment List</b>	<b>Own/Lease/Hire</b>



**WAPCOS**  
(A Government of India Undertaking)

Selection of Contractor for Construction of  
Director's Bungalow at Gujarat National Law  
University Campus

VOLUME II- SCOPE OF WORK, TECHNICAL  
SPECIFICATION

**WAPCOS LIMITED**

515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road, Kudasán,  
Dist: Gandhinagar, Gujarat-382421Tele: 079-23600292Tele fax: 079-23600352 Email:  
gandhinagar@wapcos.co.in

## SECTION-VII : SCOPE OF WORK (VOLUME- II)

---

The Scope of work of project for Contractor includes” construction of various infrastructure works under Gujarat National Law University.

### **1.0 NOC'S / APPROVALS/ CLEARANCES FROM LOCAL BODIES/ AUTHORITIES**

The Contractor will take necessary Statuary Approval/ NoCs/ Clearance from all concern Local Authorities / Departments, if any, required before start of the work / during the work / after execution of work & before handing over.

The contractor shall mobilize the resources at site after getting approval / NoCs/ Clearance from all concern Local Authorities / Departments if any, essential before start of the construction and shall not make any claim due to any delay in approval.

Contractor will follow the all rules, regulations and terms & conditions of Green building norm during the execution of the project work.

### **2.0 CIVIL WORK DESIGN AND DRAWINGS OF THE PROJECT / WORKS**

The Scope of work, shall include execution of work as per the standard technical Specification & Description of items in Bill of Quantities mentioned in tender document. The scope of work is not limited to these Specification & Description of items mentioned in tender document. The Contractor will consider all other necessary Specification and Items of works, while quoting the cost, which are essential to complete the work in all respect.

The modifications/ improvements may be made by the WAPCOS as per the requirement of Client during execution of work.

The contractor shall not be absolved of their responsibility of structural stability and correctness of structural design. The contractor shall bear all the losses if arises out of the failure of any part of the project.

**3.0 SCOPE OF CIVIL WORKS OF THE PROJECT AND ALLIED WORKS** of “Construction of Directors bungalow at Gujarat National Law University Campus”, includes

- Civil Works
- Electrical and Plumbing works
- Interior works
- Landscaping works
- Approval from GRIHA

NOTE:

- The Construction works area comes under GNLU

The Contractor must aware about location of the proposed works, surrounding local condition where works are to be constructed, Encroachment by local people and its consequence which may affect the progress of works. Accordingly, Contractor shall submit BID considering all these aspects and shall Quote the rates. Contractor shall not raise any extra/additional claim on these aspects.

- The contractor is required to deploy the resources at site and start the construction. No claim shall be entertained for idle labour, idle machinery, idle technical / non-technical staff, idle T&P and if any hindrance due to any reason.
- If any dispute/ hindrance may arise during construction, the contractor is not liable for any financial claim for damages due to such circumstances.
- The bidder shall be responsible right through the entire duration of the Project for execution of all works till commissioning and handing over of project complete with all respects and shall remove all defects, if any, developed during Defects Liability Period (DLP).
- No works, for which rates are not specifically mentioned in the priced schedule or quantities, shall be taken up without written permission of WAPCOS Limited. Rates of items not mentioned in the priced Schedule of Quantities shall be fixed by WAPCOS as provided in the corresponding clauses of the tender document.
- The work shall be executed as per the details in Schedule of Quantities and direction of Engineer-in Charge and shall be completed in all respect with full satisfaction of Engineer- in-Charge as per the Government guidelines, Indian standard codes & Manuals. The Bidder may assess the quantum of work before filling of tender.
- Contractor will also submit report on completed work along with drawings of completed (As-Built Drawings) work and including photographs of works.
- Contractor will take necessary approvals / clearance from the concerned departments before the start of work.
- The Contractor will submit the sample and test reports of prefab panel, paints, steel, cement, coarse sand etc. to the Engineer In-Charge for approval before starting the work.
- Any material used without prior approval shall be replaced by the Contractor immediately at his own cost. No payment in this regard shall be entertained.
- The contractor shall make his own arrangements for obtaining electric connection and water Connection/arrangement (if required).
- The Contractor shall dispose off all the dismantled materials, debris, garbage, waste outside of the campus of the works at his own cost after prior approval from Engineer in Charge and provide clear and clean site at the time of handing over the works.
- Contractor is advised to visit the site to understand the Scope of Work clearly before quoting the rates for the works.

**For & on behalf of Tenderer**

## SECTION– VIII: TECHNICAL SPECIFICATION (VOLUME- II)

---

1. The Work will be executed strictly in accordance with the CPWD/ R&B/GWSSB specification corrected up to date at the time of tenders, unless specified to contrary. The specifications to be generally followed will be the following specifications and codes.

- a) CPWD specification
- b) R&B/ GWSSB department Specification
- c) BIS specification
- d) National building code
- e) Particular specification as applicable.

2. Measurement of work will be done as per CPWD specification.

3. The Contractor shall not be entitled to any payments on account of work done till he signs the agreement and the same is accepted by the competent authority.

4. Actual quantities of completed and accepted work shall only be paid.

5. No claim shall be entertained on account of increase in price of material and wages of labour due to any cause what so ever.

6. The Engineer-In-Charge reserves the right to take away any item of work or any part thereof at any time during the currency of work and re-allot to any other agency with due notice to the contractor without liability of any kind or payment of any compensation.

7. The contractor will be responsible for any and all losses of material damages done to unfinished works as result of floods and any other act of God. WAPCOS will not be responsible for any compensation as a result of such damages or loss to the contractor and the contractor shall be liable to set right such damages at his own cost the satisfaction of the Engineer-In-Charge.

8. Nothing extra will be paid to the contractor for any lead or lift unless otherwise specified for any material required directly or indirectly under the contract.

9. Nothing extra will be paid to the contractor for diverting water in the channels or streams if it becomes necessary for the execution and completion of the work.

10. Amount of the work can be increased or decreased due to any item omitted and substituted in accordance with the requirement of the Board. And no claim on this account shall be entertained.

11. The Contractor shall be responsible for providing to the entire satisfaction of the Engineer-in-Charge at his own expenses for the following amenities for all the labour employed by him:-



- ii) Suitable temporary hutting accommodation.
- iii) Trench latrines, bathing enclosures, platforms separately for men and women and their regular cleanliness.
- iv) Clean drinking water.

In event of his failure, the cost thereof shall be recovered from the contractor. Any dispute regarding above points shall be settled by the Engineer-In-Charge and his decision shall be final.

12. For safe custody of materials and watch and ward thereof and proper double lock arrangement, the contractor shall be bound to follow the instruction of the Engineer-In-Charge.

13. The size of reinforced cement concrete and other structural member shall be measured and paid as per size provided in the structural drawings.

14. Error or omission, if any in the nomenclature rate or unit of the items or work shall be corrected as per CPWD schedule of Rates 2014.

**Materials and testing of materials for quality:**

15. The materials shall be subject to inspection and approval of the Engineer-In-Charge. The contractor shall be required to get necessary tests carried out of materials / work from an approved laboratory approved by the Board.

16. Any material will get tested at the cost of the contractor. The contractor will set up a site laboratory for testing of Coarse Aggregate, Fine Aggregate & Compressive Strength of Concrete, etc.

**17. Use of fly Ash**

The contractor is required to use fly ash clay bricks conforming to IS: 3812, if the same are available, in view of the Fly Ash Notification issued by the GOI from time to time.

18. The following are the respective CPWD sub sections/clauses relating to the relevant items of works under this package. Where there is discrepancy between CPWD specifications and BIS codes the former will prevail.

Sl No	Item description	Specification reference	IS Ref:
1	Earth work excavation, felling trees etc.	CPWD specifications 2.0 to 2.27	1. IS: 783 -1985 Code of practice for laying of concrete pipes. 2. IS: 1200-1992 Method of Measurement of Building Works (Part I). 3. IS: 3764-1992 Safety code for excavation work. 4. IS: 3385 Code of practice for measurement

Sl No	Item description	Specification reference	IS Ref:
			<p>of Civil Engineering Works.</p> <p>5. IS: 2720-1983 Method of test of soils (All parts)</p> <p>6. IS: 1498-1980 Classification and identification of soils for General Engineering purposes</p> <p>7. IS: 2809 Glossary of terms and symbols relating to Soil Engineering</p> <p>8. IS: 4081-1986 Safety code for blasting and related drilling operations</p> <p>9. IS: 4988 Glossary of terms and classifications of earth moving machinery (All Parts)</p>
2	PCC	CPWD specifications sub head 4.0	<p>1.IS 456</p> <p>2. Ordinary Portland cement, 33 Grade, conforming to IS: 269-1989.</p> <p>3. Rapid Hardening Portland Cement, conforming to IS: 8041-1990.</p> <p>4. Ordinary Portland cement, 43 Grade, conforming to IS: 8112-1989.</p> <p>5. Ordinary Portland cement, 53 Grade, conforming to IS: 12269-1987.</p> <p>6. Sulphate Resistant Portland cement, conforming to IS: 12330-1988.</p>
3	RCC works	CPWD specifications sub head 5.0	<p>1.IS: 269-1989 Specification for Ordinary, Rapid-Hardening and Low Heat Portland Cement.</p> <p>2.IS: 455-1989 Specification for Portland Blast Furnace Slag Cement.</p> <p>3.IS: 1489-1991 Specification for Portland- Pozzolana Cement.</p> <p>4.IS: 4031-1996 Methods of Physical Tests for Hydraulic Cement.</p> <p>5.IS: 650-1991 Specification for Standard Sand for Testing of Cement.</p> <p>6.IS: 383 Specification for Coarse and Fine Aggregates from Natural Sources for Concrete.</p> <p>7.IS: 2386-1983 Methods of Test for Aggregates for Concrete. (Part I to VIII)</p> <p>8.IS: 516-1959 Method of Test for Strength of Concrete.</p>

Sl No	Item description	Specification reference	IS Ref:
			<p><b>9.IS: 1199-1959</b> Method of Sampling and Analysis of Concrete.</p> <p><b>10.IS: 3025-1987</b> Method of Sampling and Test (Physical and Chemical) Water Used in Industry.</p> <p><b>11.IS: 432-1982</b> Specification for Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement. (Part I &amp; II)</p> <p><b>12.IS: 1139-1966</b> Specification for Hot Rolled Mild Steel and Medium Tensile Steel Deformed Bar for Concrete Reinforcement.</p> <p><b>13.IS: 1566-1982</b> Specification for Plain Hard Drawn Steel Wire Fabric for Concrete(PartI) Reinforcement.</p> <p><b>14.IS: 1785</b> Specification for Plain Hard Drawn Steel Wire for Pre-Stressed Concrete.</p> <p><b>15.IS: 1786-1985</b> Specification for Cold Twisted Steel Bars for Concrete Reinforcement.</p> <p><b>16.IS: 2090</b> Specification for High Tensile Steel Bars Used in Pre-Stressed Concrete.</p> <p><b>17.IS: 4990-2001</b> Specification for Plywood for Concrete Shuttering Work.</p> <p><b>18.IS: 2645-1975</b> Specification for Integral Cement Water-Proofing Compounds.</p> <p><b>BS: 4461</b> Cold Worked Steel Bars for The Reinforcement of Concrete.</p> <p><b>19.IS: 4098</b> Lime Pozzolana Mixture (1st Revision) (Amendment 2)</p> <p><b>IS: 3201</b> Criteria for Design and Construction of Precast Concrete Trusses.</p> <p><b>20.IS: 2204</b> Code of Practice for Construction of Reinforced Concrete Shell Roof.</p> <p><b>21.IS: 2210</b> Criteria for The Design of R.C. Shell Structures and Folded Plates.</p> <p><b>22.IS: 2751-1979</b> Code of Practice for Welding of Mild Steel Bars Used for Reinforced Concrete Construction.</p> <p><b>23.IS: 2502-1963</b> Code of Practice for Bending and Fixing</p>

Sl No	Item description	Specification reference	IS Ref:
			<p>Vibrators for Consolidating Concrete.  <b>24.IS: 3558-1983</b>                      Code of Practice for Use of Immersion Vibrators for Consolidating Concrete.  <b>25.IS: 3414-1968</b>                      Code of Practice for Design and Installation of Joints in Buildings.  <b>26.IS: 4014-1967</b>                      Code of Practice for Steel Tubular Scaffolding. (Part I &amp; II)  <b>27.IS: 2571-1970</b>                      Code of Practice for Laying In-Situ Cement Concrete Flooring.  <b>28.IS: 2250</b> Code of Practice for Preparation and Use of Masonry Mortar (1st Revision)  <b>29.9.2.5 Construction Safety</b>                      IS: 3696-1987                      Safety Code for Scaffolds and Ladders. (Part I &amp; II)  <b>30.IS: 3385</b> Code of Practice for Measurement of Civil Engineering Works.  <b>31.9.2.6 Measurement</b>                      IS: 1200 Method of Measurement of Building Works.  <b>32.IS: 3385</b> Code of Practice for Measurement of Civil Engineering Works.</p>
4	Masonry Brick work/laterite stones	CPWD specifications sub head 7.0	<p><b>1.IS 3620(Laterite),</b>  <b>2.IS: 1077-1992</b>                      Specifications for Common Burnt Clay Building Bricks                      1. IS: 1200 Measurements for Building Works                      2. IS: 1725 Specifications for Solid Cement Blocks used in General Building Construction                      3. IS: 1905-1987                      4. Code of Practice for Structural Safety of Buildings: Masonry Walls.                      5. IS: 2116-1980                      6. Sand for Masonry Mortars                      7. IS: 2180 Specification for Heavy Duty Burnt Clay Building Bricks                      8. IS: 2185-1979                      9. Specification for Concrete Masonry Units: Hollow and Solid Concrete Blocks                      10. IS: 2212-1991                      11. Code of Practice for Brick Work                      12. IS: 2222 Specification for Burnt Clay</p>

Sl No	Item description	Specification reference	IS Ref:
			Perforated Building Bricks 13. IS: 2691-1988 14. Specification for Burnt Clay Facing Bricks 15. IS: 3414-1968 16. Code of Practice for Design and Installation of Joints in Buildings 17. IS: 3466 Specification for Masonry Cement 18. IS: 3952 Specification for Burnt Clay Hollow Blocks for Walls and Partitions 19. IS:1124 water absorption and specific gravity of laterite stones 20. IS:1121 compressive strength of laterite stones 21. IS 1197(Pt.I) (Rubble)
5	Joinery works	CPWD specifications sub head 9.0	1.IS: 205 Specifications for non-ferrous metal butt hinges 2.IS: 287-1993 Recommendation for maximum permissible moisture content of timber used for different purposes. 3.IS: 303 Specification for plywood for general purpose <b>4.IS: 362 Specification for parliament hinges</b> 5.IS: 419-1967 Specification for putty for the use on window frames 6.IS: 883 Code of practice for design of structural timber in building. 7.IS: 1003-1991 Specification for Timber panelled and glazed shutters Part II - Window and ventilator shutters 8.IS: 1200-1992 Method of measurement of building and Civil Engineering Works - Wood Work and Joinery <b>9.IS: 1341 Specification for steel butt hinges</b> 10.IS: 1658 Specification for Fibre Hard Boards 11.IS: 1761 Specification for transparent sheet glass for glazing and framing purposes. 12.IS: 3087 Specification for wood particle boards (medium density for structural timber building) 13.IS: 1956 Glossary of terms relating to iron and steel 14.IS: 814-1991(Part I)

Sl No	Item description	Specification reference	IS Ref:
			<p>Specifications for covered electrodes for metal are welding of structural steel.  <b>15.IS: 814-1991(Part II)</b>                      1.For welding products other than sheets, Specifications for covered electrodes for metal is welding of structural steel.                      2.For welding sheets  <b>16.IS: 815</b> Classification and coding of covered electrodes for metal are welding and cutting operation.  <b>17.IS: 1948-1961</b>                      Aluminium doors, windows &amp; ventilators.  <b>18.IS: 6227</b> Code of Practice for use of metal are welding in tubular structure  <b>19.IS: 6248-1979</b>                      Specifications for metal rolling shutters and rolling grill  <b>20.IS: 1081-1960</b>                      Code of Practice for fixing and glazing of metal (steel and aluminium) doors, windows and ventilators.  <b>21.IS: 2062-1999</b>                      Weldable Structural Steel  <b>22.IS: 1361-1978</b>                      Specifications for steel windows for Industrial Buildings  <b>23.IS: 1200-1993(Part VIII)</b>                      Measurements for steel work and iron work  <b>24.IS: 1038-1983</b>                      Specifications for steel doors, windows, and ventilators.  <b>25.IS: 226-1975</b>                      Specifications for structural steel (Standard quality)  <b>26.IS: 823</b> Code of procedure for manual metal arc welding of metal steel  <b>27.IS: 102-1962</b>                      Ready mixed paint, brushing, red lead non-sitting, and priming.  <b>28.IS: 1363-1992</b>                      For black hexagon bolts, nut and lock nuts (dia. 6 to 39mm) and black hexagon screws (Dia. 6 to 24mm)  <b>29.IS: 813</b> Scheme of symbols for welding.</p>

Sl No	Item description	Specification reference	IS Ref:
6	Flooring	CPWD specifications sub head 11.0	<p>1.IS: 1130-1969 Specification for Marble (Blocks, Slabs and Tiles) (Reaffirmed 1993)</p> <p>2.IS: 1141-1973(1141-1993) * Code of Practice - Seasoning of Timber (2nd Revision)</p> <p>3.IS: 1197-1970 Code of Practice for Laying Rubber Floors (1st Revision (Reaffirmed 1990)</p> <p>4.IS: 1198-1982 Code of Practice for Laying, Fixing Ad Maintenance of Linoleum Floor (1st Revision) (Reaffirmed 1990)</p> <p><b>5.IS: 1200 (PartXI) 1977</b> Method of Measurement of Building and Civil Engineering Work (Part XI) Paving, Floor Finishes, Dado and Skirting (3rd Revision) (Amendment 1) (Reaffirmed 1992)</p> <p>6.IS: 1237-1980 Specification for Cement Concrete Flooring Tiles (1st Revision) (Reaffirmed 1990)</p> <p>7.IS: 1322-1982(1322-1993) Specification for Bitumen Felts for Water Proofing and Damp-Proofing (4th Revision)</p> <p>8.IS: 1443-1972 Code or Practice for Laying and Finishing of Cement Concrete Flooring Tiles (1st Revision) (Reaffirmed 1991)</p> <p>9.IS:1489(Part-1) 1991 Specification for Portland Pozzolana Cement (Part - 1) Fly ash Based (3rd Revision)</p> <p>10.IS: 1489- (Part II) 1991 Specification for Portland Pozzolana Cement (Part II) Calcined Clay Based (3rd Revision) (Amendment 1)</p> <p>11.IS: 1580-1991 Specification for Bituminous Compounds of Water Proofing and Caulking Purpose (3rd Revision)</p> <p><b>12.IS: 1195 Bitumen Mastic for Flooring</b></p> <p>13.IS: 3384-1990 Bitumen Primer for Use in Waterproofing and Damp Proofing</p> <p><b>14.IS: 4832 (Part - 1)</b> Acid Resistant Mortars - Silicate Type</p> <p><b>15.IS: 4832 (Part - 2)</b> Acid Resistant Mortars - Resin Type</p> <p>16.IS: 4457 Ceramic Unglazed Vitreous Acid Resisting Tiles</p>

Sl No	Item description	Specification reference	IS Ref:
7	Painting and Finishing	CPWD specifications sub head 13.0	<p><b>1.IS:</b> 16-1991(Part: I) Shellac: Part: I-Hand Made Shellac (3rd Revision)</p> <p><b>2.IS:</b> 16-1991(Part: II) Shellac: Part: II-Machine Made Shellac (3rd Revision)</p> <p><b>3.IS:</b> 75-1973 Linseed Oil, Raw and Refined (Reaffirmed 1990) (2nd Revision)</p> <p><b>4.IS:</b> 77-1976 Ready Mixed Paint, Brushing, Red Lead, Non setting, priming (Reaffirmed 1991)(Revised)</p> <p><b>5.IS:</b> 102-1962 Specification for Ready Mixed Paint, Brushing, Zinc Chrome, priming (Reaffirmed 1993) (2nd Revision)</p> <p><b>6.IS:</b> 104-1979 Ready Mixed Paint, brushing, priming Plaster to Indian Standard Colour No. 361, 631 White and off White (Reaffirmed 1993) (1st Revision)</p> <p><b>7.IS:</b> 109-1968 Ready Mixed Paint, Brushing, priming Plaster to Indian Standard Colour No. 361, 631 White and off White (Reaffirmed 1993) (1st Revision)</p> <p><b>8.IS:</b> 117-1964 Ready Mixed Paint, Brushing, Finishing Exterior, Semi-gloss for General Purposes to Indian Standards Colours (Reaffirmed 1988) (Revised)</p> <p><b>9.IS:</b> 133-1993 Enamel, Interior (a) Under Coating (b) Finishing (3rd Revision)</p> <p><b>10.IS:</b> 137-1965 Ready Mixed Paint, Brushing, Matt or Egg Shell Flat, Finishing Interior to Indian Standard Colour as required (Revised 1993)</p> <p><b>11.IS:</b> 158-1981 Ready Mixed Paint, Brushing, Bituminous Black, Lead Free, Acid, Alkali and Heat Resisting (Reaffirmed 1988) (3rd Revision)</p> <p><b>12.IS:</b> 217-1988 Specification for Cut Back Bitumen (2nd Revision)</p> <p><b>13.IS:</b> 218-1983 Specification for Creosote and Anthracene Oil for Use as Wood Preservatives (Reaffirmed 1990) (2nd Revision)</p> <p><b>14.IS:</b> 290-1961 Coal Tar Black Paint (Reaffirmed 1991) (1st Revision)</p> <p><b>15.IS:</b> 337-1975 Varnish, Finishing Interior (Reaffirmed 1991) (1st Revision)</p> <p><b>16.IS:</b> 341-1973 Black Japan, Types 'A', 'B' &amp; 'C' (Reaffirmed 1991) (1st Revision)</p>



Sl No	Item description	Specification reference	IS Ref:
			<p><b>17.IS:</b> 345-1952 Wood Filter, Transparent - Liquid (withdrawn)  <b>18.IS:</b> 347-1975 Varnish, Shellac for General Purposes (Reaffirmed 1991) (1st Revision)  <b>19.IS:</b> 348-1968 French Polish (Reaffirmed 1991) (1st Revision)  <b>20.IS:</b> 419-1967 Putty for Use On Window Frames (Reaffirmed 1992) (1st Revision)  <b>21.IS:</b> 427-1965 Distemper, Dry Colour as Required (Reaffirmed 1993) (Revised)  <b>22.IS:</b> 428-2000 Distemper, Oil Emulsion, Colour as Required (Reaffirmed 1993) (1stRevision)  <b>23.IS:</b> 524-1983 Varnish, Finishing, Exterior, Synthetic Air Drying (Reaffirmed 1990) (2ndEdition)  <b>24.IS:</b> 533-1973 Gum Spirit of Turpentine (Oil of Turpentine) (Reaffirmed 1990) (1st Revision)  <b>25.IS:</b> 712-1984 Specification for Building Limes (Reaffirmed 1991) (3rd Revision)  <b>26.IS:</b> 1200-1976                      (Part: XII)Method of Measurements of Building and Civil Engineering Works: Part: XII-Plastering and Pointing (Reaffirmed 1992) (3rd Revision)  <b>27.IS:</b>1200-1987 Method of Measurements of Building and Civil Engineering Works:</p>
8	Cement		<p><b>1.43</b> Grade OPC – IS8112  <b>2.53</b> Grade OPC-IS 1269  <b>3.PPC-</b>IS 1489  <b>4.</b>Rapid Harding Portland cement – IS 4032  <b>5.Port land slag cement IS 455</b>  <b>6.</b>Sulphate RC (SRC) –IS 12330</p>
9	Fine aggregates	CPWD specifications sub head 5.0	IS 383, 2386
10	Coarse aggregates	CPWD specifications sub head 5.0	IS 383, 2386
11	Mortars	CPWD specifications sub head 3.0	IS 3025,4031, 269,455,1269

Sl No	Item description	Specification reference	IS Ref:
12	Water supply and Sanitary works	CPWD specifications sub head 18 and 17	<p><b>Water supply</b></p> <p><b>1</b> IS 554 Pipe threads where pressure tight joints are required on the Threads-Dimensions, tolerances and designation.</p> <p><b>2</b> IS 778 Specification for copper alloy gate, and check valves for water works purposes</p> <p><b>3</b> IS 779 Water meters (domestic type) - Specification</p> <p><b>4</b> IS 780 Specification for sluice valves for water works purposes (50 to 300 mm size)</p> <p><b>5</b> IS 781 Specification for cast copper alloy screw down bib taps and stop valves for water services</p> <p><b>6 IS 782 Specification for caulking lead</b></p> <p><b>7</b> IS 1239 (Part 1) Steel tubes tubular and other wrought steel fittings, Part 1- Steel tubes-Specification</p> <p><b>8</b> IS 1239 (Part 2) Specification for mild steel tubes tubular and other wrought steel fittings, Part 2-Mild street tubular and other wrought steel pipe fittings</p> <p><b>9</b> IS 1538 Cast iron fittings for pressure pipes for water, gas and sewage - Specification</p> <p><b>10</b> IS 1703 Water fittings - copper alloy float valves (horizontal plunger type) -Specification</p> <p><b>11</b> IS 2692 Ferrules for water services-Specification</p> <p><b>12</b> IS 3950 Specification for surface boxes for sluice valves</p> <p><b>13</b> IS 4736 Specification for Hot-dip Zinc Coatings on mild steel tubes</p> <p><b>14</b> IS 5312 (Part 1) Swing type reflex (non return) valves for water works purposes. Part 1- Single door pattern</p> <p><b>15</b> IS 5312 (Part 2) Swing type reflex (non return) valves for water works purposes. Part 2- Multi door pattern</p> <p><b>16</b> IS 5382 Rubber sealing rings for gas mains, water mains and sewers</p> <p><b>17</b> IS 9762 Specification for polyethylene floats (spherical) for float valves</p> <p><b>18</b> IS 9763 Plastic Bib taps and stop valves (rising spindle) for cold water services specifications</p> <p><b>19.</b> IS 15450 PE-AL-PE Pipes for hot and cold</p>

Sl No	Item description	Specification reference	IS Ref:
			<p>water supplies Specifications</p> <p><b>20.</b> IS 15778 Chlorinated Polyvinyl Chloride (CPVC) pipes for potable hot and cold water distribution supplies-specifications.</p> <p><b>21.</b> IS 15801 Polypropylene- Random Copolymer Pipes for hot and cold water supplies Specifications</p> <p><b>Sanitary</b></p> <p><b>1.</b> IS 771 (Pt.1) Specification for glazed fire clay sanitary appliances: Part 1: General requirements.</p> <p><b>2.</b> IS 771 (Pt.-2) Specification for glazed fire clay sanitary appliances: Part 2: Specific requirements of kitchen and laboratory sink.</p> <p><b>3.</b> IS 772 Specific action for general requirements for enameled cast iron sanitary appliances.</p> <p><b>4.</b> IS 774 Flushing cisterns for water closets and urinals (Other than plastic cistern)- Specifications.</p> <p><b>5.</b> IS 1300 Phenolic moulding materials. - Specifications</p> <p><b>6.</b> IS 1703 Water fittings- copper alloy float valves (horizontal plunger type) - Specification.</p> <p><b>7.</b> IS 1795 Specification for pillar taps for water supply purposes.</p> <p><b>8.</b> IS 2267 Polystyrene moulding and extrusion materials - Specifications</p> <p><b>9.</b> IS 2326 Specification for Automatic Flushing Cisterns for Urinals (Other than plastic cisterns)</p> <p><b>10.</b> IS 2548 (Part-1) Plastic seats and covers for water closets Part 1: Thermo set seats and covers Specifications</p> <p><b>11.</b> IS 2548 (Part-2) Plastic seats and covers for water closets Part 2: Thermoplastic seats and covers. - Specifications</p> <p><b>12.</b> IS 2556 Vitreous sanitary appliances (vitreous china) Specifications</p> <p><b>13.</b> IS 2556 (Part-1) Part-1: General requirements.</p> <p><b>14.</b> IS 2556 (Part-2) Part-2: Specific requirements of wash-down water closets.</p> <p><b>15.</b> IS 2556 (Part-3) Part-3: Specific squatting pans.</p> <p><b>16.</b> IS 2556 (Part-4) Part-4: Specific requirements of wash basins.</p>

Sl No	Item description	Specification reference	IS Ref:
			<p><b>17.</b> IS 2556 (Part-5) Part-5: Specific requirements of laboratory sinks.</p> <p><b>18.</b> IS 2556 (Part-6) Part-6: Specific requirements of Urinals &amp; Partition plates</p> <p><b>19.</b> IS 2556 (Part-7) Part-7: Specific requirements of accessories for sanitary appliances</p> <p><b>20.</b> IS 2556 (Part -14) Part-14: Specific requirements of integrated squatting pans.</p> <p><b>21.</b> IS 2556 (Part -15) Part-15: Specific requirements of universal water closets.</p> <p><b>22.</b> IS 2963 Specification for Copper alloy waste fittings for wash basins and sinks.</p> <p><b>23.</b> IS 3389 Urea formaldehyde moulding materials. - Specifications</p> <p><b>24.</b> IS 3989 Specification for centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes fittings and accessories.</p> <p><b>25.</b> IS 4827 Specification for electroplated coating of nickel and chromium on copper and copper alloys.</p> <p><b>26.</b> IS 4984 Specification for high density polyethylene pipes for potable water supplies.</p>

**TECHNICAL SPECIFICATION FOR CIVIL WORK**

Applicable Standards for Civil Works

**Section: A - Applicable Standards for Civil & Plumbing Works**

1	Conversion factors	IS:786
2	Method of measurement of building works	IS:1200
3	Code of practice for measurement of civil engineering works	IS:3385
4	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
5	Safety code for blasting and related drilling operations	IS:4081
6	Safety code for excavation work	IS:3764
7	Moisture content in sand for filling	IS:2720
8	Determination of moisture content	IS:2720 (PART II)
9	Determination of moisture content & dry density relation using light compaction	IS: 2720 ( PART VIII)
10	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
11	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
12	Anti-termite treatment	IS:6313(PART I TO III)
13	Construction water	IS:456
14	Methods of sampling and test (physical and chemical water used in industry )	IS:3025
15	Ordinary (33 grade)/low heat Portland cement	IS:269
16	Ordinary Portland cement (43 grade)	IS:8112
17	Ordinary Portland cement (53 grade)	IS:12269
18	White Portland cement	IS:8042-E
19	Portland Pozzolana cement	IS:1489
20	Rapid hardening Portland cement	IS:8041, IS:269
21	Portland(blast furnace) slag cement	IS:455
22	Hydrophobic cement	IS:8043
23	High alumina cement	IS:6452
24	Super sulphated cement	IS:6909
25	Oil well cement	IS:8229E
26	Standard for testing of cement	IS:650
27	Methods of physical tests for hydraulic cement	IS:4031
28	Specification for standard sand for testing of cement	IS:650
29	Coarse and fine aggregates for concrete	IS:383, IS:515
30	Gradation of coarse aggregates	IS:383(TABLEII)
31	Gradation of fine aggregates	IS:383 (TABLE III)

32	All-in-aggregates	IS:383 (TABLE IV)
33	Method of tests for aggregates for concrete	IS:2386 (PART I TO VIII)
34	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
35	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
36	Flakiness index of aggregates	IS:2396 (PART I), IS:5640
37	Moisture content test for aggregates	IS:2386 (PART III)
38	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.	IS:432 (PART I & II)
39	Specification for plain hard drawn steel wire fabric for cement concrete	IS:1566
40	Specification for cold twisted steel bars for concrete reinforcement	IS:1786
41	Specifications for hot rolled mild steel and medium tensile steel deformed bars	IS:1139, IS:1739
42	Code of practice for bending and fixing of bars for concrete reinforcement	IS:2502
43	Mild steel binding wire	IS:280
44	Code of practice for welding of mild steel bars used for RCC	IS:2751
45	Code of practice for plain and reinforced concrete	IS:456
46	Code of practice for general construction of plain and RCC for dams	IS:457
47	Testing of reinforced cement concrete	IS:516
48	Method of tests for strength of concrete	IS:516
49	Methods of sampling & analysis of concrete	IS:1199
50	Code of practice for concrete structures for storage of liquids	IS:3370 (PART I TO IV)
51	Code of practice for composite construction	IS:3935
52	Code of practice for construction of reinforced concrete shell roof	IS:2204
53	Criteria for the design of RCC shell structures and folded plates	IS:2210
54	Specification for batch type concrete mixers	IS:1791
55	Specification for portable swing weigh batchers for concrete	IS:2722
56	Specification for roller pan mixer	IS:2438
57	Specification for concrete vibrators immersion type	IS:2505
58	Specification for screed board concrete vibrators	IS:2506
59	Specification for concrete vibrating tables	IS:2514
60	Specification for pan vibrators	IS:3366
61	Specification for form vibrators for concrete	IS:4656

62	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
63	Air entraining agent	ASTM:6260
64	Criteria for design and construction of precast concrete trusses	IS:3201
65	Prestressed concrete	IS:1343
66	Specification for high tensile steel bars used in code of practice for pre-stressed concrete	IS:2090
67	Specification for plain hard drawn steel wire for pre-stressed concrete	IS:1785 (PART I)
68	Specification for plywood for concrete	
69	Shuttering work	IS:4990
70	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
71	Specification for steel scaffolding	IS:2750
72	Safety code for scaffolds and ladders	IS:3696
73	Common burnt clay building bricks	IS:1077
74	Classification of burnt clay bricks	IS:3102
75	Burnt clay building bricks, heavy duty	IS:2180
76	Burnt clay facing bricks	IS:2691,IS:1077
77	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
78	Mortar for brick work	IS:2250
79	Code of practice for brick work	IS:2221
80	Masonry works	IS:3466
81	Structural safety etc. Of building masonry walls	IS:1905
82	Load bearing hollow concrete blocks	IS:2185
83	Lime - cement - cinder hollow concrete blocks	IS:5498
84	Lime - cement - cinder solid blocks	IS:3115
85	Code of practice for construction of stone masonry	IS:1597 (PART I)
86	Stone tests	IS:1124
87	Code of practice for design and installation of joints in buildings	IS:3414
88	Joint sealing compound	IS:834
89	Pre-molded bituminous joint filler	IS:1838
90	Timber door, window and ventilator frames	IS:4021
91	Material & workmanship for wood work	IS:883, IS:4021
92	Wooden flush door shutters (solid core type)	IS:2202 (PART I)
93	Timber paneled and glazed shutters	IS:1003 (PART I & II)
94	Method of tests for wooden flush doors, type tests	IS:4020
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103

98	Oil type wood preservative	IS:218
99	Particle board	IS:3087
100	Transparent sheet glass for glazing & framing purposes	IS:1761
101	Resin bonded fiber glass	IS:3144
102	Putty for glazing	IS:420
103	Steel door frames	IS:4351
104	Steel window	IS:1361
105	Steel doors	IS:1038
106	Steel ventilators	IS:1081
107	Rolling shutters	IS:6248
108	Primer for steel doors, windows & ventilators	IS:102
109	Aluminum alloy for door/window frames	IS DSGN. HEA-WP OF IS:733
110	Sections	IS:1948
111	Anodizing	BS:1616
112	Hydraulic lime & storage	IS:712
113	General tests for lime	IS:6932 (PART I TO X)
114	Field tests for lime	IS:1624
115	Lime mortar preparation	IS:1625
116	Slacked lime	IS:1639
117	Surkhi	IS:1344
118	Code of practice for application of lime plaster finish	IS:2394
119	Rough cast plaster	IS:1661(CLAUSE-165)
120	Specification for integral cement water proofing compounds	IS:2645
121	Water proofing asphalt/maxphalt	IS:702
122	Bitumen saturated layer	IS:1322
123	Bitumen felt	IS:1322
124	Bitumen	IS:702
125	Code of practice for laying and finishing of cement concrete flooring tiles	IS:1443
126	Material & workmanship for flooring	IS:1197, IS:1344
127	Code of practice for laying in situ terrazzo floor finish	IS:2114
128	Code of practice for laying in-situ cement concrete flooring	IS:2571
129	Mosaic tiles	IS:1237
130	Glazed earthenware tiles	IS:777
131	Marble chips & marble mosaic terrazzo	IS:2114
132	Plain cement tiles & tests	IS:1237
133	Marble mosaic tiles	IS:1237
134	Marble slab	IS:1130



135	PVC flooring tiles & sheets	IS:3461,IS:3462
136	Broken marble mosaic tiles	IS:1257
137	Oxy-chloride	IS:658
138	Magnesium chloride	IS:657
139	C.I. grid tiles	IS:210
140	Pigment for terrazzo flooring	IS:459
141	Ceramic unglazed vitreous acid resisting tile	IS:4457
142	Rivets	IS:1148
143	Electrodes for welding	IS:814
144	Code of practice for use of electric arc welding for general construction in steel	IS:813
145	Tests for welding works	IS:1181
146	Welding works	IS:816
147	Bolts and nuts	IS:1367
148	Tests for bolts and nuts	IS:1608
149	Structural steel sections & tests	IS:226
150	Structural steel plates	IS:2062
151	Defects in structural steel	IS:229
152	Dimension & properties of steel section	IS:808
154	Structural steel work	IS:226, IS:4948
155	Expanded metal steel sheet	IS:412
156	Mild steel wire gauze jali	IS:280
157	Welding procedure & edge preparation	IS:823
158	Washers	IS:2016
159	Storage of welding wire & electrodes	IS:816
160	Primer to structural surface for bolts	IS:2074
161	Checkered plates	IS:3502
162	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
163	Distemper and dry color	IS:427
164	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
165	Distemper and oil emulsion	IS:428
170	Enamel paints	IS:2933
171	Coat of zinc chromate	IS:104
172	French spirit polish	IS:348
173	GI sheets	IS:227
174	Ac sheets	IS:459
175	Ac sheet fixing	IS:730

176	Mangalore pattern tiles	IS:654
177	Fiber glass reinforced polyester	IS:4154
178	Galvanized steel for barbed wire	IS:278
179	Insulation of hot water pipes, tanks & heat exchanger	BS:476
180	GI pipes & MS tubes	IS:1239 (PART I)
181	Screw down bib cocks & stop cocks	IS:781
182	Vitreous sanitary fixtures(general)	IS:2556 (PART I)
183	Gun metal wheel, globe, check, gate & non return valves	IS:778
184	Wash basin	IS:2556 (PART IV), IS:771
185	European W.C.	IS:2556, IS:771
186	Solid plastic seat & cover	IS:2548
187	Orissa pan W.C.	IS:2556 (PART III)
188	Squatting pans & traps	IS:2556 (PART III)
189	Indian W.C. (wash down W.C.)	IS:2556 (PART II), IS:771
190	Urinals	IS:2556 (PART VI)
191	Half round channels	IS:2556 (PART VII)
192	Specific requirements of siphonic wash down W.C.	IS:2556 (PART VIII)
193	SS sink/C.I./flushing tank brackets	IS:775
194	C.I. siphonic flushing cistern	IS:774
195	Lead pipes	IS:404 (PART I)
196	Sand cast pipes & fittings	IS:1729
197	C.I. spun soil pipes & fittings	IS:3939
198	Gully trap	IS:651
199	Glazed stone ware pipes & fittings	IS:651
200	Ac pipe	IS:1626,IS:1626 (PART I)
201	High pressure/crydon ball valve	IS:1703
202	C.I. sluice valve	IS:780
203	Capstan head	IS:1795
204	Malleable iron fittings	IS:1879 (PART I TO X)
205	C.I. pipes	IS:1536, IS:1537
206	Molten (pig)lead	IS:782
207	C.I. manhole frames & covers	IS:1726
208	Concrete pipes	IS:458
209	Threads for screwed pipes	IS:554
210	Lead jointing	IS:718
211	Carbon steel for pipes	IS:9161
212	Low level ceramic cistern	IS:774
213	Bowl pattern flat back urinals	IS:2556 (PART IV)
214	Showers	IS:2064

215	Heavy C.I. pipes	IS:1729
216	Concrete mix design	IS:10262
217	Code of practice for construction of floor and roof with joists and filler blocks	IS:6061 (PART I)
218	Code of practice for construction of light weight concrete block masonry	IS:6042
219	Specification for load bearing light weight concrete blocks	IS:3590
220	Code of practice for construction of hollow concrete block masonry	IS:2572
221	Specification for concrete masonry units (hollow and solid concrete blocks)	IS:2185 (PART I)
222	Chemical composition of ordinary Portland cement	IS:4032
223	Sulphate resistant cement	BS:4027 & ASTM C-150 TYPE II
224	Specifications for circular hollow sections	IS:1161
225	Properties of rectangular & square hollow sections	IS:4923
226	Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
227	Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
228	Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
229	Hot rolled structural steel hollow section (Part 1) Code of Practice for design and construction of pile foundation concrete piles cast-in-situ bored piles. Recommendation for detailing of Reinforcement in Reinforced Concrete Works.	BS:4848/ IS: 2911 IS: 5525

Note: For the reference of all Codes and Standards, the latest version of the above specified Standards shall be followed, Wherever, such Standards are not specified for the construction materials, equipment and method, the relevant Indian Standard Codes of Practice shall be followed, in the absence of Indian Standards corresponding British Standard Codes of Practice or relevant American Standards shall be followed.

## Cement Consumption

**Section C - Cement Consumption**

	Item	Ratio/ Grade	Consumption	
<b>A.</b>	<b>CEMENT CONCRETE (OPC 43 grade Cement)</b>			
	BBCC (Volumetric)	1:5:10	2.60	Bags/m <sup>3</sup> .
		1:4:8	3.40	Bags/m <sup>3</sup> .
	PCC (Volumetric)	1:6:12	2.30	Bags/m <sup>3</sup> .
		1:5:10	2.60	Bags/m <sup>3</sup> .
		1:4:8	3.40	Bags/m <sup>3</sup> .
	PCC (Controlled concrete)	1:3:6	4.30	Bags/m <sup>3</sup> .
		M7.5	3.40	Bags/ m <sup>3</sup> .
		M15	5.50	Bags/ m <sup>3</sup> .
	RCC (Controlled concrete Minimum cement content as per IS -456:2000)	M20	6.0	Bags/m <sup>3</sup> .
		M25	6.5	Bags/m <sup>3</sup> .
M30		7.0	Bags/m <sup>3</sup> .	
<b>B.</b>	<b>MORTARS</b>			
	Cement and Sand mortar	1:1	20.4	Bags/m <sup>3</sup> .
		1:2	13.6	Bags/m <sup>3</sup> .
		1:3	10.2	Bags/m <sup>3</sup> .
		1:4	7.60	Bags/m <sup>3</sup> .
		1:5	6.2	Bags/m <sup>3</sup> .
		1:6	5.0	Bags/m <sup>3</sup> .
		1:8	3.83	Bags/m <sup>3</sup> .
<b>C.</b>	<b>MASONRY WORK</b>			
	Brickwork in Cement sand mortar (Conventional)	1:3	2.55	Bags/m <sup>3</sup> .
		1:4	1.90	Bags/m <sup>3</sup> .
		1:5	1.56	Bags/m <sup>3</sup> .
		1:6	1.27	Bags/m <sup>3</sup> .
		1:8	0.95	Bags/m <sup>3</sup> .
	Stone masonry, Coursed	1:3	3.06	Bags/m <sup>3</sup> .
		1:4	2.28	Bags/m <sup>3</sup> .
		1:6	1.50	Bags/m <sup>3</sup> .
		1:8	1.18	Bags/m <sup>3</sup> .
	Stone masonry Uncoursed	1:5	2.04	Bags/m <sup>3</sup> .
		1:6	1.65	Bags/m <sup>3</sup> .
	Half Brick work (Conventional)	1:3	0.29	Bags/m <sup>2</sup> .
		1:4	0.21	Bags/m <sup>2</sup> .

		1:5	0.17	Bags/m <sup>2</sup> .
<b>D.</b>	<b>PLASTERING</b>			
	10 mm. thick plaster in Cement mortar, on ceiling & soffit of stair, chajjas etc.	1:3	0.12	Bags/m <sup>2</sup> .
		1:4	0.1	Bags/m <sup>2</sup> .
	15 mm. thick single coat plaster in on walls	1:3	0.17	Bags/m <sup>2</sup> .
		1:4	0.13	Bags/m <sup>2</sup> .
	20 mm. thick plaster in Cement mortar, on unfair side of brick in single coat	1:3	0.23	Bags/m <sup>2</sup> .
		1:4	0.17	Bags/m <sup>2</sup> .
	20 mm. thick plaster in Cement mortar, on unfair side of brick in double coat (First coat 15mm in 1:4 and second coat of 5mm in 1:3)		0.18	Bags/m <sup>2</sup> .
	20 mm. thick Sand Face plaster (First coat 15mm in 1:4 and second coat of 5mm in 1:2)		0.22	Bags/m <sup>2</sup> .
	15 mm. thick Water Proof plaster in 1:3 Cement mortar		0.21	Bags/m <sup>2</sup> .
	Neat Cement finishing		0.044	Bags/m <sup>2</sup> .
<b>E.</b>	<b>POINTING</b>			
	Flush, Grooved or Struck in Cement Brick masonry	1:1	0.092	Bags/m <sup>2</sup> .
		1:2	0.046	Bags/m <sup>2</sup> .
		1:3	0.03	Bags/m <sup>2</sup> .
		1:4	0.023	Bags/m <sup>2</sup> .
	Flush, Grooved or Struck in Cement Random Stone masonry	1:3	0.023	Bags/m <sup>2</sup> .
<b>F.</b>	<b>FLOORING</b>			
	Precast Mosaic Tiles of 40mm thk. in cement mortar 1:6		0.30	Bags/m <sup>2</sup> .
	20mm thk. Green Kotah/Granite Stone in flooring, skirting & dado of 50mm thk. in cement mortar 1:6		0.50	Bags/m <sup>2</sup> .
	20 mm thick. Green Kotah/ Granite Stone in Risers and Treads		0.50	Bags/m <sup>2</sup> .
	20 mm thick. Double Polished Kotah/Granite Stone		0.50	Bags/m <sup>2</sup> .
	25mm thick. Rough Kotah, Dholpur, Red Mandana, Bansipahadpur stone etc. in flooring, skirting & dado of		0.50	Bags/m <sup>2</sup> .

	50mm thk. in cement mortar 1:6			
	Glazed Tiles, Ceramic tiles, vitrified tiles flooring in 25 mm thick. Bedding of C:M 1:6		0.20	Bags/m <sup>2</sup> .
	Glazed Tiles, Ceramic tiles, vitrified tiles dado in C:M 1:1		0.20	Bags/m <sup>2</sup> .
	China mosaic with 25 mm bedding mortar in C:M 1:6		0.22	Bags/m <sup>2</sup> .
	18-20mm Marble, Granite, Jesalmer Slab with avg. 50mm bedding mortar in cement mortar 1:6		0.50	Bags/m <sup>2</sup> .
	I.P.S.	40 mm. thick	0.35	Bags/m <sup>2</sup> .
		50 mm. thick	0.40	Bags/m <sup>2</sup> .
		75mm. thick	0.55	Bags/m <sup>2</sup> .
	115mm water proofing plaster		0.40	Bags/m <sup>2</sup> .
	Brick-on-edge		0.12	Bags/m <sup>2</sup> .
	Wet stone cladding in C:M 1:2		0.2	Bags/m <sup>2</sup> .
	Chemical water proofing 3 coats		0.05	Bags/m <sup>2</sup> .
	Sandwich platform		0.5	Bags/m <sup>2</sup> .
<b>G.</b>	<b>MISCELLANEOUS</b>			
	Filling Zaris with			
	C.M.	1:3	5.0	Bags/ 100 mts.
	C.C	1:2:4	3.2	Bags/100 mts.
<b>H.</b>	<b>ROADWORK</b>			
	Precast exposed Curbs M20	1:2:4	35	Bags/100 mt.
<b>I.</b>	<b>SANITARY WORK</b>			
	R.C.C Hume pipes jointed with Cement mortar 1:1	600 mm. dia.	6.4	Bags/100 m.
		450 mm. dia.	4.8	Bags/100 m.
		300 mm. dia.	2.2	Bags/100 m.
		230 mm. dia.	1.8	Bags/100 m.
		150 mm. dia.	1.2	Bags/100 m.
		100 mm. dia.	1.0	Bags/100 m.
	SW pipes jointed with Cement mortar 1:1	300 mm. dia.	12.94	Bags/100 m.
		230 mm. dia.	9.74	Bags/100 m.
		150 mm. dia.	6.56	Bags/100 m.
		100 mm. dia.	4.34	Bags/100 m.
	Fixing wall hung type WC		0.1	Bag/no.
	Fixing Urinal/s.		0.2	Bag/no.
	Half Round Channel 100 mm.		15.86	Bags/100 m.

Fixing 100 mm. dia. SW Gully Trap	0.5	Bag/no.
-----------------------------------	-----	---------

**Note: For the items not covered in above list, CPWD co-efficient shall be followed or proportionate from CPWD co-efficient or actual consumption shall be checked in the beginning, during execution of item in consultation with EIC.**

**Section D - MATERIALS SPECIFICATIONS – CIVIL WORKS**

1. In the specifications, “as directed” / “Approved” shall be taken to mean “as directed” / “approved” by the Architect / Engineer-in-charge.
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
3. In “Mode of Measurement” in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to.
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits:  
 Length, width and depth (height) - 0.01 Metre.  
 Areas - 0.01 Sq.Mt.  
 Cubic Contents - 0.01 Cu.Mt.
5. The distance which constitutes lead shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer - in - charge in this regard shall be taken as final.
6. Where no lead is specified, it shall mean “all leads”
7. Lift shall be measured from Ground Level.
8. Reference to specifications of materials as made in the detailed specifications of the items of work is in the form of a designation containing the number of the specifications of the material and prefix “M” e.g. “M-5”
9. Approval to the samples of various materials given by the Engineer - in - charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer - in - charge.
10. The contract rate of the item of work shall be for the work completed in all respects.
11. No collection of materials shall be made before it is not approved from the Engineer-in-charge.

12. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
13. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
14. No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.
15. All works shall be carried out in a workmanlike manner as per the best technique for the particular item.
16. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
17. The mode, procedure and manner of execution shall be such that it does not cause damage or over loading of the various components of the structure during execution or after completion of the structure.
18. Special modes of construction not adopted in general engineering practice, if proposed to be adopted by the contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
19. All installations pertaining to water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the contractors.
20. The contractor shall be responsible for observing the rules and regulations imposed under "Minor Minerals Act" and such other laws and rules prescribed by Government from time to time.
21. All necessary safety measures and precaution (including those laid down in the various relevant Indian Standards), shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.
22. Contractor shall submit the test reports for every material carried out at recognized laboratory technical institute or laboratory. Many certificates for such test shall not be considered The testing charges of all materials shall be borne by the Contractor.
23. Approval to any of the executed items for the work does not in any way relieve



- the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specifications
24. Contractor shall set up testing laboratory on site. Laboratory shall be equipped with minimum following equipment's / instruments.
- |                               |                              |
|-------------------------------|------------------------------|
| Beaker-Measuring Cylinder     | Core cutter set              |
| Flakiness Index               | Mortar Mixture               |
| Elongation Index              | Casgranade Apparatus         |
| Aggregate Impact Value        | Welding gauge                |
| Oven                          | Dye penetration material-set |
| Slump Cone                    | Pycnometer                   |
| Concrete cube testing Machine | Proctor mould                |
| Concrete Test Cubes           | GI tray/ Ceramic tray        |
| Vicat Apparatus               | Distilled Water              |
| 90 micron Sieve               | Wire basket                  |
| Mortar Cube Mould             | PH meter                     |
| Plate Vibrator                | TDS meter                    |
| Micrometer Screw              | IS 1852                      |
| Varner Calipers               | Electronic vernier           |
| Thermometer                   | Welding gauge                |
| 5 kg- Weigh Scale /Balance    | Theodolite                   |
| Electronics Balance – 20 kg   | Auto Level/Staf              |
| 300 kg- Weigh Scale /Balance  |                              |

**M-1 Water**

- 1.1 Nabhi's commentary on CPWD specifications clause no. 3.1.1 shall be followed.
- 1.2 Nabhi's commentary on CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

**M-2 Lime**

- 2.1 Nabhi's commentary on CPWD specifications clause no. 3.1.3 shall be followed.

**M-3 Cement**

- 3.1 Nabhi's commentary on CPWD specifications clause no. 3.1.2 shall be followed.
- 3.2 Nabhi's commentary on CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

**3.3 Reduction of strength of cement with passage of time**

Reduction of strength at 28 days of concrete made from fresh and stored cement

Sr.no.	Storage Period of Cement	Strength Reduction
1.	Fresh	NIL
2.	3 months old	20%
3.	6 months old	30%
4.	12 months old	40%
5.	24 months old	50%

3.4 Stored cement can be used only up to the 3 months from the date of manufacture. After 3 months' cement is to be used after prior permission of the consultant.

#### **M-4 White Cement**

4.1 The white cement shall conform to IS : 8042-E.

#### **M-5 Colored Cement**

5.1 Colored cement shall be with white or grey Portland cement mixed with pigments as specified in the item of the work.

5.2 The pigments used for coloured cement shall be of approved quality and its quantity shall not exceed 10% of the cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties as to provide for durability for colour under exposure to sunlight and weather.

5.3 The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.

#### **M-6 Sand**

6.1 Nabhi's commentary on CPWD specifications clause no. 3.1.4 shall be followed.

6.2 Nabhi's commentary on CPWD specifications chapter 3 Mortars - List of Mandatory Tests shall be followed.

#### **M-7 Stone Dust**

7.1 This shall be obtained from crushing hard black trap or equivalent. It shall not contain more than 8% of silt as determined by field test with measuring cylinder. The method of determining silt contents by fields test is given under:

7.2 A sample of stone dust to be tested shall be placed without drying in 200 mm. measuring cylinder. The quantity of the sample shall be such that it fills the cylinder upto 100 mm. mark. Then clean water shall be added upto 150 mm. mark. The mixture shall be stirred vigorously and the contents allowed to settle for 3 hours.

7.3 The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the content within the allowable limit.

7.4 The fineness modulus of stone dust shall not be less than 1.80.

**M-8 Stone Grit**

8.1 Grit shall consist of crushed or broken **black trap stone** and be hard, strong, dense, durable clean of proper gradation and free from skin or coating likely to prevent proper adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of IS : 383 Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge and Architects. The grit shall have no deleterious reaction with cement.

8.2 The grit shall conform to the following gradation as per sieve analysis:

IS Sieve Designation	% passing Through sieve	IS Sieve Designation	% Passing Through sieve
12.50 mm.	100%	4.75 mm.	0-20%
10.00 mm.	85-100%	2.36 mm.	0- 5%

8.3 The crushing strength of grit will be such so as to allow the concrete in which it is used to build up the specified strength of concrete.

8.4 The necessary tests for grit shall be carried out as per the requirements of IS: 2386 (parts I to VIII), as per instructions of the Engineer-in-charge and Architect. The necessity of test will be decided by the Engineer-in-charge and Architect.

**M-9 Cinder**

9.1 Cinder is well burnt furnace residue which has been fused or centered into lumps of varying sizes.

9.2 Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean and free from clay, dirt ash or other deleterious matter.

9.3 The average grading for cinder aggregates shall be as mentioned below:

IS Sieve Designation	% Passing	IS Designation	% Passing
----------------------	-----------	----------------	-----------

20 mm.	100	4.75 mm.	70
10 mm.	86	2.36 mm.	52

9.4 Density of cinder shall be 900 Kg / cum or as approved by structural consultant.

9.5 Material shall be nonhazardous and suitable as per relevant IS code.

**M-10 Lime mortar**

10.1 Nabhi's commentary on Nabhi's commentary on CPWD specifications clause no. 3.2.1 shall be followed.

**M-11 Cement Mortar**

11.1 Nabhi's commentary on Nabhi's commentary on CPWD specifications clause no. 3.2.2 shall be followed.

**M-12 Coarse Aggregate**

12.1 Nabhi's commentary on Nabhi's commentary on CPWD specifications clause no. 4.1.2 shall be followed.

**M-13 Murrum**

13.1 Murrum or the selected earth shall be brought from outside, as indicated in the item. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case, Black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones, or brick bats. The clods shall be broken to a size of 50 mm. or less. It shall be of good binding quality and of approved quality obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of calcareous origin. Contractor shall make his own arrangement, at his own cost, for land for borrowing selected earth. The staking of the material shall be done as directed by Engineer-in-charge, in such a way as not to interfere with any constructional activities and in proper stacks.

**M-14 Stone**

14.1 The stone shall be of specified variety such as Granite/Trap Stone/Quartz or any other type of good hard stones.

The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more

than 5% of dry weight, when tested in accordance with IS : 1124. The minimum crushing strength of the stone shall be 200 Kg/cm<sup>2</sup>. Unless otherwise specified.

14.2 The samples of the stone to be used shall be got approved before the work is started.

14.3 The Khanki facing stone shall be dressed by chisel as specified in the item for Khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

**M-15 Brick Bat coba**

15.1 Brick Aggregate shall be obtained by breaking well burnt or over burnt dense bricks / brickbats. They shall be homogeneous in texture, roughly cubical in shape and clean. They shall be free from unburnt clay particles. Soluble salt, silt, adherent coating of soil, vegetable matter and other deleterious substances. Such aggregate should not contain more than one percent of sulphates and should not absorb more than 10% of their own mass of water, when used in cement concrete and 20% when used in lime concrete. It shall conform to IS: 306 – 1983 unless otherwise specified.

**M-16 Chemical Admixture**

16.1 Nabhi's commentary on CPWD specifications clause no. 4.1.3 shall be followed.

**M-17 Steel for reinforcement**

17.1 Nabhi's commentary on CPWD specifications clause no. 5.1.2 shall be followed except chairs, separators etc. will be measured and paid under this item.

**M-18 Mild Steel Binding Wire**

18.1 The mild steel wire shall be of 16 gauge (1.63 mm), 18 gauge (1.22mm) or 20 gauge (1 mm) or as specified in the item conforming to IS: 280.

18.2 It shall be free from rust, oil paint, grease, loose mill scale or any other desirable coating which may prevent adhesion of cement mortar.

**M-19 Polyurethane Foam Filler (Capcell HD-100)**

19.1 Polyurethane from filler shall be Capcell HD-100 of Supreme or equivalent. It should comply with BS 5628 Part 3. It should be semi-rigid, UV resistant, high performance laminated closed cell polyethylene foam joint filler in sheet form.

19.2 The density of polyurethane shall be 100Kgs / cum. The water absorption should be 0.012%. The operating temperature of foam filler should be between -40 c to +100 c.

- 19.3 It should be bitumen free and chemical resistant. It should possess excellent recovery after compression.

**M-20 Poly-sulphide Sealant**

- 20.1 The poly-sulphide sealant shall be of Choksi chemicals, Pidilite or equivalent as approved by the architect or engineer-in-charge. It shall conform to relevant IS codes.
- 20.2 It shall be a two component polysulphide sealant. The mix ratio of both the parts should be as per manufacture's specification. It should not contain chloride or other corrosive substance.
- 20.3 It shall be used for sealing joints in water retaining structures, buildings, roofs, external walls, cladding, concrete highways, airport runways, bridges, parking and cargo areas and buildings. It shall have excellent adhesion to wide range of building materials like Aluminum, Stainless Steel, Glass, Concrete, Marble, Stone, Brick, Masonry block, Plaster, Ceramic and quarry tiles, Timber etc.
- 20.4 It should accommodate continuous and pronounced cyclic movements. Material should be low in shrinkage, UV resistance, water resistant to bio-degradation. It should be water resistant to occasional spillage of dilute acids, alkalis, petrol, aviation fuels, diesel, kerosene, lubricating oils etc. It should be non-toxic.
- 20.5 The density of the material should be  $1.58 \pm 0.03$  Kg / ltr. The pot life should be more than 2 hrs. at 30°C. Shore A hardness should be 16 to 22 after complete curing. Movement accommodation should be 25% for butt joints and 50% for lap joints. Joint size should be 5 to 50 mm. and depth to width ratio should be 1:2 (min). For joints with skew movement the ratio shall be 1:1

**M-21 Expansion Joints – Copper Strips & Hold Fast**

- 21.1 The item provided for expansion joints in RCC frame structure, for internal joint as well as for exposed joints, with the use of necessary copper strip and holdfasts.
- 21.2 Copper sheet shall be 1.25 mm. thick and 125 mm width and shall be of U shape in the middle. Copper strip shall have holdfast of 3 mm. diameter copper rod 25 cm long soldered on the strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width of each flange (horizontal side), to be embedded in the concrete work shall be 25 mm. Depth of 'U' to be provided in the expansion joint, in the copper plate shall be of 25 mm.

**M-22 Shuttering Material**

All shuttering materials which are in contact with concrete surfaces, used material brought from other projects shall not be permitted.

**M-22A Timber / Wooden Planks**

- 22A.1 Timber / wooden planks and timber bracing, scaffolding shall conform to IS: 883. The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together, so as to make the centering rigid. In place of ballie props, brick work of adequate section built in mud mortar may be used to support the arch after approval of EIC
- 22A.2 The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration, live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.
- 22A.3 If at any stage of work, during or after placing concrete in the structure, the form work sag or bulge out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge and Architect, before the reinforcement bars are placed in position.
- 22A.4 The props shall consist of ballies having 100 mm. minimum diameter, measured at mid length and 80 mm. at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plate 40 mm. thick and minimum bearing area of 0.10 m<sup>2</sup>. laid on sufficiently hard base.
- 22A.5 Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.
- 22A.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planned on the sides and surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.
- 22A.7 As far as possible, clamp and ties shall be used to hold the forms together and use of nails and spikes shall be avoided.
- 22A.8 The surface of timber shuttering that would come on contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacture may be applied in place of soap solution. In case of steel shuttering, either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances, black or burnt oil shall be permitted.

22A.9 The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 in 250) as per structural drawing or as directed by engineer-in-charge, so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the project length structural drawing or as directed by engineer-in-charge.

**M-22B Concrete Shuttering Plywood (laminated or non-laminated)**

22B.1 Plywood shall conform to IS 4990. It shall be made from strong and selected hard-woods. It shall be bonded with high quality Phenol Formaldehyde synthetic resin adhesive, hot pressed and then shall be further treated with a permanent type of preservative by vacuum-cum-pressure impregnation.

22B.2 Due to the bonding with Phenol Formaldehyde, it shall be moisture and weather proof. The use of selected hard-woods renders hard and wear-resistant faces and thereby it shall be reusable several times. It shall be highly resistant to rot, termites and other wood inhabiting insects. Due to complete penetration of the preservative, it shall be exceedingly durable.

22B.3 It shall have high impact strength and therefore shall be used successfully in place of timber planks and steel sheets. It shall protect the concrete from rapid temperature changes and shall provide optimum conditions for setting of the concrete. As it shall possess remarkable design flexibility, it shall be ideal for curved formwork.

22B.4 Besides it shall be used as centering, shuttering and formwork of concrete columns, beams, slabs, walls, tanks, bridges, fly-overs, silos etc. It shall also be used for structural applications like external walling, roofing, flooring, curtain walls, work-site offices, in cabins of trucks, rail coaches etc.

**M-22C Steel Shuttering and Steel Plates**

22C.1 Steel shuttering plates shall conform to IS 8500, IS 2062, and IS 1977. Steel sheeting and steel plates should be free from crimps, twists, offsets, warps, etc. Their surface should be neat, clean and smooth. Before placing concrete, steel forms shall be thoroughly cleaned off of all rust, dust and loose materials. Colorless oil or grease of approved quality shall be applied before placing steel.

22C.2 The size of rolled steel sections, tubular steel section used for framing and bracing of steel plates should be sufficient to withstand the weight of concrete without forming crimps, twists, offsets, warps, etc. in the steel plates. Also, the gauge of steel sheeting used should not be less than 2 mm.

22C.3 Minimum two bracing angles should be provided along with angle framing while making the steel plates. It should be riveted for non-exposed concrete or welded for exposed / fair finished concrete. Minimum two rivets should be provided at all Four Corners and at junction of angle framing and bracing.



22C.4 If the plates are to be welded, steel sheet and angle framing/bracing should be welded from sides and at back. Welding on sides should be buffed to make the sides smooth. Also, intermittent welding should be done to keep steel sheet and angle framing/bracing in one plane

**M-23 Brick**

23.1 CPWD Technical specifications clause no. 6.1 shall be followed

**M-24 Bricks for exposed work**

- 24.1 Bricks for exposed work shall be first class brick conventional bricks with size of 228 X 107 X 75 mm. Bricks are to be laid such that ten layers of brick laid in mortar shall form masonry of 1 m. height.
- 24.2 The weight of the bricks should be 3 Kgs Water absorption for each bricks shall not more than 12% of the total weight of the brick.
- 24.3 These bricks are manufactured from good quality plastic earth, which is free from saline deposits. They are of good uniform color. They are well burnt, giving a hard ringing sound when two bricks are struck together.
- 24.4 They should have straight edges and even surfaces. They are free from cracks, flows, nodules of free lime wrap age and organic matter.
- 24.5 The bricks shall have plane rectangular faces with parallel sides and sharp straight right angled edges. Bricks should have uniform color and even texture.
- 24.6 When immersed in water for an hour, they do not absorb water more than 1/6th of their weight. On drying, these bricks do not show any sign of efflorescence.
- 24.7 Average Compressive strength of the bricks shall be more than 65 Kg / cm<sup>2</sup> either wire cut or hand moulded as directed by the Architect or engineer-in-charge.
- 24.8 Unless otherwise specified machine molded bricks shall be used. Selected hand molded hand bricks are to be used if it is specified. As far as possible total requirement of facing bricks for a work shall be arranged from the same kiln. Bricks with chipped edges and corners shall not be used.

**M-25 Calcium Silicate Bricks**

25.1 The bricks shall be machine moulded and made from good quality and clean silicious sand, lime and flyash (maximum content up to 30% in raw material composition). They shall be free from cracks, flaws, clay, free lime. They shall have smooth rectangular faces with sharp corners and shall be uniform in size, colour and shape.

- 25.2 The size of bricks shall be 228 mm. x 110 mm.x 72 mm. or as approved by the Architect. The compressive strength of bricks shall be minimum 150 kg/m<sup>2</sup> and the bricks shall have very high strength to weight ratio. The bricks shall have very good resistant capacity to atmospheric conditions, optimum building properties in relation to heat insulation, sound insulation, absorption of water and fire protection.
- 25.3 Calcium silicate products shall conform to the appropriate IS standards and there shall be no change required in civil application techniques while using such products in the place of traditional clay bricks.

**M-26 Glass Brick**

- 26.1 It shall be KIG Indonesia or equivalent as approved by the Architect and Engineer-in-Charge.
- 26.2 It shall be free from any defects like, cracks, air bubbles, uneven surface, breaks etc. During handling and laying, its edges shall not be damaged. All edges and corners of all faces shall be sharp and well-shaped. It shall be of size and colour as specified in the item or as approved by the Architect. The glass bricks shall be of uniform size and tolerance of +2 mm. shall only be allowed in dimensions of glass brick. Spots of color other than that of bricks or in bricks shall not be allowed. The weight of each brick shall be about 2.75 kg.
- 26.3 The transmission of direct light through brick shall not be less than 40%. The glass brick shall have good thermal insulation. It shall be sound proof and vibration absorber having adequate compressive strength. If bricks with groove or projections shall be used, the groove or projections shall be uniform and regular in size & shape.

**M-27 Cement Concrete Hollow Block**

- 27.1 Hollow concrete blocks shall be of size such that they can be bonded with brick masonry, if necessary. The blocks are generally referred by their nominal sizes which include the block and an allowance for joints. The block shall have one or more large holes or cavities which either pass through the block or do not effectively pass through (in case of closed cavity) and shall have the total solid material between 50 to 75% of the total volume of the block, calculated from the overall dimensions. In case of solid blocks, the solid material shall not be less than 75% of the total volume of the block.
- 27.2 The shell thickness of the blocks shall be not less than 65 mm., in any part, however based on the strength requirements, the thickness can be varied between 20 mm. to 50 mm., as follows

Nominal block face width.	Shell thickness minimum.	Web thickness minimum.
100 or less	25	25

Over 100 to 150	25	25
Over 150 to 200	30	25
Over 200	35	30

All the above dimensions are in mm.

27.3 The volume of concrete shall not be less than half the gross volume of the block. The total width of the cavities shall not be less than 2/3rd of the overall thickness of the block. The maximum variation in the length of the blocks shall not be more than  $\pm 5$  mm. and maximum variation in height and width shall not be more than  $\pm 3$  mm.

27.4 Hollow blocks are manufactured by special machines. Casting is done in a single operation. Concrete shall be thoroughly compacted in the moulds with blunt end steel rods or vibrators or by using vibrating tables. Ordinary concrete mix 1:2:4 of very low water/cement ratio is used and shall be mixed as described in the section no. 2.00 of plain and reinforced concrete. Additives or admixtures shall be used such as a) Accelerating, water-reducing and air-entraining admixtures, b) Water-proofing agents, etc. High compressive strength and very dry consistency enables to remove the blocks for curing, immediately after casting. In case of manual compaction, the mixture shall be placed into the mould, in layers of about 50 to 75 mm. and each layer is thoroughly tamped until the whole mould is filled up and struck off level with a trowel. In case of mechanical compaction, the mould shall be filled up to overflow, vibrated or mechanically tamped and struck off level. Steel wire may be embedded in each block while casting. Rapid hardening cement may be used. After demoulding, the blocks shall be protected until they are sufficiently hardened to permit handling without damage. The blocks shall be thoroughly cured for atleast 14 days and shall be dried out for a period of 4 weeks, before placing. They shall be stacked with voids horizontal to facilitate thorough passage of air. The blocks shall be allowed to complete their initial shrinkage before placing. Water absorption shall not be more than 10% by mass.

27.5 Hollow blocks have better thermal properties than solid blocks. Further hollow blocks made from light weight concrete have still better insulation against heat. They shall conform to the following three grades:

Grade A - They shall be used as load bearing units and shall have a min. block density of 1500 Kg/m<sup>3</sup>. They shall possess min. average compressive strength of 35, 45, 55 and 70 Kg/cm<sup>2</sup>. respectively, for its sub-category, at 28 days.

Grade B - They shall be used as load bearing units and shall have block density less than 1500 Kg/m<sup>3</sup>. but not less than 1000 Kg/m<sup>3</sup>. They shall possess min. average compressive strength of 20, 30 and 50 Kg/cm<sup>2</sup>. respectively, for its sub-category, at 28 days.

Grade C - They shall be used as non-load bearing units and shall have block density less than 1500 Kg/m<sup>3</sup>. but not less than 1000 Kg/m<sup>3</sup>. They shall possess min. average compressive strength of 15 Kg/cm<sup>2</sup>. at 28 days.

Grade D - Solid Concrete Blocks - They shall be used as load bearing units and shall have block density not less than 1800 Kg/m<sup>3</sup>. They shall possess min. average compressive strength of 75 to 100 Kg/cm<sup>2</sup>. respectively, for its sub-category, at 28 days.

- 27.6 They shall have a variety of surface textures ranging from very fine close texture to a coarse open texture, by proper selection, grading and proportioning of the aggregates. Further the texture shall be developed by treating the surface while the units are still green. Color shall be rendered by adding non-fading mineral pigments.
- 27.7 Well-made units shall not require plaster, in case of unimportant buildings. Two or three coats of cement paint shall be sufficient to render the masonry resistant to rain water. However, if plaster is intended, the unit shall have a sufficiently rough surface to afford good key to the plaster. Water-proofing admixtures shall be used in the plaster.

#### **M-28 Cement concrete Solid Block**

- 28.1 A block shall be considered to be solid if the solid material is more than 75% of the total volume of the block calculated from over all dimensions.
- 28.2 The size other than those specified in the item description may be used with the approval of the Architect and engineer-in-charge.
- 28.3 The blocks may be machine made. The concrete mix the mixing of concrete, the manufacturing of blocks, curing and drying shall be accordance with para-6 to 10 of IS: 2185-1967.
- 28.4 Faces of blocks shall be flat and rectangular. Surface finish shall be render smooth or plastered with CM 1:3 (1 cement: 3 coarse sand) as directed. The payment for the rendering shall be included in this item.
- 28.5 The average compressive strength of 8 blocks, when determined in the manner described in IS: 2185-1967, shall not be less than 50 Kg/cm<sup>2</sup> of gross area. The lowest strength of an individual block shall not be less than 75% of average compressive strength of the 8 blocks.
- 28.6 Concrete blocks shall be stored and stacked properly in such a way to avoid any contact with moisture at site. They shall be stock plied on planks or other supports free from contact with ground and covered to protect against wetting.

#### **M-29 Stone (For Rubble Masonry)**

- 29.1 Nabhi's commentary on Nabhi's commentary on CPWD specifications clause no. 7.1.1 shall be followed

**M-30 Perlite Aggregate**

- 30.1 The Perlite shall be from Amol dicalite or equivalent as approved by the Architect and Engineer-in-charge.
- 30.2 Perlite shall conform to ASTM C-332-61.
- 30.2 Perlite is naturally occurring siliceous volcanic rock, which when heated in excess of 870 C expands four to twenty times its original volume and its transformed into lightweight glass like particles containing countless sealed cells. This unique structure accounts for its superior insulating characteristic.
- 30.3 It is light weight aggregate which when combined with Portland cement and water produces an ultra-light concrete that is used for insulating roof decks, lightweight floor fills, insulating structural rock decks, curtain wall systems and for variety of permanent insulating applications.
- 30.4 It shall have sintering temperature and melting point about 2300°F and 2400°F, respectively. The specific heat and specific gravity of minerals shall be 0.2 and 2.6 respectively. The mineral should possess pH value of 7.0 and cation exchange rate 90 to 100 milli equivalent per 100 grams. The thermal conductivity K shall be 0.43-0.45 Btu.
- 30.5 The mineral should be incombustible and capable to withstand temperature upto 1100°C to give effective insulation. It shall be insoluble and inert to organic solvents having cold crushing strength at least 250 Psi. The air contraction at maximum service temperature shall be less than 1%.

**M-31 Water Proofing Compound**

- 31.1 The water proofing compound shall conform to IS 2645-latest version. It should be chloride free, corrosion inhibitor, Hydrophoper and water reducer. It shall be compatible with all types of cement. It should be able to reduce water absorption and dampness. It shall be highly water-tight against water head pressure. It shall be able to reduce efflorence, salt petering, and fungus growth. It shall be of approved make as approved by Architect.
- 31.2 It should be non-flammable, non-toxic and eco-friendly. It should be able to reduce shrinkage. It should be able to increase plastic workability.

**M-32 Ex-foliated Vermiculite**

- 32.1 Ex-foliated Vermiculite should be of approved make as directed by the engineer-in-charge.

- 32.2 Ex-foliated Vermiculite shall be 100% natural, non-fibrous, light weight material. It can be used for thermal insulation, acoustic treatment and fire resistance.
- 32.2 Vermiculite shall be formed by hydration of certain basaltic material. Vermiculite shall be natural mineral that expands with the application of heat.
- 32.3 It shall be possible to reduce the heat transfer. Heat energy can be transferred by conduction, convection, radiation. The material shall be such that it should maintain acceptable temperature throughout the building and makes the building well-insulated as per manufacture's specification.
- 32.4 It shall be hydrated laminar natural mineral having, Aluminum-Iron, Magnesium Silicates as content and shall consist of thin flat flakes, containing innumerable microscopic voids and layers. It shall have physical properties like chemical inertness, light weight, fire and rot proofness, porosity, non-abrasive nature, flakiness etc.
- 32.5 It shall have centering temperature and melting point about 1260°C and 2400°F, respectively. The specific heat and specific gravity of minerals shall be 0.2 and 2.6, respectively. The mineral should possess pH value of 7.0 and cat ion exchange rate 90 to 100 milli equivalent per 100 grams. The thermal conductivity K shall be 0.43-0.45 Btu. It shall have bulk density 6 Kg.c.ft.
- 32.6 It shall be mixed with cement in 6:1 ratio by volume and requisite water or as per manufacture's specification.
- 32.6 The mineral should be incombustible and capable to withstand temperature upto 1100°C to give effective insulation. It shall be insoluble and inert to organic solvents having cold crushing strength at least 250 Psi. The air contraction at maximum service temperature shall be less than 1%.

**M-33 Precast Terrazzo Tile**

- 33.1 Terrazzo tile shall generally conform to IS: 1237. Unless otherwise specified tiles shall be supplied with initial grinding and grouting of wearing layer. The size of the tiles shall be as per the drawing. Half tiles for use with full tiles shall be such as to make two half tiles when joined together, match with the dimensions for the full tile.
- 33.2 Tolerance on length and breadth shall be as per plus or minus one millimeter and tolerance on thickness shall be plus 5 mm. The range of the dimensions in any one delivery shall not exceed 1 mm on length and breadth and 3 mm on thickness.
- 33.3 The tiles shall be manufactured in a factory under pressure process subjected to hydraulic pressure of not less than 140 kg per square centimeter shall be given the initial grinding with machine and grouting of the wearing layer before delivery to site. The wearing layer shall be free from projections, depressions, cracks, holes, cavities and other blemishes. The edges of the wearing layer may be rounded.

- 33.4 The proportion of cement to aggregate in the backing of tiles shall be not leaner by 1:3 by weight. Where colouring material is used in wearing layer, it shall not exceed 10 percent by weight of cement used in the mix.
- 33.5 The finished thickness of the upper layer shall not be less than 5 mm for size of marble chips from the smallest upto 6 mm and also, not less than 5 mm for size of marble chips ranging from the smallest upto 12 mm, and not less than 6 mm for size of marble chips varying from the smallest upto 20 mm.

**M-34 Chequered Tile**

- 34.1 The size of the tiles shall be as shown in the drawing or as required Architect or engineer-in-charge.
- 34.2 The center to center distance of chequers shall not be less than 2.5 cm and not more than 5 cm.
- 34.3 The overall thickness of the tile shall not be less than 22 mm. The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not less than 3 mm. The chequered tile shall be terrazzo or cement tile as specified in the description of item. The thickness of the upper layer, measured from the top of the chequers shall not be less than 6 mm.
- 34.4 The terrazzo tiles shall be given the first grinding with machine before delivery to site.
- 34.5 The tiles shall conform to the specifications for plain cement concrete or terrazzo tiles in respect to the method of the manufacture and the mix of the backing and wearing layers.

**M-35 Ceramic Tile**

- 35.1 The tiles shall be of approved make and shall generally conform to IS: 777. They shall be flat and true to shape and free from blisters crazing, chips, welts, crawling or other imperfections detracting from their appearance. The tiles shall be tested as indicated in Appendix of IS: 777.
- 35.2 The size of the tiles shall be square or rectangular as shown in the drawing or as required Architect or engineer-in-charge.
- 35.3 The thickness of the tiles shall be 6 to 9 mm depending upon the size and manufacture. The length of all four sides shall be measured correct to 0.1 mm and average length breadth shall not vary more than  $\pm 0.8$  mm from specified dimension. The variation of individual dimension from average value of length/breadth shall not exceed  $\pm 0.5$  mm. Tolerance in thickness shall be  $\pm .5$  mm.
- 35.4 The top surface of the tiles shall be glazed and glaze shall be either glossy, mat or as specified. The underside of the tiles shall not have glaze more than 5 percent of the area

in order that the tile may adhere properly to the base. The edges of the tiles shall be preferably free from glaze. However, any glaze if unavoidable shall be permissible only up to 50 percent of the surface area of the edges.

- 35.5 They shall be extremely strong, breaking strength of the tile shall be 350 kg/ cm<sup>2</sup>. They shall offer good abrasion resistant i.e. can withstand upto 5000 grindings. They shall be scratch resistance, their hardness on the Moh's scale shall be 6.8 to 7. They shall be resistant to all acids and alkalies except hydrofluoric acid. In addition, they shall be bacteria free and fire proof, as they are fired at @ 11600C. They shall have very high acoustic damping factor and their specific gravity shall be 0.12, making them good insulators. Their resistance to thermal shocks shall be upto 10 cycles and their co-efficient of linear thermal expansion shall be 9 from ambient temperature to 1000C.
- 35.6 Ceramic tile for Industrial purposes, shall have a hardness of 8.6 on the Moh's scale and shall be non-skid, hard wearing, long lasting and acid and alkali resistant. They shall adequately meet the IS : 4457.
- 35.7 In Rectified ceramic tile sizing and squaring is done in tile.

#### **M-36 Vitrified Tile**

- 36.1 Vitrified floor tiles shall be of approved make, as approved by the Architect and Engineer-in-charge. They shall conform to the relevant IS Codes.
- 36.2 They shall be monolithic and available in smooth, mirror-polished and anti-skid finishes. They shall have a size tolerance of + 0.5%, in length and width and + 5% in thickness. Allowable warpage shall be + 0.2%. Allowable squareness wedging shall be + 0.5%. Their water absorption rate shall be less than 0.5%. They shall offer hard-working and hard-wearing floors for homes, public buildings, apartments and airports. The tiles shall be of ASTM or DIN standards.
- 36.3 They shall be extremely strong, breaking strength of the tile being 1600 Kg/cm<sup>2</sup>, flexural strength 3500 Kg/cm<sup>2</sup>. and bonding strength of 2500 Kg/cm<sup>2</sup>. They shall offer abrasion resistance to < 175 mm<sup>3</sup>. They shall be scratch resistance, their hardness on the Moh's scale shall be min. 7. They shall be able to resist thermal shock upto 10 cycles and shall have a density of greater than 2 gm/cc. They shall have greater than .4 co-efficient of friction for polished/unpolished surfaces.

#### **M-37 Cement based Polymer Adhesive**

- 37.1 Tile adhesive complies with the BS: 5980 with latest edition. The adhesive shall be polymer modified cement based adhesive. The adhesive should be able to fixing tiles, natural stones in exterior and interior use including swimming pool.
- 37.2 Adhesive should be able to improve adhesion, reduce water permeability and widen application. It should be able to fixing up to 6 mm thickness.



37.3 It should possess low shrinkage and should be flexible to accommodate physical and thermal movements.

37.4 It should be able to use for indoor and outdoor application.

### **M-38 Grouts**

#### **M-38A Cementitious grout**

38A.1 The grout shall be of high quality, water resistant, cement based powder grout for grouting ceramic tile, vitrified tile, industrial tile etc.

38A.2 It should be available in all colors to match the tile color. It should have high strength for maximum load bearing. It should be non-shrink, non-bleeding and non-segregating at fluid consistency.

38A.3 It should not contain any chlorides and or additives which may contribute the corrosion of the structure.

38A.4 It should be weather resistant, non-cracking, non-shrinking. The compressive strength, linear shrinkage, tensile strength and flexural strength should be according to the IS codes.

#### **M-38B Epoxy Grout**

38B.1 It should be hygienic, hard wearing, impervious, epoxy resin based ceramic tile grout with a high degree of resistance to chemical attack, abrasion and impact.

38B.2 The grout should not transfer taints to food stuffs and should not permit the entry of bacteria or dirt and easily maintained in a sterile condition.

38B.3 It should be available in all colors to match the color of the tile color. It should attain very good early strength. It should possess good chemical resistance to acid, alkalies etc.

38B.4 It should possess good tensile and flexural strength and it has a very good dynamic load resistance.

### **M-39 Floor Hardener**

39.1 The Concrete floor hardener shall be of best quality and from manufacturer like Ironite or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

39.2 It shall be applied on the concrete floors when concrete is green. It should be applied as per the manufacture's specification. Floor hardener makes the permanently hardened concrete floor, with increased abrasion resistance, increased surface density, increased resistance to chemical attack and to eliminate dust accumulation. Precautions shall be

taken while using the product, to avoid contact with eyes and open wounds and to work in good ventilation. After application, the affected parts shall be washed copiously.

**M-40 Polypropylene Fibers**

- 40.1 Polypropylene fibers shall conform to ASTM C 1116 Type III 4.1.6. Polypropylene fibers should be of NINA concrete or equivalent as approved by engineer-in-charge. Polypropylene fibers should inhibit and controls the formation of cracking in the concrete.
- 40.2 It should reinforce the concrete against impact forces, shattering forces. It should make the concrete abrasion resistance and should reinforce the concrete against water migration.
- 40.3 It should provide the concrete better durability. It should be able to reduce the plastic shrinkage and settlement cracking.
- 40.4 It should protect rebar from corrosion and should prevent explosive spouling of concrete due to fire

**M-41 Marble Chips**

- 41.1 The marble chips shall be of approved quality and shade. It shall be hard, sound, dense, homogeneous in texture with crystalline and coarse grains. It shall be uniform in color and free from stains, cracks, decay and weathering.
- 41.2 The marble chips to be used should be as per the grading as decided by the Architect.
- 41.3 The marble chips shall be machine crushed if not specified in the item description. They shall be free from foreign matter, dust etc. The marble chips shall conform to IS : 2114.

**M-42 China Mosaic**

- 42.1 China mosaic shall be from broken pieces of white glazed tile. The size of the broken pieces of white glazed tiles shall not be more than 12-20mm. Triangular china mosaic pieces shall not be used. Rectangular or square pieces shall only be used. The broken pieces shall be soaked in water for 24 hr before using for the execution.

**M-43 Rough Kota Stone**

- 43.1 The kota stones shall be of selected quality, hard, even, sound, dense and homogeneous in texture free from cracks, decay and weathering and flaws. They shall be hand or machine cut to the requisite thickness. They shall be of color as indicated in the drawings or as instructed by engineer-in-charge.

- 43.2 The slabs shall have the top (exposed) face rough before being brought to the site, unless otherwise specified. The slabs shall conform to the size required. Before starting of the work the contractor shall get the samples of the slabs approved by engineer-in-charge.
- 43.3 Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth and so that a straight edge laid along the side of the stone shall be in full contact with it. The sides (edges) shall be table rubbed with coarse sand or machine rubbed before paving. All angles and edges of the slabs shall be true, square and free from chippings and the surface shall be true and plane.
- 43.4 The thickness of the slab after it is dressed shall be 20, 25,30 or 40 mm as specified in the description of the item. Tolerance of  $\pm 2$  mm shall be allowed for the thickness. In respect of length and breadth of slabs tolerance of  $\pm 5$  mm for hand cut slabs and  $\pm 2$  mm for machine cut slabs shall be allowed.

**M-44 Polished Kota Stone**

- 44.1 Polished kota stone shall have same specifications as Rough Kota stone, except as mentioned below.
- 44.2 The stones shall have machine polished surface. When brought on site, the stone shall be single polished or double polished, depending upon its use. Single polished kotah stone shall have single face of the stone polished whereas, double polished kotah stone shall have both the faces polished. The stones for paving shall generally be single polished. The stones to be used for dado, skirting, sink, veneering, sills, steps, etc., where machine polishing after the stones are fixed in situ is not possible, shall be polished more than once for the desired finish, before fixing.
- 44.3 When brought at site, the colour of the stone shall be fairly uniform. It shall be ensured that the stones to be used in a particular work, shall not differ much in shade or tint, from the approved sample.

**M-45 Marble Stone**

- 45.1 Marble shall be hard, sound, dense and homogeneous in texture with crystalline texture as far as possible. It shall generally be uniform in color and free from stains, cracks, decay and weathering.
- 45.2 Marbles are metamorphic rocks capable of taking polish, formed from the re-crystalization of lime stones or dolomitic lime stones and are distinguished from lime stone by even visibly crystalline nature and nonflag by stratification. The surface shall be machine polished to an even and perfect plane surface and edges machine cut, true and square. The rear face shall be rough to provide key for the mortar.

45.3 Marble slabs are to be laid as per pattern of engineer-in-charge. The slab shall not be thinner than the specified thickness, at its thinnest part. A few specimen of the finished slab to be used, shall be deposited by the Contractor in the office, for reference.

45.4 Except as above marble slab shall conform to IS : 1130.

**M-46 Dholpur Stone**

46.1 Dholpur sand stone shall be of best quality, as approved by the Architect and Engineer-in-charge. The stone slab shall be hard, even, sound, durable and tough free from cracks, decay and weathering.

46.2 The size of the slab shall be as specified in the item or detailed drawing or as approved by the Architect and Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of + 2 mm.

46.3 The stones shall have machine polished surface. When brought on site, the stone shall be rough, single polished or double polished, depending upon its use and as specified in the item or detailed drawing. The stones for paving shall generally be single polished. The stones to be used for sills, steps, brackets, coping, facias, bands, pillars, fabricated railings, jali work etc., where machine polishing after the stones are fixed in situ, is not possible, shall be double polished or as required.

46.4 All angles and edges of the stone slab shall be fine chiselled or polished, as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the face of the stone slab shall be true and plane.

46.5 The sample of stone shall be got approved by the Engineer-in-charge and Architect, for a particular work. It shall be ensured that the stones to be used in a particular work shall not differ much in shade or tint, from the approved sample. No white, black or any other colour spots shall be there. Cheetah or tiger skinned stones shall not be allowed under any case.

**M-47 Granite Stone**

47.1 Granite shall be of approved color and quality. It shall be got approved by the Engineer-in-charge and Architect, prior to procurement. The stone shall be hard, even, sound and regular in shape and generally uniform in color. It shall be without any soft veins, cracks or flaws.

47.2 The thickness of the stone shall be as specified in the item.

47.3 All exposed faces shall be double polished to render truly smooth and even reflecting surface. The exposed edges and corners shall be rounded off, as directed. The exposed edges shall be machine cut and shall have uniform thickness.

**M-48 Red Mandana Stone**

48.1 Red mandana stone shall be of best quality, as approved by the Architect and Engineer-in-charge. The stone shall be without any veins, cracks and flaws. The stone shall be even, sound and durable, regular in shape and of uniform colour.

48.2 The size of the stone shall be as specified in the item or detailed drawing or as approved by the Architect and Engineer-in-charge. The thickness of the stone shall be as specified in the item of work, with the permissible tolerance of + 2 mm.

48.3 The stones shall have machine polished surface. When brought on site, the stone shall be rough, single polished or double polished, depending upon its use and as specified in the item or detailed drawing. The stones for paving shall generally be single polished.

48.4 All angles and edges of the stone shall be fine chiselled or polished, as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the face of the stone shall be true and plane.

48.5 The sample of stone shall be got approved by the Engineer-in-charge and Architect. It shall be ensured that the stones to be used shall not differ much in shade or tint, from the approved sample

**M-49 Jesalmer Yellow Stone**

49.1 Jesalmer stone shall be of best quality, as approved by the Architect and Engineer-in-charge. The stone shall be without any veins, cracks and flaws. The stone shall be even, sound and durable, regular in shape and of uniform colour.

49.2 The size of the stone shall be as specified in the item or detailed drawing or as approved by the Architect and Engineer-in-charge. The thickness of the stone shall be as specified in the item of work, with the permissible tolerance of + 2 mm.

49.3 The stones shall have machine polished surface. When brought on site, the stone shall be rough, single polished or double polished, depending upon its use and as specified in the item or detailed drawing. The stones for paving shall generally be single polished.

49.4 All angles and edges of the stone shall be fine chiselled or polished, as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the face of the stone shall be true and plane.

49.5 The sample of stone shall be got approved by the Engineer-in-charge and Architect, for a particular work. It shall be ensured that the stones to be used in a particular work shall

not differ much in shade or tint, from the approved sample. No white, black or any other colour spots shall be there. Cheetah or tiger skinned stones shall not be allowed under any case.

**M-50 Cobble Stone**

- 50.1 Cobble stones shall be of best quality, as approved by the Architect and Engineer-in-charge and shall be obtained from reliable source. The make will be approved by the Architect and the source of supply shall not be changed without prior approval of the Architect. The stone shall be without any veins, cracks and flaws. The cobble stones shall be even, sound, durable and regular in shape and of uniform colour
- 50.2 The size of the cobble stone shall be as specified in the items or detailed drawing or as approved by the Architect and Engineer-in-charge. The thickness of the stone shall be as specified in the item of work, with permissible tolerance of + 2 mm.
- 50.3 The stone shall have machine polished surface. When brought on site the stone shall be single polished or double polished, depending upon its use and as specified in the item or detailed drawing. The cobble stones to be used for walkways, roadways, parking, floors, docks, roofs, public squares etc., where machine polishing after the fixing of stones, is not possible, the stones to be fixed shall be double polished or polished more than once, as required. All angles and edges of the cobble stone shall be true and plane.

**M-51 Precast Cement Concrete Tile**

- 51.1 The plain cement tiles shall be of general purpose type. Cement used in the manufacture of the tiles shall conform to relevant IS code. Pigments are not used in this tile.
- 51.2 The tiles shall be manufactured from a mixture of cement and natural aggregates, using pressure process. During the manufacture, the tiles shall be subjected to a pressure of not less than 140 Kg/cm<sup>2</sup>. The proportion of cement to aggregate, in the backing of the tiles shall be not less than 1:3 by weight. The wearing face though the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportion of cement to aggregate, in the wearing layer of the tiles shall be three parts of cement to one part chips, by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of the wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist condition, continuously atleast for 7 days and subsequently, if necessary, for such long period, as would ensure their conformity to requirements of IS : 1237, regarding strength, resistance to wear and water absorption.
- 51.3 The wearing face of the tiles shall be plane, free from projections, depressions and cracks and shall be reasonably parallel to the backing of the tile. All angles shall be right angles and all edges shall be sharp and true.

- 51.4 The tiles shall generally be square in shape, with a size specified in the item. The thickness of the tiles shall be 25 mm. Tolerance of length and breadth shall be + 1 mm. Tolerance of thickness shall be + 5 mm.
- 51.5 The tiles shall satisfy the test as regards transverse strength, resistance to wear and water absorption as per IS: 1237

**Testing Standards:**

A. Water Absorption:

Sampling: 6 tiles out of every 3000 tiles are taken for testing.

Results: Absorption permissible, shall be at the most 10%.

B. Transverse strength test:

Sampling: 12 tiles out of every 3000 tiles are taken for testing.

Results: When wet :- 80 Kg/cm<sup>2</sup>.

When dry:- 120 Kg/cm<sup>2</sup>.

C. Abrasion test :

Sampling : 6 tiles out of every 3000 tiles are taken for testing.

Results : Average abrasion shall not be more than 3.5 mm.

**M-52 Interlocking Paver Block**

- 52.1 The Paver block shall conform to IS 1237:1980. The variation in length of any side not to exceed + 2 mm. The variation in thickness shall not be more than + 3 mm.
- 52.2 The average abrasion value of the same shall not be more than 2.00mm & for individual it shall not vary more than 2.5mm.
- 52.3 The water absorption shall not be more than 5%. The compressive strength of the tile shall be as per item description.

**M-53 PVC (Poly Vinyl Chloride Sheet/Tile)**

- 53.1 PVC sheets/tiles for PVC/ Vinyl floor covering shall be of approved make as approved by the Architect and Engineer-in-charge. It may be in form of sheets or tiles or rolls as specified. It shall consist a thoroughly blended composition of thermoplastic binder, filler and pigments. The thermoplastic binder shall consist substantially of one or both the following.
- a) Vinyl Chloride Polymer
- b) Vinyl Chloride Copolymer

The polymeric material shall be compounded with suitable plasticizers and stabilizers.

- 53.2 The preferred thickness of PVC tiles for normal floor covering shall be 1.5 to 4 mm. Dimensional stability shall be 0.3% The thickness of the PVC sheets shall be measured with micrometer or Ratechet type or a dial guage graduated to .02 mm. The micrometer shall have flat bearing surfaces of at least 6.5 mm diameter at both contact points. For sheets and rolls the thickness of the specimen shall be measured at twenty scattered points.
- 53.3 The width of rolls shall be as per manufacture's specification and length shall not be less than 20 meters. The measurement shall be carried out with a traveling microscope or suitable scale graduated to .02 mm. Each tile shall be measured for length and width at the three quarter point in each direction
- 53.4 The following tolerance shall be allowed
- a) Thickness -  $\pm .15$  mm
  - b) Width
    - i) 300 mm square tile  $\pm .2$  mm
    - ii) 600 mm square tile  $\pm .4$  mm
    - iii) 900 mm square tile  $\pm .6$  mm
    - iv) Sheets and rolls  $\pm 0.1$  percent
- 53.5 It shall offer colour fastness to daylight as per the relevant IS: 3462. Allowance for curling shall be 0.6 mm. It shall be flexible and shall not break, crack or show any signs of failure.
- 53.6 It shall offer above average resistance to mild and diluted acids, alkalies, soaps and detergents. It shall have high abrasion resistance. At normal temperature, it shall develop an indent of 0.15 mm., after one minute and 0.20 mm., after ten minutes. It shall offer insulation resistance as per the IS: 2259. It shall have a sound reduction factor of 3db for 2 mm. thickness and 2db for 1.5 mm. thickness. It shall have self-extinguishing property and water absorption at room temperature for 24 hrs. shall be 0.1%.
- 53.7 It shall be available in various designs and shall be recommended for floors and walls, in homes, institutions, commercial establishments, clinics and hospitals.

#### **M-54 Linoleum**

- 54.1 Linoleum shall conform to IS: 653. Linoleum shall be of thickness as specified in the description of item. Linoleum shall be of either plain, moire jaspe or marble type or a combination of the above types as shown in the drawing or as per direction of engineer-in-charge.



- 54.2 Linoleum shall be stored in a clean, dry and well ventilated place without exposure to direct sunlight.
- 54.3 The contractor shall get approve the samples by the architect or engineer-in-charge.
- 54.5 Linoleum used shall be of a thickness adequate for the conditions of surface and situation. The following thickness generally shall be used are
- a) For Public buildings, cinemas, restaurants, ships and the like - 6 to 6.7 mm
  - b) For offices, shops and the like depending upon the intensity of traffic - 3.2 to 4.5 mm
  - c) For residential house - 3.2 mm

**M-55 Acid Resistant tile**

- 55.1 Acid and Alkali resistant tiles should be able to withstand most corrosive of chemicals without as much as stain on acid resistant tile.
- 55.2 The tiles should be perfect for the floors of chemical, petrochemical, oil, pharmaceutical, food and textile industries.
- 55.3 The tiles should be of approved make. The sample of the tiles should be approved by the Architect before procurement and the after laying of sample tile same should be approved by the Architect before laying of all the tiles.
- 55.4 The tiles should cater the specifications as per IS 4457. It should be heavy duty as per the project's requirement.
- 55.5 It shall have a very high load bearing capacity with cold crushing strength as 1500 Kg/cm<sup>2</sup>. and shall withstand a load of 3000 Kg/cm<sup>2</sup> in the compression strength test. The tiles shall have extremely low porosity because of their monolithic body structure. The water absorption shall be less than 1% and the tiles shall remain free of stains due to lubricants, oils, grease etc. The tiles shall be non-glazed and anti-skid, having a matt finish. They shall be available in special ribbed surface, also. The tiles shall be tough, have high surface hardness, 9 on the Moh's scale and shall offer extremely high resistance to wear and abrasion. They offer good resistance to acids and when tested, the loss of weight shall be around 0.25%

**M-56 Blended Marble tile / slab**

- 56.1 Marble tile / slab is an engineered wood or composite marble is asthetically like natural marble.
- 56.2 It shall be composed of 80% to 95% of finest grains of quality selected marble aggregates, bonded together with 4% to 8% special resins, alongwith palette of colourants. It shall

therefore offer a wide range of colour compared to natural marble. It shall be manufactured so, that its design goes right through the tile, insuring lasting designs.

- 56.3 It shall be available in pre-cut, pre-polished, chamfered and grooved upto sizes of 600 mm. x 600 mm. Sizes upto 2400 mm. x 1200 mm. shall also be supplied. It shall have indispensable mechanical strength,

Test	Dry	Wet
Compressive strength in Kg/cm <sup>2</sup> .	1340	1317
Flexural strength in Kg/cm <sup>2</sup> .	308	453
Modulus of Rupture in Kg/cm <sup>2</sup> .	462	453

It shall offer flexibility, high wear resistance, impact resistance and on testing shall be 1.5 kgcm/cm., hardness on the Moh's scale shall be 3 to 4, abrasive wear index shall be 22 and total water absorption shall be around 0.13%. It shall not be easily affected by the freeze and thawing cycling.

- 56.4 It shall be non-porous and shall be used in all types of weather. It shall be used for internal and external surfaces. It shall be easily cut with a normal hand cutting machine, if required and shall be laid in the same manner as natural marble stone.

#### **M-57 Glass Mosaic Tile**

- 57.1 Glass mosaic tile shall be of approved make as directed by Architect. They shall confirm to relevant IS codes.
- 57.2 Tiles shall be water proof, weather proof and chemical proof. Tile should be resistant to thermal shocks. They should retain their original color and were not cracked or damaged during in any way during construction.
- 57.3 They shall be available in the form of sheet pasted on paper for easy-fixing. They shall be non-slippery, non-porous, non-sensitive and non-conductive. They should offer good resistance to temperature changes, chemical effects, impact and pressure and surface abrasion. They shall be weatherproof and 100% fire proof. They shall be light weight and could be fixed on any surface and in any shape. They shall be available in all colors and shall be permanent in color. They shall be antistatic and easy to clean.
- 57.4 For the properties mentioned below it shall conform to mentioned code.

- |    |                            |   |                             |
|----|----------------------------|---|-----------------------------|
| 1. | Chemical Reistance         | - | EN 122 / ISO 10545: Part 13 |
| 2. | Color Resistance to fading | - | DIN 51094                   |
| 3. | Water Absorption           | - | ISO 10545: Part 13          |
| 4. | Thermal Shock Resistance   | - | ISO 10545: Part 9           |

**M-58 Rubber Tile**

- 58.1 The rubber tile shall be of approved make such as REPHOUSE, Nora or equivalent.
- 58.2 The tiles should be manufactured by polymerically rubber and cork particles.
- 58.3 Rubber tiles should have premium acoustical underlay which provides optimum sound and vibration resonance absorption as well as excellent thermal insulation properties.
- 58.4 It should be environmentally safe and is not health hazardous. It should exhibit excellent dynamic properties and should remain permanently elastic.
- 58.5 It should have excellent sound absorption and thermal insulation properties.
- 58.6 It should be available in a variety of thickness, widths, density and multi build up layers to suit most construction needs.

**M-59A Solid Wood Flooring**

- 59A.1 Solid wood represents a homogeneous construction of wood. Solid wood should be seasoned well and pre finished with minimum 7 coats of formaldehyde-free acrylic lacquer.
- 59A.2 The lacquer used for polishing shall be UV-cured so that it does not get dusty, stain or scratch easily.
- 59A.3 It shall be available in oil and lacquer both type of polish

**M-59B Engineered Wood Flooring**

- 59B.1 Engineered hardwood flooring shall be robust flooring comprised of 4 layers or as per manufacture's specification.
- 59B.2 Top layer shall be of 5 coats of hard-wearing lacquer above the genuine wood surface layer. Below the genuine wood surface layer middle layer of plywood or particle board shall be there. At bottom stabilizing layer shall be there as per manufacture's specification.
- 59B.3 It shall be available in oil and lacquer both type of polish.

59B.4 The lacquer used for polishing shall be minimum 5 coats of UV curved formaldehyde free lacquer

**M-59C Laminated Wood Flooring**

59C.1 Laminated flooring shall be available in 8 mm to 12 mm thickness. Laminated wood floor is made up of three layers. Bottom layer is stabilizing layer made up of special paper, middle layer or core layer made of HDF board, top most layer made of decorative and overlay in melamine resin.

59C.2 The decorative paper is what it gives the laminate flooring its individual appearance. Three layers shall be pressed with direct pressure laminate process in which decorative covering layer and stabilizing layer are pressed together onto the core layer made of HDF board.

**M-60 Structural Steel**

60.1 Nabhi's commentary on CPWD specification clause no. 10.1.1 shall be followed.

**M-61 Rolling Shutters**

61.1 The rolling shutters shall conform to IS: 6248. Rolling shutters shall be supplied of specified type, with accessories. The size of the rolling shutters shall be as specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm. wide, for shutters upto 3.5 m. width and not less than 1.25 mm. thick and 80 mm. wide, for shutters 3.5 m. in width and above, unless otherwise specified.

61.2 Guide channels shall be of mild steel, deep channel section and roll pressed or built-up (fabricated), with jointless construction. The thickness of the sheet used shall not be less than 3.15 mm.

61.3 Hood covers shall be made of MS sheets, not less than 0.90 mm. thick. For shutters having width of 3.5 m. and above, the thickness of MS sheet for the hood cover shall be not less than 1.25 mm.

61.4 The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong MS or malleable CI brackets. The brackets shall be fixed on or under the lintel as specified with rawlplugs and screws bolts, etc.

61.5 The rolling shutters shall be of self-rolling up to 8 m<sup>2</sup>. clear area, without ball bearing and upto 12 m<sup>2</sup>. Clear area, with ball bearing. If the rolling shutters are of large area, then gear operated type shutters shall be used.

61.6 The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.

61.7 The shutters shall be completed with door suspension shafts, locking arrangements, pulling hooks, handles and other accessories.

**M-62 Welded steel wire fabric**

62.1 Welded steel wire fabric for general purpose shall be manufactured from cold drawn steel wire "as drawn" or galvanized steel conforming to IS : 226 or as specified in the item with longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to IS : 4948. It shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be dust proof. The type of mesh shall be oblong or square, as directed in the item description. The mesh sizes and sizes of wire for square as well as oblong, welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece, in each panel, as far as stock sizes permit.

**M-63 Expanded Metal Sheets**

63.1 The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface defects. Expanded metal steel sheet shall conform to IS 42 except the blank sheets need not be with guaranteed mechanical properties. The size of the expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance on nominal weight of the expanded metal sheets shall be  $\pm 10\%$ .

63.2 Expanded metal in panels shall be in one whole piece, in each panel as far as stock size permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion

**M-64 Oil Bound Washable Distemper**

64.1 Oil Emulsion (Oil Bound Washable Distemper (IS: 428) of approved brand and manufacture shall be used. The primer used for distemper shall be of same make as paint. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacture. Only sufficient quantity of distemper required for day's work shall be prepared.

64.2 The ready mixed paints shall only be used. However, if ready mixed paint of specified shade of tint is not available white ready mixed paint with approved stainer shall be allowed. In such a case contractor shall ensure that the shade of the paint so allowed shall be uniform.

64.3 All the paints shall meet following requirements

a) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, levering, caking or colour separation and shall be free from lumps and skins.

b) The paint as received shall brush easily, possess good levelling properties and show no running or sagging tendencies.

c) The paint shall dry to a smooth uniform finish free from roughness grit, unevenness and other imperfections.

64.4 The distemper and primer shall be brought by the contractor in sealed tins in sufficient quantities at a time to suffice for a fortnight's work, and the same shall be kept in the joint custody of the contractor and engineer-in-charge. Empty tins shall not be removed from the the site of work, till this item of work has been completed and passed by the engineer-in-charge.

**M-65 Water Bound Distemper**

65.1 It shall be from Asian, Berger or Asian or equivalent as approved by Architect. It shall conform to relevant IS codes.

65.2 It can be in powder form or liquid form as per the manufacture's specification. If it is in powder form it can be prepared by adding warm water in the proportion recommended by the manufacture.

65.3 It shall be applied by the conventional distemper brush to all plastered surface. It shall be applied by the conventional distemper brush to all plastered walls, ceilings and woodwork. Priming coat shall be applied before applying the paint.

**M-66 Plastic Emulsion Paint**

66.1 Plastic emulsion paint shall conform to IS : 5411 of approved brand and manufacture and of the required shade shall be used.

66.2 The plastic emulsion paint is not suitable for application on external, wood and iron surface and surfaces which are liable to heavy condensation. These paints are to be used on internal surfaces except wooden and steel.

**M-67 Cement Paint**

67.1 The cement paint shall be (conforming to IS: 5410) of approved brand and manufacture.

67.2 The cement paint shall be brought to the site of work by the contractor in its original container in sealed condition. The material shall be brought by the contractor at a time in adequate to suffice for the whole work or atleast for a fortnight's work. The material shall be kept in joint custody of Architect and engineer-in-charge. Empty tins shall not be removed from the the site of work, till this item of work has been completed and passed by the engineer-in-charge.

67.3 It shall be manufactured from selected range of raw materials and a special cement, so the it shall be suitable for both indoors and outdoors. It shall be suitably used on concrete renderings, cement/sand renderings, cement/lime/sand renderings, asbestos sheets, fiber boards, brickwork, etc. It shall offer matt finish. It shall require no primer and shall be water thinnable. It shall offer a covering capacity as per manufacture's specification, depending on the surface and shade used. It shall preferably not be applied under direct sunlight to avoid patchy effect.

**M-68 Textured wall finish**

68.1 It shall be from Bakelite Hylam Ltd or equivalent as approved by Architect or engineer-in-charge. It shall conform to relevant IS codes. It shall be granules, flakes, granite flakes and granules and flakes mix.

68.2 It shall be of two component or one component as specified by the Architect or engineer-in-charge. It shall be easily applicable by trained applicators. The single coat shall be 1.5 mm thick as specified in the item description. It shall be weather and fade resistant, water and damp resistant, durable and highly washable. It shall be acid and alkali resistant, high abrasion resistant, non-toxic and shall be capable to taking any shape. It can be applied on wide variety of surface like cement mortar, plywood, plaster board, AC sheet, Asbestos board, gypsum plaster or any other materials, to get homogenous layer.

68.3 It shall be water thinnable to avoid water contamination, incombustible and flexible. It shall be good fire resistant, anti-fungal, good impact resistant having adhesion strength more than 8 kg./cm<sup>2</sup>. There shall not be any development of hair line cracks and no peeling off shall occur, after the maximum drying time of 4 hours and curing period of 2 days.

**M-69 Silicone paint**

69.1 It shall be of the best quality, like Wacker, GE Silicone, Pidilite, Dow Corning or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Codes.

69.2 It shall be prepared by mixing Silicone and Epoxy. It shall be applied on dry as well as damp surfaces. It shall be non-toxic and odourless, so shall be suitable for drinking water structures also. It shall render the surface impervious to water and shall prevent water penetration. It itself shall penetrate into the structure and shall form a strong film on the pores of the structure surface, making the surface water-tight, non-toxic and erosion free.

69.3 It shall be water thinnable. Before use, the hardener of the Siliconate Epoxy shall be mixed with resin and thinned with water, in the proportions described by the manufacturer. It shall be applied with a suitable spray gun with a fine nozzle. An overlap of 25 to 30 cm. shall be preferred. It shall be semitransparent but on drying it shall become transparent.

**M-70 Synthetic Enamel Paint**

- 70.1 Synthetic Enamel paint shall conform to IS: 2933. It shall be from Nerolac, Berger, Asian Paints or equivalent. It shall offer variety of finishes like Glossy, Semi-glossy, Pearl lustre and Matt finish.
- 70.2 It shall be applied either by brush, roll or spray. It shall have a covering capacity of as specified by the manufacture, depending on the surface to be painted. It shall be used both on metal and wood surfaces.
- 70.3 It shall have a viscosity of application of 30 to 40 seconds, if brush or rollers are used and 20 to 25 seconds, if spraying is done. The drying time shall however vary with the ambient temperature and humidity.

**M-71 Acrylic Paint**

- 71.1 It shall be from Asian Paints, ICI, Berger, Nerolac or equivalent as approved by the Architect. It shall conform to the relevant IS Codes.
- 71.2 It shall be used on both interiors and exteriors on all different types of plaster, wooden surfaces, stone, brickwork, asbestos cement sheets, hard and soft boards, etc. as specified in the drawing. It shall render rich smooth finish and shall provide a tough film that forms a suitable protection against all elements.
- 71.3 It shall be water thin able. On interior surface it shall be applied after one coat of cement primer and in case of exterior surface it shall be applied on waterproof cement coating. On a new but highly absorbent surface, a thin coat of the paint shall be applied by adding two parts of water by volume to two parts of Acrylic Emulsion by volume. On previously painted surfaces, one coat of the acrylic paint shall be applied by thinning four parts of the emulsion with one or two parts of water. It shall be applied by brush, roller or spray. It shall have a covering capacity as per manufacture's specification, depending on the surface and shade used. It can be washed to remove the day-to-day dirt, after the surface has been painted, minimum for a month. It should be non-flammable. For the best performance of paint proper washing and cleaning of all algal and fungal growth at regular intervals at six months is required.

**M-72 French Polish**

- 72.1 Pure Shellac conforming to IS: 16 varying from pale orange to lemon yellow color free from resin or dirt shall be dissolved in methlated spirit at the rate of 140 gm of Shelllac to 1 litre of spirit. Suitable pigment shall be added to get the required shade.
- 72.2 Readymade polish conforming to IS: 348 can also be used. The French polish so prepared shall Conform to IS: 348.

**M-73 Lacquer Polish**



- 73.1 Lacquer polish of ASIAN or TARALAC with thinner of same company shall be used.
- 73.2 Surfaces to be polished shall be properly grinded with sandpaper and all grains of the wood shall be filled by sealer coat over that multiple layers of approved company's Laquar to be applied up to hot water resistance.

**M-74 Wax Polish**

- 74.1 The Wax polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials.
  - (a) 2 parts Bees wax conforming to IS : 1504-196
  - (b) 1.5 parts boiled linseed oil conforming to IS : 75
  - (c) 1 part of Turpentine conforming to IS : 83
  - (d) 0.5 part Varnish conforming to IS : 337
- 74.2 Pure bees wax free paraffin or stearine adulterants shall be used. The bees wax and boiled linseed oil shall be heated over a slow fire. When the wax is completely dissolved the mixture shall be cooled till it is just warm and turpentine and varnish added to it in the required proportions and entire mixture shall be well stirred.

**M-75 Melamine Polish**

- 75.1 The melamine polish shall be of best quality and make such as Asian Paints or equivalent, as approved by the Architect and Engineer-in-charge. It shall be transparent or opaque, as specified by the Architect or engineer-in-charge.
- 75.2 It shall give silken, smooth finish. The Melamine polish shall have shade and shine, either satin or glossy, as approved by the Architect. It shall be two component polish consisting of a base and hardener. It shall be capable of protecting wood from moisture, heat, cold, scratches, stains, cigarette burns etc. It shall have excellent covering capacity. It shall be applicable to all wooden surface of every shape. It shall be applied using brush or spray gun. It shall require lesser time to dry and there shall be no cracks or peeling off of the polish. There shall not be any undulation on the finished surface nor cracks at joints. It shall be of any desired shade as approved by the Architect. It shall have excellent colour, shall be free flowing and shall have good leveling properties. It shall be durable and flexible to absorb cracks. It shall have resistant to scrubs, light rays, heat etc. complete as per architect or engineer-in-charge.

**M-76 Polyurethane paint**

- 76.1 It shall be from Asian, ICI, Nerolac or equivalent as approved by the Architect.
  - 76.1.1 It shall be a three coat application. It can be done either by using a brush, spray or a roller. It shall be available in variety of decorative finishes i.e. in almost all shades and in glossy and matt finishes. It shall offer the following properties

- (a) Adhesion to concrete / metal surface
- (b) Sealing effect against heavy rain
- (c) Good Water vapor diffusion
- (d) Weather resistance, color stability, gloss retention and chalk resistance
- (e) Resistance to disinfectants, chemical, fire, radiation, acid gases, abrasion and wear
- (f) Low soil adhesion
- (g) Scratch and Mar resistance
- (h) Have long life and excellent gloss

76.2 It shall absorb UV radiation and shall be easily cleaned of radioactive contamination. The ultraviolet part of the solar radiation shall not affect the coating and thereby shall be long lasting

#### **M-77 Powder Paints**

77.1 Powder paints shall of superior quality such as Asian, Nerolac or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS specifications.

77.2 Powder coatings should be a blend of resins, curing agent and pigments which are melt mixed(extruded) and pulverized into finely divided particles. It should be solvent free.

77.3 It shall be available in the following types:

##### **Epoxy Powder**

It is practical coatings for pipes, water and gas valves, steel furniture and indoor appliances. It is suited for surface subjected to high stress and chemical effects.

##### **Epoxy polyester powder**

This is a system for economical operation with a high degree of chemical resistance. The manufacturers of household appliances, automobile parts, shelving systems, electrical cabinets and steel furniture use it

##### **Pure Polyester Powder**

This is best suited for articles such as aluminum extrusion, which are exposed to exterior environment. This powder has excellent U.V. resistance.

##### **Polyurethane powder**

Polyurethane gives excellent flow & Finish and protects the surface from Ultra Violet rays.

#### **M-78 Mangalore Pattern Roof Tiles**

78.1 The Mangalore pattern tiles shall conform to IS: 654 for Class AA or Class A type, as specified in the item. The tiles are to be made from clay, place it in a mould and cut to the

measurement. Sample is to be got approved from Architect. Necessary tests are to be carried out as per IS code.

#### **M-79 Aluminum Sheets**

- 79.1 It shall be of the best quality and from reputed manufacturer like Hindalco or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS: 1254, in all respects. The aluminum alloys used in the manufacture of the sheets shall conform to IS: 737.
- 79.2 The sheets shall be extremely light with high-strength-to weight ratio. having a density of about 2.70 gms/cm<sup>3</sup>. It is corrosion resistant in almost any kind of environment. Even in highly-corrosive industrial environments, it should be resistant to fumes and vapours of organic compounds and to chemicals like ammonia, carbon-dioxide and acids like hydrochloric acid, nitric acid and sulphuric acid. This corrosion-resistant property gives the metal a long life and keeps it looking good throughout its life. The sheets shall be non-fragile and shall be exceptionally durable. As aluminum reflects a high proportion of the radiant heat, the sheets provide excellent insulation when used for cladding/roofing. The sheets shall be non-combustible, non-flammable and non-sparking. As aluminum is elastic, the sheets shall offer high resistance to denting and shall be shatter-proof. Co-efficient of linear expansion of aluminum is 0.000024 per °C and therefore the lateral expansion of the sheets shall be readily accommodated in the corrugations. The sheets shall offer no health hazard and shall be totally hygienic. Aluminium is a good conductor of heat, its high reflectivity of radiant heat and light (75 to 80 per cent when new, 60 per cent after several years) keeps the interiors of an aluminium building from five to eight degree celsius cooler in summer while its low emission rate cuts heat loss during winter.
- 79.3 It shall be available in trapezoidal and rounded corrugations and shall be extensively used for various Industrial buildings, Warehouses, Aircraft hangers, Power plants, Storage sheds, Bunk houses etc. It shall be innovatively used as interior partitions, wall panels, false ceiling etc.

#### **M-80 PVC Sheet**

- 80.1 PVC sheet should be of Finolex or equivalent as sample approved by Architect and engineer-in-charge. PVC sheet should be corrosion resistant and chemical resistant. It should resist actions against chemicals like mineral acids, alkalis, plating solutions, pickling solutions, paper making chemicals, most inorganic compounds, alcohols, aliphatic hydrocarbons, glycols, amines and phenols in both liquid and vapour form.
- 80.2 It should be hygienic, virtually maintenance free, UV resistant, highly flexible so that it can be bent perpendicular or parallel to corrugation. It should be light weight than it can be easily handled and transported.

- 80.3 It should possess excellent thermal insulation and rust proof to make it ideal for coastal region.
- 80.4 It should be fire retardant It should be as per the sample approved by engineer-in-charge. It should be such type that it can be used in heavy industries, factories and warehouses, agricultural and food processing industries and for coastal construction

**M-81 Fiber Glass**

- 81.1 It shall be of the best quality such as Glass poll, Malibu or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to BSS: 4154.
- 81.2 It shall be a combination of glass fiber mat and polyester resin, suitably modified to resist ultraviolet degradation. It shall disperse light rays, allowing uniform diffused light penetration. It shall absorb the heat rays and so helps to save electricity. It shall be available in (1) Clear grade - where light transmission shall be 87% to 90%. (2) Natural white/green/blue/yellow/red - where light transmission shall be 60% to 70%. It shall be available in lengths of 1.5 m. to 3 m. The width shall be equivalent to that of asbestos/galvanized and aluminum corrugated sheets. It shall have a thickness of 1.2 mm. with a tolerance of  $\pm 0.2$  mm
- 81.3 It shall have a coefficient of linear expansion of .000012 per °C. Its heat distortion temperature shall be approximately 75°C. It shall have thermal conductivity of 0.22 Kcal/mh°C. It shall have an impact strength of 14.5 Ft, hardness of 40 - 50 Barcol and Brinell 26. It shall have a tensile strength of 600 - 800 Kg/cm<sup>2</sup> and compressive strength of 1200 - 1400 Kg/cm<sup>2</sup>. On soaking for 24 hrs., at 25°C, its water absorption shall be 0.24%. It shall have effective resistance to most chemicals except strong acids.
- 81.4 It shall be suitably used for industrial and residential roof coverings, where light transmission is desired. It shall also be used to cover swimming pools, gardens and terraces, if desired. It shall be normally self-cleaning type but when used in industrial areas, it shall be cleaned with water and soap.

**M-82 Polycarbonate Sheet**

- 82.1 Polycarbonate sheets for versatile glazing shall of the best quality such as GE, Lexan or equivalent, as approved by the Architect and Engineer-in-charge. It shall meet all the requirements of BS: 6262. For impact performance, it shall meet the BS: 6206 requirements and for anti-bandit requirements, it shall conform to BS: 5544.
- 82.2 It shall be as transparent as glass, but shall have half its weight. It shall be tough and yet flexible. It shall have strong impact strength and shall offer thermal and sound insulation. It shall resist the effects of weather, shall be unbreakable and shall provide protection against forced intrusion. It shall be used for roof glazing, door and window glazing as well

as privacy glazing, on many different types of buildings. As light weight, it shall be feasible to use it on wider spans. It promotes natural light and shall impart an impression of spaciousness.

- 82.3 It shall have tensile strength greater than 70 N/mm<sup>2</sup>. Its flexural modulus shall be 2500 N/mm<sup>2</sup> and flexural yield strength shall be 100 N/mm<sup>2</sup>. It shall have an impact strength (falling dart) greater than 200 Nm. It shall have an indentation hardness - H358 10 of 98 N/mm<sup>2</sup>. and H358 60 of 93 N/mm<sup>2</sup>. Its coefficient of linear expansion shall be 0.00067 per °C and thermal conductivity shall be 0.21 W/m.K. It shall have a specific gravity of 1.2 gm/cc. and water absorption @ 24 hrs. 23°C shall be 10 mg. Its elongation at break shall be greater than 100%. It shall have a higher coefficient of thermal expansion. It shall allow light transmission of between 82% and 90%, depending on the thickness of the sheet. It shall not transmit UV radiation upto 385 Nm. It shall resist the effect of chemicals. It shall have self-extinguishing, low flame spread characteristics and low fire propagation indices.

**M-83 Corrugated GI Sheet**

- 83.1 CPWD specification clause no. 12.1.1, 12.1.2 shall be followed.

**M-84 Asbestos Cement Sheets**

- 84.1 Asbestos cement sheets plain, corrugated or semi corrugated and curved shall be from Everest or equivalent, as approved by the Architect or Engineer-in-charge. It shall conform to IS : 459. The thickness of the sheet shall be as specified in the item. The sheet shall be free from all defects such as cracks, holes, deformation, chipped edge or otherwise damaged.
- 84.2 It shall manufacture by reinforcing Asbestos in cement, in such a manner that every fibre is covered with fine particles of cement to ensure maximum strength. It shall be alkali resistance and anti-corrosive. It should not break during transportation, handling, laying etc. and should be non- destructible, non-inflammable and non-organic. It shall have high tensile strength and high slenderness ratio.
- 84.3 The minimum nominal thickness of sheets shall be 6 mm., having covering efficiency of about 90% and weight 1518 kg/cm<sup>2</sup>. The sheet shall be free from all defects such as cracks, holes, deformation, chipped edge or otherwise damaged. The permissible bending stress shall be 130 kg/cm<sup>2</sup>.
- 84.4 The accessories shall be same thickness that of AC sheets. They shall be suitable for all the types of sheets and locations. They also shall be from approved manufacturer and shall be free from any defects. The fixing of AC sheets and accessories shall conform to IS: 730.
- 84.5 Ridges & Hips:
- 84.5.1 Ridges and hips shall be of same thickness as that of AC sheets. The different types of ridges shall be suitable for its corresponding type of sheets and locations.

84.5.2 Other accessories to be used in roof such as flashing piece, caves, filler pieces, valley gutters, north light and ventilator curves, barge boards etc. shall be from standard manufacture and shall be suitable for the different types of sheets and location.

**M-85 Teak Wood**

85.1 CPWD specification clause no. 9.1 and 9.2 is to be followed.

**M-86 Plywood**

86.1 The plywood for general purpose shall conform IS: 303.

Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers, 3,5,7,9 ply etc. The plies are placed so that grain of each layer is at right angles to the grain in the adjacent layer.

86.2 The chief advantages of plywood over a single board of the same thickness is that, plywood offers more uniform strength, along its length and width and also offers greater resistance to cracking and splitting with change in moisture content.

86.3 Usually synthetic resins are used for gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates, which maintain a temperature of 90°C to 140°C and a pressure of 11 to 14 Kg/cm<sup>2</sup>, on the wood. The time of heating may be anything from 2 to 60 minutes depending upon the thickness.

86.4 When water glues are used the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive, the finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

86.5 According to IS : 303, the plywood for general purpose shall be of the grades namely BWR, WWR and CWR, depending upon the adhesives used for bonding the veneers, and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A,B and C. After pressing, the finished plywood should be reconditioned to a moisture content not less than 8% and not more than 16%.

86.6 Thickness of plywood boards:

Board Thickness	Board Thickness	Board Thickness	Board Thickness
3 ply 3 mm.	5 ply 5 mm.	7 ply 9 mm.	9 ply 16 mm.
4 mm.	6 mm.	13 mm.	19 mm.
5 mm.	8 mm.	16 mm.	11 ply 19 mm.
6 mm.	9 mm.	9 ply 13 mm.	22 mm.

25 mm.

-----  
Types of plywood:

**M-86A Water Proof (Weather Proof) Plywood:**

- 86A.1 The plywood shall be from Kitply, Wonder Wood, Anchor Board or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS : 710 and to the relevant Defense and Navy specifications.
- 86A.2 Plywood shall be made from veneers of hard wood timbers and bonded with high quality BWP type Phenol Formaldehyde Synthetic Resin Adhesive and hot pressed at high temperature and pressure, and further treated with a fixed type of preservative by vacuum-cum-pressure impregnation, to produce thin boards or sheets of wood panels. There are always an odd number of layers. The plies shall be placed, so that, grain of each layer is at right angles to the grain in the adjacent layer.
- 86A.3 Plywood shall be waterproof, weather proof, boilproof, and highly durable even against strenuous vulnerable uses. It shall resist the attack of termites, cockroaches, wood burrowers, fungus, mould, rot, decay and other wood destroying insects and marine organisms.
- 86A.4 The tensile strength of the plywood shall be minimum 600 kg/cm<sup>2</sup> and bending strength above 400 kg/cm<sup>2</sup>. The swelling of plywood in water should be almost negligible. Specific gravity of plywood should be 0.7 to 0.75, having screw and nail holding strength normal to face, atleast 250 kg. and 60 kg., respectively.
- 86A.5 The moisture content shall be less than 10% and the plywood shall have high fire resistance and shall be free from any cracks, wraps, split etc., and shall have uniform strength all over the panel surface. It shall be used for marine structures, leather tanning tables, wall panelling, and underlayment for kitchen and other furniture, subjected to heat and moisture.

**M-86B Commercial Ply:**

- 86B.1 The plywood shall be from Mafatlal Plywood Industries Ltd. or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS 303.
- 86B.2 Plywood shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives.
- 86B.3 It shall be smooth and strong and shall be free from warping, cupping and twisting.

**M-86C Pre-laminated - Standard and Veneered:**

**86C.1 Decorative Plywood**

86C.1.1 It shall be obtained from manufacturer as approved by the Architect and Engineer-in-charge. It shall conform to relevant IS Code.

86C.1.2 Plywood shall be made from hard wood timbers, finished with selected species of timber, suitable for veneers and bonded with strictly controlled and evenly spread adhesives. It shall be smooth and strong and shall be free from warping, cupping and twisting.

#### 86C.2 **Decorative Veneers**

86C.2.1 Decorative veneered plywood shall be manufactured using veneers of the best quality timbers like Teak, Rosewood, Walnut, Laurel, White Cedar and many others.

86C.2.2 They shall be available in flitch form as well as in lay-on form, in sizes suitable to the furniture industry. They shall be available either flat or quarter sliced, varying in thickness from 0.2 mm. to 1.5 mm. Lengths shall vary upto 4 m.

#### **M-86D Block Boards**

86D.1 They shall be manufactured from well-selected and seasoned hardwood timbers, used in sturdy construction. They shall be usually bonded with Urea Formaldehyde, however against specific requirements, Phenol Formaldehyde bonded boards shall also be available.

86D.2 They shall be strong, weather and water proof and shall be ideally used for high quality furniture and exterior applications.

#### **M-87 Glass**

87.1 All glass shall be of the best quality, free from specks, bubbles, smokes, veins, air holes, blisters, and other defects. The kind of glass to be used shall be as mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of the glass panels shall be uniform. The specifications for different kinds of glass shall be as under:

##### 87.2 **Sheet Glass**

87.2.1 In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 7.5 Kg/m<sup>2</sup>. for panes up to 600 mm. x 600 mm.

87.2.2 For panes larger than 600 mm. x 600 mm and up to 800 mm. x 800 mm., the glass weighing not less than 8.75 Kg/m<sup>2</sup>. shall be used. For bigger panes up to 900 mm. x 900 mm., glass weighing not less than 11.25 Kg/m<sup>2</sup>. shall be used.



87.2.3 Sheet glass shall be patent flattened glass of best quality and for glazing and framing purposes shall conform to IS : 1761. Sheet glass of the specified colours shall be used, if so shown on the detailed drawings or so specified for important buildings and for panes with any dimensions over 900 mm., plate glass of specified thickness shall be used.

### 87.3 Plate Glass

87.3.1 When plate glass is specified, it shall be 'Polished patent plate glass' of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness, the thickness of plate glass to be supplied shall be 6 mm. and a tolerance of 0.20 mm. shall be admissible.

### 87.4 Obscured Glass

87.4.1 This type of glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figure, ribbed or fluted, or frosted, as may be specified or as required. The thickness and type of glass shall be as per details on drawings or as specified or as directed.

### 87.5 Wired Glass

87.5.1 Glass shall be with wire netting embedded in a sheet of plate glass. Electrically welded 13 mm. Georgian square mesh shall be used. Thickness of glass shall not be less than 6 mm. Wired glass shall be of the type and thickness as specified.

### 87.6 Double Glazed units

87.6.1 Double glazed unit shall comprise of two glasses, of appropriate thickness and absolutely machine-cleaned on both sides, with an air gap of 12 mm .in-between. The space between the two glasses is kept totally dry, avoiding any condensation by sealing the space with elastomeric sealant. Thus in all, it is an insulating glass unit of around 20mm. thickness.

87.6.2 It shall be suitably used for any kind of Doors and Windows, in all areas of work and residences. It shall be absolutely and clearly transparent, giving the following advantages:

- 1) Total light penetration, but with dust and heat insulation.
- 2) Noise insulation.
- 3) 25% saving in electricity due to heat insulation.
- 4) Crystal clear transparency.

### M-88 PVC Water stops

- 88.1 The PVC water stop shall be of approved make, as approved by the Architect and Engineer-in-charge.
- 88.2 It shall have optimum resilience, high elasticity & stretch strength, immune to corrosion, excellent weather resistance. They shall be manufactured to safeguard against hydrostatic pressure, water seepage, expansion or contraction of joints and to take care of any deflection or displacement arising due to change in temperature or settlement of foundation to eliminate danger of cracks.
- 88.3 They shall be effective in tropical climate having high mechanical strength, good ageing, longer life, shall be unaffected by acids, alkalis, metal salts and other chemicals. It shall not be hazardous and shall have fire retardant properties. It shall absorb less water than rubber, shall work as water tight seal but shall allow safe passage of seepage water and shall withstand high hydrostatic pressure. It shall be easily welded and can be installed easily, having high tensile strength and shall be capable of bearing heavy shocks arising due to turbines, earthquakes, floods etc.
- 88.4 It shall withstand a minimum hydrostatic pressure of 30 m. high column of water.
- 88.5 The selection criteria of water stop depend upon the hydrostatic pressure; however, the following points should be kept in mind:
- 1) Where substantial expansion/contraction of joints takes place, Dumb Bell type shall be used.
  - 2) Where a firm grip in concrete is desired, Serrated types should be used.
  - 3) The overall width of the water stop should not be greater than the thickness of concrete.
  - 4) The distance from the face of the concrete to the water stop must not be less than half the width of the water stop.
  - 5) The width of the water stop must be at least 6 times the largest aggregate used for satisfactory compaction.
- 88.6 The prior approval of selected size and type of water stop shall be taken from the Architect and Engineer-in-charge, before use.

## **M-89 Admixtures for Mass Concrete and Mortar**

### **M-89A Joint Sealant:**

- 89A.1 The sealant shall be of best quality and from manufacturer like CICO, MC-BAUCHEMIE, PIDILITE, HMP or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

- 89A.2 It shall be a two component polysulphide rubber joint sealant, based on a low molecular weight polymer. It should not contain chlorides or other corrosive substances.
- 89A.3 It shall be used for sealing joints in water retaining structures, roofs, external walls, cladding, floors, partitions, ceilings etc. It shall have excellent property to adhere most of building materials like Aluminium, Stainless Steel, Glass, Concrete, Marble, Stone, Brick, Masonry block, Plaster, Ceramic and quarry tiles, Timber etc. The modulus of elasticity of the sealant shall be less than 0.16 MPa,  $\pm 10\%$  at 100% elongation. The shore "A" hardness of the sealant shall be  $22 \pm 3$  @  $25^{\circ}\text{C}$ . The operating temperature range for the sealant shall be  $-25^{\circ}\text{C}$  to  $80^{\circ}\text{C}$ . The permanent dynamic movement capability of the sealant shall be  $\pm 25\%$ . The tensile strength of the sealant shall not be less than 0.4 MPa. The optimum width/depth ratio shall be 2:1. The Sp.gr. of the sealant shall be 1.6 kg/lit. The sealant should be capable to resist attack of water, sunlight, oxidation, corrosive fumes, oils, petrol, diluted acids and alkalies, salt spray, aliphatic and aromatic solvents and shall not contain tar or bituminous ingredients.
- 89A.4 It shall possess the properties like 550% elongation at break, non-toxicity when fully cured, no staining and shrinkage less than 1%. The trafficable strength shall be achieved within 24 hours and full at 7 days (at  $25^{\circ}\text{C}$  & 250% RH). It shall possess excellent coverage capacity and more strength at low dry temperatures.

**M-89B Abrasion Resistant Industrial Flooring Aggregate:**

- 89B.1 The flooring aggregate, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89B.2 The flooring aggregate shall be a factory processed and specially graded non-oxidising, non-magnetic and chemically inert metallic flooring aggregate, free from oil and grease.
- 89B.3 It shall be used as a surface hardener to concrete floors. It is recommended for Factory floors, Warehouses, Hangers, Car parks and such other areas, subjected to heavy vehicular traffic. It shall also be used on open and continuously wet surfaces. The flooring aggregate shall build in wear resistance and shall produce high abrasion resistant floor surface. It shall impart extreme surface density and shall offer resistance to oil and water penetration. It shall provide a non-rusting floor surface which is easy to maintain.
- 89B.4 It shall be used with cement in the ratio, as per the manufacturer's instructions and spread evenly on the surface to be treated, at the rate depending on the type of floor. The flooring aggregate shall be spread when the surface of the concrete floor is still fresh, i.e. as soon as the surface water has evaporated and then trowled, in stages, to bring about a uniform and smooth finish.

**M-89C Concrete Hardener and Dustproofers :**

- 89C.1 The Concrete hardener and dustproofer, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89C.2 It shall have a specific gravity of 1.18 and shall be applied on concrete floors, at the rate of atleast 25 lit.s per 100 m<sup>2</sup> per coat. A total of three coats shall be applied for permanently hardened concrete floor, with increased abrasion resistance, increased surface density, increased resistance to chemical attack and to eliminate dust accumulation. Drying time of 4-6 hours for each coat shall be allowed before the floor is put to use or is applied with another coat of the product. Precautions shall be taken while using the product, to avoid contact with eyes and open wounds and to work in good ventilation. After application, the affected parts shall be washed copiously. It shall not be stored for a period of more than 2 months before use.

**M-89D Water Repellent Coating:**

- 89D.1 The Water repellent coating, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89D.2 Water repellent coatings for exterior exposed surfaces shall be acrylic resin based, having a Flash point of approx. 40<sup>0</sup>C and specific gravity of 0.95.
- 89D.3 It shall be suitably used for concrete, brick, stone and plastered surfaces preventing moisture penetration and thus any damage to the interiors. It shall be quick acting, long lasting, invisible i.e. colourless so as to maintain the original colour of the surface treated. It shall impart sealing characteristics so that the treated surface becomes stain and dust free. The coating itself shall not darken or turn yellow with age.

**M-89E Accelerating, Water Reducing Admixture and Plasticizer:**

- 89E.1 The Accelerating, Water reducing admixture and plasticizer, shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89E.2 It shall be in liquid state with a specific gravity of 1.30 and complying with ASTM C-494 Type E, IS : 9103 & IS : 2645. It shall accelerate the setting and hardening of the concrete mix, thereby achieving higher early age strength. It shall reduce the water content of the concrete without affecting its workability. It is useful for pre-cast/pre-stressed works, structural concrete works, floors, roads, runways, paving etc. It shall be used at the rate instructed by the manufacturer, with cement, depending on the amount of acceleration of hardening required. It should be compatible to all types of cement.

**M-89F Retarding, Water Reducing Admixture and Plasticizer:**

- 89F.1 The Retarding, water reducing admixture and plasticizer, shall be of best quality and from manufacturer like CICO, Feb Roffe or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89F.2 It shall be in liquid state with a specific gravity of 1.22 and complying with ASTM C-494 Type B & D, IS : 9103, CRD-C87 Type B & D, BS 5075 Part 1. It shall be added to the concrete mix during the mixing process, at the same time as the water or the aggregates. No extension of normal mixing time is necessary. It shall extend the period of time as to placing the concrete and compacting, i.e. delay the initial and final setting time. It shall help to spread the heat of hydration over a longer period of time. It shall give a highly workable concrete with a low W/C ratio. It shall be used at the rate instructed by the manufacturer, with cement, depending on the amount of acceleration of hardening required. It should be compatible to all types of cement.

**M-89G Water & Weather Proof Compound:**

- 89G.1 The water & weather proof integral cement admixture shall be of best quality and from manufacturer like Feb Roffe's Roff Hyseal, Roff hyproof, Algiproof, Hydro Shield of ConTech Chemicals or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.
- 89G.2 It shall be used as an excellent cement admixture in all types of concrete/plaster mortars, pointing mortars, masonry works, guniting works and pressure grouting works. It shall improve resistance of concrete surfaces to weathering and chemical attack. It shall be non-toxic so as to use for waterproofing water tanks, reservoirs, bio-gas tank, leaking ceiling, basements, tunnels, lift wells etc.
- 89G.3 It shall be mixed to concrete or plaster mortar, while mixing. First, water is added and then the admixture, at the rate instructed by the manufacturer. For use of the admixture, precaution shall be taken to use clean materials for preparation of mortar.

**M-90 Sand Stone Grills/Baluster:**

- 90.1 Sample shall be approved by the Architect and Engineer-in-charge.
- 90.2 It shall be made from best quality either Bansipahadpur or as specified in item having uniform color (no other colour spot shall be allowed) and texture. The sand stone shall be even, sound, durable and free from any veins, cracks and flaws. The thickness of the stone used shall be as specified in item of work with the permissible tolerance of +2 mm.
- 90.3 The sandstone grills shall be produced by fine chiselling. All edges, faces and angles of fine

hand chiselled grills, columns, baluster shall be smooth finished.

**M-91 Polyurethane Foam Insulation:**

- 91.1 Polyurethane foam shall be from SDC, FGP, Excilite, VCM or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Code.
- 91.2 It shall have high strength to weight ratio alongwith excellent thermal insulation and acoustic absorption. It shall be based on the exothermic, catalytic reaction of polyisocyanates with polyol molecules containing hydroxyl groups in the presence of blowing agent. It shall be perfectly homogenous and having uniform characteristics like perfect adhesion to metal surfaces, higher insulation capacity, maximum resistance and lightness. It shall be perfect non-hygroscopic, completely water proof having dimensional stability, optimum thermal insulation, fire retardancy.
- 91.3 It shall be of low foam density, not more than 40 Kg/m<sup>3</sup>. The thermal conductivity shall be 0.02 Kcal/m hr°C. The compressive strength shall not be less than 2.5 Kg/cm<sup>2</sup> and 1.2 Kg/cm<sup>2</sup>, in direction parallel to rise and perpendicular to rise respectively. The close cell content of the foam shall be 90 to 95% and it shall be workable within the temperature range of -150°C to +80°C. The water vapour permeability shall be 2.0 perms/in.

**M-92 Fiberglass Reinforced Plastics (FRP)**

- 92.1 Fiberglass Reinforced Plastic shall be from CEAT or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to relevant IS Code.
- 92.2 It shall be either unidirectional reinforced or sheet moulded or filament wound epoxy to match the purpose of work and item of tender. It shall have versatile chemical inertness, electrical resistance and mechanical strength, ease of processibility, repeatability and predictability. It shall have desirable characteristics like light weight, high strength, stiffness, toughness, thermal insulation properties, superior weather resistance, complete elasticity, fatigue, creep, resistance to corrosion, rot, swelling, insects, fungus etc.
- 92.3 There shall be no yield point beyond which buckling or denting of the FRP occurs, to reduce the possibility of irritating damages for minor stresses or impacts. The density, flexural strength and flexural modulus shall not be less than 1.5 mg/m<sup>3</sup>, 1000 MPa and 40x10<sup>3</sup> MPa, respectively. It shall have minimum tensile strength, tensile modulus and compressive strength of 1000 MPa, 40x10<sup>3</sup> MPa and 250 MPa, respectively. The FRP shall have thermal conductivity about 0.2 w/m°C. Thermal coefficient of expansion shall be less than 10x10<sup>-6</sup> per °K.
- 92.4 The minimum glass content shall be 60%. The weight index for stiffness and tensile strength at yield shall not be less than 0.6 and 0.9 respectively. No damage should be there while testing at impact energy of 8 joules. The level of translucency should be greater than 80% of diffused transmission that of direct light. It shall provide superior

aesthetic value with incorporated colour. It shall be good fire retardant, durable and impermeable to water.

**M-93 Fly ash**

Nabhi's commentary on CPWD specifications clause no. 3.1.7 shall be followed.

**M-94 Plaster of Paris**

94.1 Plaster of Paris is manufactured by heating gypsum at 120°C - 160°C. When plaster of paris is mixed in water it rehydrates and form dense matrix of gypsum crystal.

94.2 Chemical formula of POP shall be  $\text{CaSO}_4, \frac{1}{2} \text{H}_2\text{O}$ .

94.3 Plaster of paris shall be stored at dry place. Once the mix is prepared, it shall be applied within half an hour or the final setting whichever is earlier. Set material and wastage cannot be used.

**M-94A Asbestos Cement Sheets**

94A.1 Asbestos cement sheets plain, corrugated or semi corrugated and curved shall be from Everest or equivalent, as approved by the Architect or Engineer-in-charge. It shall conform to IS: 459. The thickness of the sheet shall be as specified in the item. The sheet shall be free from all defects such as cracks, holes, deformation, chipped edge or otherwise damaged.

94A.2 It shall manufacture by reinforcing Asbestos in cement, in such a manner that every fibre is covered with fine particles of cement to ensure maximum strength. It shall be alkali resistance and anti-corrosive. It should not break during transportation, handling, laying etc. and should be non- destructible, non-inflammable and non-organic. It shall have high tensile strength and high slenderness ratio.

94A.3 The minimum nominal thickness of sheets shall be 6 mm., having covering efficiency of about 90% and weight 1518 kg/cm<sup>2</sup>. The sheet shall be free from all defects such as cracks, holes, deformation, chipped edge or otherwise damaged. The permissible bending stress shall be 130 kg/cm<sup>2</sup>.

94A.4 The accessories shall be same thickness that of AC sheets. They shall be suitable for all the types of sheets and locations. They also shall be from approved manufacturer and shall be free from any defects. The fixing of AC sheets and accessories shall conform to IS : 730.

94A.5 Ridges & Hips

94A.5.1 Ridges and hips shall be of same thickness as that of AC sheets. The different types of ridges shall be suitable for its corresponding type of sheets and locations.

94A.5.2 Other accessories to be used in roof such as flashing piece, caves, filler pieces, valley gutters, north light and ventilator curves, barge boards etc. shall be from standard manufacture and shall be suitable for the different types of sheets and location.

**M-94B Curved Corrugated Asbestos Cement Sheets**

94B.1 It shall be of the best quality such as Everest or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS specifications.

94B.2 It shall be available in nominal thickness of 6 mm. with an overall width of 1050 mm. and laid width of 876 mm. It shall be available in standard lengths of 2743 mm. and 3048 mm. It shall have a nominal radius of 2743 mm.

94B.3 It shall provide an arch roofing system of which the semi-circular arch shall be the most stable. It shall provide a self-supporting roof construction and shall be used for wide varieties of structures for agricultural, industrial and domestic uses, garages and for temporary site offices and for storage of implements. It shall be easily erected without any need of expertise and as temporary sheds without any foundation requirements.



## **Item Wise Specifications**

### **Item Specifications for Civil Works**

#### **CW 1.00 Earthworks**

**1.01 Excavation for foundation / pits / raft / trenches/etc. for following depth, by mechanical or manual including sorting out and stacking of useful materials, dressing of the sides, ramming of bottom, disposing of the excavated stuff up to 50 m. lead including lifts, for all kind of soil, all complete as per drawing, specifications, instruction & directions of the Engineer-in-charge. For all civil, plumbing, electrical & infrastructure works**

- a) **Depth upto 1.5m**
- b) **Depth upto 1.5 to 3m**
- c) **Depth upto 3m to 5m**
- d) **Depth upto 5m to 7m**
- e) **Depth upto 7m to 9m**
- f) **Depth upto 9m to 11m**

#### **1.0 General**

1.1 Nabhi's commentary on CPWD specifications clause no. 2.1, 2.2, 2.3 shall be followed.

#### **2.0 Site Clearance**

2.1 Nabhi's commentary on CPWD specifications clause no. 2.4 shall be followed except nothing extra will be paid for removing, diverting existing structures and services and providing fencing for the any archeological monuments within or adjacent to the area.

#### **3.0 Setting out and making profiles**

3.1 Nabhi's commentary on CPWD specifications clause no. 2.5 shall be followed.

#### **4.0 Excavation**

4.1 Nabhi's commentary on CPWD specifications clause no. 2.7 shall be followed up to any width (not restricted to 1.5m) and any area (not restricted to 10 sqm) on plan.

4.2 The Contractor shall do the necessary shoring and strutting or shall provide necessary slopes to a safe angle or steps as required or directed at his own cost. No extra payment shall be made for such precautionary measures, taken

4.3 The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water either sub-soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till the Architect and Engineer-in-charge considers it necessary, i.e. till the concrete is sufficiently set.

**5.0 Disposal of the excavated stuff**

- 5.1 The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers, including ramming and watering etc. complete as directed by the engineer-in-charge.
- 5.2 The Contractor has to dispose the surplus excavated earth within the plot at non objectionable place.
- 5.3 The lead is the shortest practical route and not necessarily the route actually taken. The decision of Engineer-In charge shall be final.
- 6.0 Mode of Measurement and Payment
- 6.1 Nabhi's commentary on CPWD specifications clause no. 2.10, 2.11 shall be followed.
- 6.2 The rate shall also include necessary shoring & strutting, dewatering, getting out the excavated soil, sorting and stacking of useful material, dressing of the sides, ramming of bottom, backfilling into trenches and disposal of surplus excavated earth at non objectionable place within the site.

**1.02 Earth work in excavation by mechanical means / manual means in foundation trenches, drains, manholes and soak wells etc. including necessary shoring & strutting, dewatering, getting out the excavated soil, sorting and stacking of useful material, dressing of the sides, ramming of bottom, backfilling into trenches and disposal of surplus excavated earth at non objectionable place within the site as directed by engineer-in-charge. For all civil, electrical and plumbing works**

**1.02.1 Ordinary Rock**

- a) Depth up to 1.5m
- b) Depth up to 1.5 to 3m
- c) Depth up to 3m to 5m
- d) Depth up to 5m to 7m
- e) Depth up to 7 to 9m
- f) Depth up to 9m to 11m

**1.02.2 Hard Rock (Requiring Blasting)**

Depth as described in 1.02.1

**1.02.3 Hard Rock (Blasting Prohibited)**

Depth as described in 1.02.1

**1.0 General**

- 1.1 Relevant specifications of item no. 1.01 shall be followed except excavation is to be carried out for ordinary rock, Hard rock (Requiring Blasting), Hard rock (Blasting prohibited) as per the CPWD specification clause no. 2.8.

- 1.2 Nabhi's commentary on CPWD specification clause no. 2.8 shall be followed up to any width (not restricted to 1.5m) and any area (not restricted to 10 sqm) on plan.
- 2.0 Blasting**
  - 2.1 Nabhi's commentary on CPWD specifications clause no. 2.6 shall be followed for blasting, general precautions and precautions against misfire.
- 3.0 Disposal of the excavated stuff**
  - 3.1 No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5 m from the distance prescribed by the Architects or engineer-in-charge, from the outer edge of excavation. All materials excavated shall remain the property of the Client. The rate for excavation includes sorting out of useful materials and stacking them separately as directed within the specified lead. Materials suitable and useful for back filling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required for constructional purpose. The site shall be left clean of all debris on completion.
  - 3.2 Disposal of excavated materials is subject to the following
    - 3.2.2 Useful materials obtained from clearing site and excavation shall be stacked within a lead of 50 m., beyond the building, as directed. Materials suitable for back filling shall be stacked at convenient places within a lead of 50 m. from the structure for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 50 m. and will be allowed to be used by the Contractor, on payment at rates laid down in the contract or if not so paid down, at mutually agreed rates. The Contractor has to dispose the surplus excavated material within the plot at non objectionable place.
- 4.0 Mode of Measurement and Payment**
  - 4.1 Nabhi's commentary on CPWD specification clause no. 2.10, 2.11 shall be followed.
  - 4.2 The rate shall also include necessary shoring & strutting, dewatering, getting out the excavated soil, sorting and stacking of useful material, dressing of the sides, ramming of bottom, backfilling into trenches and disposal of surplus excavated earth within a plot at non objectionable place.
- 1.03.a Earth work in excavation for surface excavation not exceeding 30 cms in depth any width and length, including disposal of excavated earth at non objectionable place within the site for all lifts, disposed soil to be leveled and neatly dressed as directed by engineer-in-charge.**
  - 1.03. a.1 For all kinds of soil.**
  - 1.03. a.2 For Ordinary Rock**

Nabhi's commentary on CPWD specifications clause no. 2.12 shall be followed along with relevant specification of item no. 1.01.

**1.03.b Earth work in excavation for mass areas, basements, water tanks, septic tanks, soak wells etc. by mechanical means / manual means including necessary shoring & strutting, dewatering, getting out the excavated soil, sorting and stacking of useful material, dressing of the sides, ramming of bottom and disposal of surplus excavated earth at non objectionable place within the site for all lifts as directed by engineer-in-charge.**

**1.03.b.1 For all kinds of soil.**

**Depth as described in 1.02.1**

**1.03.b.2 For Ordinary Rock**

**Depth as described in 1.02.1**

Nabhi's commentary on CPWD specifications clause no. 2.12 shall be followed except depth will be as specified above upto any width and any area on the plan along with relevant specifications of item no. 1.01, 1.02.

**1.04 Earth work in rough excavation, banking selected approved quality excavated earth in layers not exceeding 20 cms in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers and rolling every 3<sup>rd</sup> and top most layer with power roller / vibratory roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal and guide banks or filling up ground depressions at non objectionable place within the site for all lifts as directed by engineer-in-charge. All kinds of soil**

Nabhi's commentary on CPWD specifications clause no. 2.13 shall be followed along with relevant specifications of item no. 1.01.

**1.05 Banking selected approved quality excavated earth in layers not exceeding 20 cms in depth, breaking clods, watering, rolling each layer with ½ tonne roller or wooden or steel rammers and rolling every 3<sup>rd</sup> and top most layer with power roller of minimum 8 tonnes and dressing up in embankments for roads, flood banks, marginal and guide banks etc., at non objectionable place within the site and lift upto 1.5m as directed by engineer-in-charge.**

Nabhi's commentary on CPWD specifications clause no. 2.13 shall be followed along with relevant specifications of item no. 1.01.

**1.06 Deduct for not rolling with power roller of minimum 8 tonnes for banking excavated earth in layers not exceeding 20 cms in depth.**

Nabhi's commentary on CPWD specifications clause no. 2.13 shall be followed along with relevant specifications of item no. 1.01.

**1.07 Deduct for not watering the excavated earth for banking.**

Nabhi's commentary on CPWD specifications clause no. 2.13 shall be followed along with relevant specifications of item no. 1.01.

**1.08 Excavation in trenches of required width and gradient for pipes, cables as per drawing etc. including excavation for sockets and dressing of sides, ramming of bottoms, depth upto 1.5m including getting out excavated soil and returning (backfilling) the soil as required in layers not exceeding 20 cms in depth including consolidated each deposited layer by ramming, watering etc. and disposing of surplus excavated soil as directed at non objectionable place within the site for all lifts as directed by engineer-in-charge.**

**All Kinds of Soil**

**1.08.1 Pipes, cables not exceeding 80 mm dia.**

**1.08.2 Pipes, Cables etc. exceeding 80 mm dia. But not exceeding 300 mm dia.**

**1.08.3 Pipes, Cables etc. exceeding 300 mm dia. But not exceeding 600 mm dia.**

Nabhi's commentary on CPWD specifications clause no. 2.18 shall be followed except the surplus excavated earth shall be disposed at non objectionable within the site along with relevant specifications of item no. 1.01.

**1.09 Extra for excavating for pipes, trenches, cables etc. in all kinds of soil for depth exceeding 1.5m but not exceeding 3m. (Rate is over corresponding basic item of 1.5m)**

The relevant specifications of item no. 1.08 shall be followed except that the depth of excavation will be from 1.5m to 3.0 m. The excavation work from 1.5 m. to 3.0 m. shall be measured and paid under this item.

**1.10 Extra for excavating trenches, cables etc. in all kinds of soil for depth exceeding 3.0m but not exceeding 4.5m. (Rate is over corresponding basic item of 1.5m)**

The relevant specifications of item no. 1.08 shall be followed except that the depth of excavation will be from 3.0m to 4.5 m. The excavation work from 3.0 m. to 4.5 m. shall be measured and paid under this item

**1.11.a Excavating trenches required width for pipes, cables etc. as per drawing including excavation for sockets and dressing of sides, ramming of bottoms, depth upto 1.5m including getting out excavated soil and returning the selected approved soil as required in layers not exceeding 20 cms in depth including consolidated each deposited layer by ramming, watering etc. and disposing of surplus excavated soil as directed at non objectionable place within the site.**

- 1.11.a.1 Ordinary Rock**
- 1.11.a.1.1 Pipes, cables not exceeding 80 mm dia.**
- 1.11.a.1.2 Pipes, Cables etc. exceeding 80 mm dia. But not exceeding 300 mm dia.**
- 1.11.a.1.3 Pipes, Cables etc. exceeding 300 mm dia. But not exceeding 600 mm dia.**
- 1.11.a.2 Hard Rock (Requiring Blasting)**
- 1.11.a.2.1 Pipes, cables not exceeding 80 mm dia.**
- 1.11.a.2.2 Pipes, Cables etc. exceeding 80 mm dia. But not exceeding 300 mm dia.**
- 1.11.a.2.3 Pipes, Cables etc. exceeding 300 mm dia. But not exceeding 600 mm dia.**
- 1.11.a.3 Hard Rock (Blasting Prohibited)**
- 1.11.a.3.1 Pipes, cables not exceeding 80 mm dia.**
- 1.11.a.3.2 Pipes, Cables etc. exceeding 80 mm dia. But not exceeding 300 mm dia.**
- 1.11.a.3.3 Pipes, Cables etc. exceeding 300 mm dia. But not exceeding 600 mm dia.**

Nabhi's commentary on CPWD specifications clause no. 2.18 shall be followed except the surplus excavated earth shall be disposed at non objectionable within the site along with relevant specifications of item no. 1.01 and 1.02.

- 1.11.b Extra over item no. 1.11.a for excavating trenches, cables etc. in Ordinary / Hard Rock for depth exceeding 1.5m but not exceeding 3m. (Rate is over corresponding basic item of 1.5m)**

The relevant specifications of item no. 1.11 shall be followed except that the depth of excavation will be from 1.5m to 3.0 m. The excavation work from 1.5 m. to 3.0 m. shall be measured and paid under this item.

- 1.11.c Extra over item no. 1.11.a for excavating trenches, cables etc. in Ordinary / Hard Rock for depth exceeding 3.0m but not exceeding 4.5m. (Rate is over corresponding basic item of 1.5m)**

The relevant specifications of item no. 1.11 shall be followed except that the depth of excavation will be from 3.0m to 4.5 m. The excavation work from 3.0 m. to 4.5 m. shall be measured and paid under this item.

- 1.12.a Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered)**

- 1.12.a.1 Depth not exceeding 1.5m**
- 1.12.a.2 Depth exceeding 1.5m but not exceeding 3m**

**1.12.a.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.2, 2.19.4, and 2.19.5 shall be followed.

**1.12.b Close timbering in case of shafts, wells, cesspits, manholes and like including strutting, shoring and packing cavities. (wherever required) complete. (Measurements to be taken of the face area timbered)**

**1.12.b.1 Depth not exceeding 1.5m**

**1.12.b.2 Depth exceeding 1.5m but not exceeding 3m**

**1.12.b.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.2, 2.19.4, and 2.19.5 shall be followed.

**1.12.c Close timbering over areas including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered)**

**1.12.c.1 Depth not exceeding 1.5m**

**1.12.c.2 Depth exceeding 1.5m but not exceeding 3m**

**1.12.c.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.2, 2.19.4, and 2.19.5 shall be followed.

**1.12.d Extra for planking, strutting and packing materials for cavities (in close timbering) if required to be left permanently in position. (Face area of timber permanently left to be measured.)**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.2, 2.19.4, and 2.19.5 shall be followed except that material required for planking, strutting and packing will be left permanently in position.

**1.13.a Open timbering in trenches including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered)**

**1.13.a.1 Depth not exceeding 1.5m**

**1.13.a.2 Depth exceeding 1.5m but not exceeding 3m**

**1.13.a.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.3, 2.19.4, and 2.19.5 shall be followed.

**1.13.b Open timbering in case of shafts, wells, cesspits, manholes and like including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered)**

**1.13.b.1 Depth not exceeding 1.5m**

**1.13.b.2 Depth exceeding 1.5m but not exceeding 3m**

**1.13.b.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.3, 2.19.4, and 2.19.5 shall be followed.

**1.13.c Open timbering over areas including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered)**

**1.13.c.1 Depth not exceeding 1.5m**

**1.13.c.2 Depth exceeding 1.5m but not exceeding 3m**

**1.13.c.3 Depth exceeding 3 m but not exceeding 4.5m**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.3, 2.19.4, and 2.19.5 shall be followed.

**1.13.d Extra for planking, strutting and packing materials for cavities (in open timbering) if required to be left permanently in position. (Face area of timber permanently left to be measured.)**

Nabhi's commentary on CPWD specifications clause no. 2.19.1, 2.19.3, 2.19.4, and 2.19.5 shall be followed. except that material required for planking, strutting and packing will be left permanently in position.

**1.14 Filling/Backfilling with available selected/approved excavated earth the quantity of earth stacked any inside the park (excluding rock and black cotton soil) in foundation, trenches, plinth & plot etc, in layers not exceeding 15 cm. in depth, including breaking the clods, watering to optimum moisture content, ramming and compacting by mechanical means of suitable type of vibrator, including freight, transportation, loading, unloading, screening, passes etc. all complete as instruction & directions of the Engineer-in-charge (Consolidated measurements of fill shall be paid for under this item). The rates shall include for all leads and lifts including transporting using mechanical / manual means within the park area. Note: Using excess available excavated earth from foundations and dressing of the plot area.**

**1.0 Workmanship**



- 1.1 Nabhi's commentary on CPWD specification clause no. 2.21.1, 2.21.2 shall be followed except the earth is to be filled with layers not exceeding 15 cm in depth.
- 1.2 The plinth shall be filled with earth in layers not exceeding 15 cm, adequately watered and consolidated by ramming with iron rammers/ mechanical rollers. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- 1.3 In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified or as directed. The extent of consolidation required shall also be as specified or as directed by engineer-in-charge.
- 1.4 The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths. The soil used for backfilling shall have optimum moisture content (OMC).
- 1.5 The compaction shall be carried out to achieve Proctor density of 95%. The procedure for OMC and proctor density shall be carried out as per relevant IS codes. The samples for test shall be as per the relevant IS codes

## **2.0 Mode of Measurement and Payment**

- 2.1 Nabhi's commentary on CPWD specification clause no. 2.21.3 shall be followed.
  - 2.2 No deductions shall be made for shrinkage or voids. The rate includes the cost of mechanical compaction by compactors. Only consolidated measurements of the fill shall be measured and paid under this item.
- 1.15 Supplying and Filling in foundation, plinth with murrum or selected soil brought from outside in trenches, plinth, sides of foundation etc. in layers not exceeding 15 cm in depth, including watering, ramming, consolidating each deposited layer for all leads and lifts.**

## **1.0 Materials**

### **1.1 Murrum**

- 1.1.1 Murrum shall conform to M-13.

## **2.0 Workmanship**

- 2.1 As soon as the work in foundation has been completed and measured, the sides of foundation shall be cleared of all debris, brick bats, mortar dropping etc. and filled with earth in layers not exceeding 15 cm. Each layer shall be adequately watered, rammed well and consolidated before the succeeding layer is laid. The earth shall be well watered and rammed with Iron rammer, mechanical rammer (plate compactor) of different capacity, as per site condition. Where rammer cannot be used ramming shall be done with blunt

end of crowbars.

- 2.2 The plinth shall be similarly filled with earth in layers not exceeding 15 cm. adequately watered and consolidated by ramming with iron rammers/ mechanical rollers. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- 2.3 The finished level of filling shall be kept to shape and gradient, intended to receive any floor finish.
- 2.4 In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers (light or heavy), mechanical machinery, where so specified or as directed. The extent of consolidation required shall also be as specified or as directed upto OMC.
- 2.5 The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths.
- 2.6 The compaction shall be carried out to achieve Proctor density of 95%. The procedure for OMC and proctor density shall be carried out as per relevant IS codes. The samples for test shall be as per the relevant IS codes.

### **3.0 Mode of Measurements and Payment**

- 3.1 The payment shall be made for filling in plinth and sides of foundations. No deductions shall be made for shrinkage or voids, if considered as instructed above.
- 3.2 The rate includes cost of collecting and carting murrum or selected earth of approved quality with all lead, lift and labor required for filling in foundations and plinth and all the operations as described above.
- 3.3 The rate shall be for an unit of one m<sup>3</sup>.
- 3.4 Only consolidated measurements of the fill shall be measured and paid for under this item.
- 3.5 Receipt of royalty for earth paid to government authority shall be submitted.

**1.16 Filling in plinth with good quality river sand under floors including watering, ramming, consolidating and dressing complete for all lead and lift as directed by engineer in charge.**

### **1.0 Materials**

#### **1.1 Sand**

- 1.1.1 Sand shall conform to M-6.

### **2.0 Workmanship**

- 2.1 Nabhi's commentary on CPWD Specification clause no. 2.22.2 shall be followed along with relevant specifications of item no. 1.15.

### **3.0 Mode of Measurement and Payment**

- 3.1 Nabhi's commentary on CPWD specification clause no. 2.22.3 and 2.22.4 shall be followed along with relevant specifications of item no. 1.15.

**1.17.a Providing and filling with good quality cement cinder 1:10 (1:cement 10:cinder) as directed by the Engineer-in-charge, in sunk in layers of 15 cm. thickness, including watering, placing, ramming properly with wooden rammers (not exceeding 2 Kg in weight) etc. complete, as directed by engineer-in-charge. Minimum required qty of water shall be added until mixture becomes damp. If required curing shall be carried out at least for 7 days by sprinkling required quantity of water so that surface remains damp and not to be done by ponding or flooding.**

### **1.0 Material**

#### **1.1 Cement**

- 1.1.1 Cement shall conform to M-3.

#### **1.2 Cinder**

- 1.2.1 Cinder shall conform to M-9.

### **2.0 Workmanship**

- 2.1 The specified quantity of cement shall properly machine mixed with the cinder so as to form an integral mix with optimum amount of water.

- 2.1 The cinder so prepared shall be placed at any height in sunken slab or any other area as specified in the drawing.

- 2.2 It shall be filled after completion of water proofing treatment/plaster.

- 2.3 The finished level of filling shall be kept to shape and gradient, intended to receive any further floor finish.

### **3.0 Mode of Measurement and Payment**

- 3.1 The payment shall be made for filling in sunks at all floors. No deductions shall be made for shrinkage or voids. Consolidated measurements to be paid for.

- 3.2 The rate shall be for an unit of one m<sup>3</sup>.

**1.17.b Providing and filling, with good quality cinder concrete in 1:4:8(1 cement : 4 sand : 8 cinder), as and where directed by the Architect and Engineer-in-charge, in sunks in**

**layers of 15 cm. thickness, including watering, ramming well etc. complete as directed by engineer in charge.**

**1.0 Material**

**1.1 Cement**

1.1.2 Cement shall conform to M-3.

**1.2 Cinder**

1.2.1 Cinder shall conform to M-9.

**1.3 Sand**

1.3.2 Sand shall conform to M-6.

**2.0 Workmanship**

**2.1 Proportion of mix**

The proportion of cement, sand and cinder shall be specified in the item of the work and shall be measured by volume.

**2.2 Mixing**

The concrete shall be mixed in mechanical mixer. Mixing shall be continued till there is uniform distribution of the material and the mass is uniform in consistency but in no case mixing shall be done for less than 2 to 3 minutes.

**2.3 Laying and compacting**

The concrete shall always be used fresh. It shall be laid (not thrown) in layers not exceeding 150 mm. in thickness and shall be well and quickly rammed with wooden rammers, till the required compaction is achieved. The concrete laid shall not be of too fluid consistency. After it has been mixed, no more water shall be added. The surface during and after compaction shall be kept damp. In laying consecutive layers, the layer cast shall be kept wet, before the upper layer is laid. The concrete shall be kept continuously wet for period of 7 days from the date of placing or until it is built over, whichever is more.

2.4 The cinder so prepared shall be placed at any height in sunken slab or any other area as specified in the drawing.

2.5 It shall be filled after completion of water proofing treatment/plaster.

2.6 The finished level of filling shall be kept to shape and gradient, intended to receive any further floor finish.

**3.0 Mode of Measurement and Payment**

3.1 The payment shall be made for filling in sunks at all floors. No deductions shall be made for shrinkage or voids. Consolidated measurements to be paid for.

3.3 The rate shall be for an unit of one cum.

**1.18.a Providing and laying rubble soling in plinth and for plinth protection, compacted thickness specified as following, using specified size of hard stones, filling, covering and leveling the surface with a layer of murrum after filling the voids with smaller size black trap stones 20-40mm, 40-63mm, 63-90, 90-150mm size of stone/metals or stone chips, including watering, ramming well and consolidating each layer by static roller/ vibratory roller or as directed by Engineer-in charge.**

**1.18.a.1 150mm compacted thickness using 100 to 150mm cut size stones**

**1.18.a.2 230mm compacted thickness using 150 to 230mm cut size stones**

**1.0 Material**

**1.1 Murrum**

Murrum shall conform to M-13.

**1.2 Stone**

Stone shall conform to M-14.

**2.0 Workmanship**

1.1 Rubbles of average size 100-150mm or 150 to 230mm as per specified thickness shall be laid closely in position on the sub grade for plinth and plinth protection. Thereafter, the voids between the stones laid in the first layer shall be filled by hand packing the stones of smaller size or stone chips of the same stones to ensure tight packing and complete filling of interstices, as directed. The voids shall be filled with 20-40mm, 40-63mm, 63-90mm size of stones. The layers then shall be rammed well and consolidated.

1.2 The relevant specification of item no. 1.15 shall be followed except that first layer of stone of average size of stone as per item description shall be laid in plinth and for plinth protection.

1.3 The surface of the stone layer then shall be filled, covered and leveled with a layer of murrum. This shall then be watered and well consolidated using power driven rammers or rollers, as directed. The consolidated thickness of the above layers, totally, should be of as per item description or as specified in the drawing.

1.4 Rubble soling shall be started only after antitermite treatment is completed in plinth & plinth protection.

**2.0 Mode of Measurements and Payment:**

2.1 Compacted thickness of rubble soiling shall be measured.

The rate includes the cost of collecting, carting stones and murrum, with all leads, lifts and

labour for laying, hand packing and consolidating the same in plinth or plinth protection

2.2 The rate shall be for an unit of one cum.

**1.18.b Providing and laying rubble soling in plinth and for plinth protection, compacted thickness specified as following, using specified size of hard stones, filling, covering and leveling the surface with a layer of sand after filling the voids with smaller sized black trap stones 20-40mm, 40-63mm, 63-90, 90-150mm size of stone/metals or stone chips, including watering, ramming well and consolidating each layer by static roller/ vibratory roller or as directed by Engineer-in-charge.**

**1.18.b.1 150mm compacted thickness using 100 to 150mm cut size stones**

**1.18.b.2 230mm compacted thickness using 150 to 230mm cut size stones**

**1.0 Material**

**1.1 Sand**

1.1.1 Sand shall conform to M-6.

**1.2 Stone**

1.2.1 Stone shall conform to M-14.

**2.0 Workmanship**

2.1 Workmanship shall be as per item no. 1.18.a shall be followed except sand shall be filled in voids instead of murrum.

**3.0 Mode of Measurement**

3.1 Relevant specification of item no. 1.18.a shall be followed.

**1.19 Disposing of the surplus excavated earth and/or debris etc. including loading at site, transporting by mechanical or manual means & disposal, unloading, spreading and dressing and compacting etc. complete as directed beyond the initial lead of 50 m and all lifts.**

**1.19.1 0.5km**

**1.19.2 1km**

**1.19.3 1.5km**

**1.19.4 2km**

**1.19.5 2.5km**

**1.19.6 3km**

**1.19.7 3.5km**

**1.19.8 4km**

**1.19.9 4.5km**

**1.19.10 5km**

**1.0 General:**

- 1.1 The distance for lead shall be as per the item description.
- 1.2 All the excavated material shall be the property of the Government. Where the excavated material is directed to be used in the construction of the works for general grading, plinth filling or embankments, the operations shall be arranged in such a manner that the capacity for cutting, haulage and compaction are nearly the same.
- 1.3 All hard materials such as hard murrum, rubble etc. not intended for filling in foundations, plinth or embankments shall be stacked neatly for future use as directed by the Engineer. The contractor on his own risk shall dispose off unsuitable or surplus materials not intended for use in part of the works or for reuse outside the work site.
- 1.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, riprap with regular slopes within the lead specified and levelling. As a rule, all softer material shall be laid along the centre of the heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Excavated soft rock or hard rock shall be stacked separately.

**2.0 Workmanship:**

- 1.1 The surplus excavated earth shall be disposed off as and when directed by the Architect or Engineer-in-charge. In case the excavated earth is to be stacked inside the plot, the location of the stack shall be directed by the architect or engineer in charge. If earth is to be disposed outside the plot, non-objectionable site shall be selected by the contractor.
- 1.2 The disposal of the stuff includes loading the earth in vehicle, conveyance to the specified site, unloading and spreading and compacting the same.
- 1.3 The Contractor should contact the Engineer-In-Charge before disposing the material.

**3.0 Mode of measurements and payment:**

- 3.1 The actual measurements of the disposed earth shall be calculated by taking actual levels of the original ground before start of the work after site clearance and after compaction of the fill as specified. Quantity of the earth so computed shall be reduced by 10% in case of consolidated fills, 5% in case of consolidation is done by heavy equipment. No

deduction will be done in case of consolidation heavy mechanical machinery at optimum moisture content. The quantity of the earth worked out for interim payment by taking lorry measurements; have to be reduced by 20%.

- 3.2 The rate includes for spreading, dressing etc. complete at the specified site and shall be for an unit of one cum.
- 3.3 The Final quantity of the transported earth shall be worked out after overall reconciliation of excavation, filling and disposing of the earth for whole site.

**1.20 Carrying out pre construction anti-termite treatment for all types of structure with / without basement with RCC foundation/RCC wall or with load bearing walled foundation. The chemical used shall be like chloropyriphos, Biflex TC, lindane etc. as per latest IS code no 6313 (Part II). Plinth area in plan at GF shall only be measured and paid. A guarantee bond of 10 years shall be furnished. Rate shall be inclusive of material required for Anti Termite Treatment and labour for applying.**

Nabhi's commentary on CPWD specifications – clause no. 2.26.0, 2.26.1, 2.26.2, 2.26.3 shall be followed.

- 1.0 The treatment against termite infection shall remain effective for a period not less than 10 years, from date of issue of the final certificate of completion of work. If at any time during this period, any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the Contractor shall rectify the concerned defects within 15 days on receipt of notice from Engineer-in-charge. On Contractor's failure to do so the Engineer-in-charge may get the same rectified through any other agency at the Contractor's risk and cost, and the decision of Architect or Engineer-in-charge as to the cost payable by the Contractor for the same shall be final and binding to the Contractor.
- 2.0 **Unless otherwise specified antitermite treatment shall be executed through approved specialized anti termite agency. Contractor shall furnish a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same which is also to be signed by the specialized agency. However, soul responsibility shall be of main contractor for any leakages.**
- 3.0 **Copy of work order mentioning the rate issued to the specialized agency shall be attached with guarantee bond.**
- 4.0 A guarantee bond on appropriately stamp paper shall be given by the contractor to the client in the manner form prescribed below:

**FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by termite or any other germs of similar types, for a period of 10 years after completion of the work of anti-termite, as per the terms and



conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of termite and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Client and further guarantees to redo the affected work without claiming any extra cost”

5.0 **This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.**

6.0 The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after virtual completion of the work.

1.21 **Carrying out post construction anti termite treatment / plinth treatment to existing structure by spraying chemical solution for termite control treatment including labour and material like chloropyriphos or biflex as per the latest IS code 6313 (Part III).**

Nabhi's commentary on CPWD specifications – clause no. 2.26.0, 2.26.1, 2.26.2, 2.26.4 shall be followed.

1.0 The treatment against termite infection shall remain effective for a period not less than 10 years, from date of issue of the final certificate of completion of work. If at any time during this period, any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the Contractor shall rectify the concerned defects within 15 days on receipt of notice from Engineer-in-charge. On Contractor's failure to do so, the Engineer-in-charge may get the same rectified through any other agency at the Contractor's risk and cost, and the decision of Architect or Engineer-in-charge as to the cost payable by the Contractor for the same shall be final and binding to the Contractor.

2.0 A guarantee bond on Twenty Rupee stamp paper shall be given by the Contractor to the Government, in the manner form described below

#### **FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by termite or any other germs of similar types, for a period of 10 years after completion of the work of anti-termite, as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of termite and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Client and further guarantees to redo the affected work without claiming any extra cost”

3.0 This guarantee shall remain force for the period of 10 years, from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 year.

4.0 The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after virtual completion of the work.

**1.22 Surface dressing of the ground including removing vegetation and in-equalities not exceeding 15 cm deep and disposal of rubbish (unwanted material) anywhere outside the site at non objectionable place. (Item shall be operated after prior approval from the client.) Site shall be selected by contractor.All kinds of Soil**

Nabhi's commentary on CPWD specifications – clause no. 2.23 shall be followed except the material is to be disposed outside the plot at non objectionable place. Site shall be selected by contractor.

**1.23 Clearing jungle including uprooting of rank vegetation, glass, brush, wood, trees and saplings of girth upto 30 cm measured at a height of 1 m above ground level and removal of rubbish upto a distance of 50m outside the periphery of the area cleared. Item shall be operated after prior approval from the client**

Nabhi's commentary on CPWD specifications – clause no. 2.24.0, 2.24.1, 2.24.2, 2.24.4, 2.24.5 shall be followed.

**1.24 Clearing grass and removal of the rubbish up to a distance of 50m outside the periphery of the area cleared.**

Nabhi's commentary on CPWD specifications – clause no. 2.24.3, 2.24.4, 2.24.5 shall be followed.

**1.25 Felling trees of the girth (measured at a height of 1 m above ground level) including cutting of the trunks and branches removing the roots and stacking of serviceable material shall be at non objectionable place within the site and disposal of unserviceable material anywhere outside the plot area at non objectionable place for all leads and lifts. Site shall be selected by contractor.**

**1.25.1 Beyond 30 cm girth upto and including 60 cm girth.**

**1.25.2 Beyond 60 cm girth upto and including 120 cm girth.**

**1.25.3 Beyond 120 cm girth upto and including 240 cm girth.**

**1.25.4 Above 240 cm girth**

Nabhi's commentary on CPWD specifications – clause no. 2.25 shall be followed. except the disposal of unserviceable material shall be anywhere outside the plot area at non objectionable place for all leads and lifts. Site shall be selected by contractor.

**1.26 Providing and injecting Chemical emulsion for PRE - CONSTRUCTIONAL anti-termite treatment and creating a chemical barrier on the top surface of plinth filling, junction of inside wall and floor, on top of damp proof course (DPC) or on masonry at level of plinth filling as per IS 6313 (Part-2)-1981 using chemical like chloropyripos emulsifiable (IS 8944-1978) 20EC mixed with water in 1:19 ratio (1 liter chemical: 19 litres of water). The emulsion is spread at 5 litres / sqm on top of plinth filling, top of damp proof coarse and 1 litre / linear meter along the junction of wall and floor at all stages mentioned below, all as per specification and directions of Engineer-in-charge. Plinth area of building at ground floor only shall be measured.**

**A1) Bottom surface and the sides of the excavation made for masonry foundations at the rate of 4 liters/sqm (wherever applicable)**

**A2) At the rate of 7.5 liter/ sqm to the backfill at the depth of 500mm below the original ground level. The soil in the immediate contact with the vertical surface of RCC column/Masonry shall be treated**

**B) Top surface of the plinth filling at the rate of 5 liter/sqm of internal plinth area etc. complete**

**C) At the rate of 7.5 litre/ sqm to the internal vertical surface from original Ground level to top of the earth filled in the plinth.**

**D) At the rate of 7.5 litre/ sqm to the external vertical surface below finished Ground level to the full depth of the filling complete.**

**1 Materials:**

1.1 The chemicals used for the soil treatment shall be only one of the following, with concentration shown against each, in aqueous emulsion.

Chemical Concentration: **Chloropyriphos 20%**

**Dursban of Nocil      Kannodene of Kanoria Lindane of Kanoria**

**2 Workmanship**

2.1 The chemical barrier shall be complete and continuous under whole of the structure to be protected.

2.2 The treatment shall be done as per the PCI specifications.

2.2.1 Treatment for building shall start after the excavation is complete and before laying soiling and PCC. The treatment shall be carried out in the following stages:

**2.2.2 Treatment to soil below raft:**

The soil in the raft shall be compacted and levelled with mechanical rollers. The procedure of the same is covered in the relevant item no. The surface of earth shall be treated with

emulsion at the rate of 5 liters per sqm. The treatment shall be done before laying rubble soling and PCC.

**2.2.3 Treatment to soil along the retaining wall:**

The soil along the retaining wall shall be treated at the rate of 5 liters per sqm. The treatment shall follow the backfilling which shall be done in layers of 30 cms. Rodding shall be carried out to facilitate the absorption of the chemical emulsion.

**2.2.4 Treatment of soil along the external perimeter of the building:**

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

**2.2.5 Treatment of soil surrounding pipes, wastes and conduits:** The soil surrounding pipes, waste pipes and conduits in the plinth shall be loosened to facilitate the absorption of emulsion. Rodding is performed at 15cm interval and upto a depth of 30cm.

The chemical treatment shall be carried out when the surface is quite dry. Chemical treatment shall not be carried out when it is raining or when the soil is wet with rainwater or sub soil water.

Once formed, treated soil barriers shall be not disturbed. If disturbed, immediate steps shall be taken to restore the continuity and compactness of the barrier system.

Reconciliation of chemicals brought on site and used for treatment shall be submitted on completion of job.

The treatment against termite infection shall remain effective for a period not less than 10 years, from date of issue of the final certificate of completion of work. If at any time during this period, any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the Contractor shall rectify the concerned defects within 15 days on receipt of notice from Engineer-in-charge. On Contractor's failure to do so, the Engineer-in-charge may get the same rectified through any other agency at the Contractor's risk and cost, and the decision of Architect or Engineer-in-charge as to the cost payable by the Contractor for the same shall be final and binding to the Contractor.

**2.2.6 A guarantee bond on Twenty Rupee stamp paper shall be given by the Contractor to the Government, in the manner form described below:**

**FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by termite or any other germs of similar types, for a period of 10 years after completion of the work of anti-termite, as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Government from any loss and or damage that might be caused on account of termite and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Government and further guarantees to redo the affected work without claiming any extra cost."

**2.2.7** This guarantee shall remain force for the period of 10 years, from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

**2.2.8** The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after virtual completion of the work.

**2.3 Mode of Measurements and Payment:**

**2.3.5** The plan area at ground floor shall be measured and paid. No deduction shall be made nor extra paid for any opening for pipes, etc., up to 0.1 m<sup>2</sup>. The rate shall include the cost of all labour and materials required for the operation involved for satisfactory completion of this item.

**2.3.6** The rate shall be for an unit of one m<sup>2</sup>.

**1.28 Cleaning, removing and disposing of debris etc from site and disposing the same as directed by engineer in charge with all lead and lift and stacking of useful material as per relevant IS standard specification.**

**1.0 General:**

1.2 The distance for lead shall be as per the item description.

1.2 All the excavated material shall be the property of the Government. Where the excavated material is directed to be used in the construction of the works for general grading, plinth filling or embankments, the operations shall be arranged in such a manner that the capacity for cutting, haulage and compaction are nearly the same.

1.3 All hard materials such as hard murrum, rubble etc. not intended for filling in foundations, plinth or embankments shall be stacked neatly for future use as directed by the Engineer. The contractor on his own risk shall dispose off unsuitable or surplus materials not intended for use in part of the works or for reuse outside the work site.

1.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, riprap with regular slopes within the lead specified and levelling. As a rule, all softer material shall be laid along the centre of the heaps, the harder and more weather resisting materials forming the casing on

the sides and the top. Excavated soft rock or hard rock shall be stacked separately.

## 2.0 Workmanship:

The surplus excavated debris, earthwork etc shall be disposed off as and when directed by the Architect or Engineer-in-charge. In case the excavated earth is to be stacked inside the plot, the location of the stack shall be directed by the architect or engineer in charge. If debris, earthwork etc is to be disposed outside the plot, non-objectionable site shall be selected by the contractor.

The disposal of the stuff includes loading the earth in vehicle, conveyance to the specified site, unloading and spreading and compacting the same.

The Contractor should contact the Engineer-In-Charge before disposing the material.

## 3.0 Mode of measurements and payment:

3.1 The actual measurements of the disposed debris, earthwork etc shall be calculated by taking actual levels of the original ground before start of the work after site clearance and after compaction of the fill as specified. Quantity of the earth so computed shall be reduced by 10% in case of consolidated fills, 5% in case of consolidation is done by heavy equipment. No deduction will be done in case of consolidation heavy mechanical machinery at optimum moisture content. The quantity of the debris, earthwork etc worked out for interim payment by taking lorry measurements; have to be reduced by 20%.

3.2 The rate includes for spreading, dressing etc. complete at the specified site and shall be for an unit of one cum.

3.3 The Final quantity of the transported debris, earthwork etc shall be worked out after overall reconciliation of excavation, filling and disposing of the debris, earthwork etc for whole site.

**1.29 Clearing and grubbing the site consists of unsuitable for incorporation in works from the area of site by cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil, rubbish, stone pitching, garbage, dismantle building materials, etc., from the area of work site.**

### 1. 1. Scope

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil not exceeding 100 mm in thickness, rubbish etc., which in the opinion of the Engineer are unsuitable for incorporation in the works, from the area of road land containing road embankment, drains, cross-drainage structures and such other areas as may be specified on the drawings or by the Engineer. It shall include necessary excavation, backfilling of pits

resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials. Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these Specifications.

## **1.2. Preservation of Property/Amenities**

Roadside trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all highway facilities within or adjacent to the highway which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional works to that effect vide Clause 306. Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan including the procedure to be followed for disposal of waste materials etc., and the schedules for carrying out temporary and permanent erosion control works as stipulated in Clause 306.3.

## **1.3. Methods, Tools and Equipment's**

Only such methods, tools and equipment as are approved by the Engineer and which will not affect the property to be preserved shall be adopted for the Work. If the area has thick vegetation/roots/trees, a crawler or pneumatic tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc., falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the subgrade. Also, all vegetation such as roots, under-growth, grass and other deleterious matter unsuitable for incorporation in the embankment/subgrade shall be removed between fill lines to the satisfaction of the Engineer. On areas beyond these limits, trees and stumps required to be removed as directed by the Engineer shall be cut down to 1 m below ground level so that these do not present an unsightly appearance.

All branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding area.

Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several metres, shall be suitably treated.

## **1.4 Disposal of Materials**

All materials arising from clearing and grubbing operations shall be the property of Government and shall be disposed of by the Contractor as hereinafter provided or directed by the Engineer.

Trunks, branches and stumps of trees shall be cleaned of limbs and roots and stacked. Also boulders, stones and other materials usable in road construction shall be neatly stacked as directed by the Engineer. Stacking of stumps, boulders, stones etc., shall be done at specified spots with all lifts and lead.

All products of clearing and grubbing which, in the opinion of the Engineer, cannot be used or auctioned shall be cleared away from the roadside in a manner as directed by the Engineer. Care shall be taken to see that unsuitable waste materials are disposed of in such a manner that there is no likelihood of these getting mixed up with the materials meant for embankment, subgrade and road construction.

### **1.5. Measurements for Payment**

Clearing grubbing for road embankment, drains and cross-drainage structures shall be measured on area basis in terms of Hectare. Clearing and grubbing of borrow areas shall be deemed to be a part of works preparatory to embankment construction and shall be deemed to have been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same. Cutting of trees up to 300 mm in girth including removal of stumps and roots, and trimming of branches of trees extending above the roadway shall be considered incidental to the clearing and grubbing operations. Removal of stumps left over after trees have been cut by any other agency shall also be considered incidental to the clearing and grubbing operations.

### **1.30 Embankment construction behind the retaining wall with general earth filling materials from selected excavated / selected borrow area at OMC to 95 % proctor density by using vibratory roller for compaction as per the specifications, drawings and as directed by the Engineer within the project length.**

#### **1. General**

**1.1 Description:** These Specifications shall apply to the construction of embankments including sub grades, earthen shoulders and miscellaneous backfill with approved material obtained from roadway and drain excavation, borrow pits or other sources. All embankments, sub grades, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer.

#### **2 Materials and General Requirements**

##### **2.1 Physical requirements:**



**2.1.1** The materials used in embankments, sub grades, earthen shoulders and miscellaneous backfills shall be soil, murrum, gravel, a mixture of these or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment/subgrade.

The following types of material shall be considered unsuitable for embankment:

- a) Materials from swamps, marshes and bogs;
- b) Peat, log, stump and perishable material; any soil that classifies as OL, OI, OH or Pt in accordance with IS : 1498;
- c) Materials susceptible to spontaneous combustion;
- d) Materials in a frozen condition;
- e) Clay having liquid limit exceeding 70 and plasticity index exceeding 45; and
- f) Materials with salts resulting in leaching in the embankment.

**2.1.2.** Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 per cent when tested as per IS: 2720 – Part 40) shall not be used as a fill material. Where an expansive clay with acceptable "free swelling index" value is used as a fill material, subgrade and top 500 mm portion of the embankment just below subgrade shall be non-expansive in nature.

**2.1.3** Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO<sub>3</sub>) per litre when tested in accordance with BS: 1377 Test 10, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract, of concrete, cement bound materials or other cementitious materials forming part of the Permanent Works.

Materials with a total sulphate content (expressed as SO<sub>3</sub>) exceeding 0.5 percent by mass, when tested in accordance with BS : 1377 Test 9 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

**2.1.4.** The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the embankment and 50 mm when placed in subgrade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

**2.1.5.** Ordinarily, only the materials satisfying the density requirements given in Table 300-1 shall be employed for the construction of the embankment and the subgrade.

**TABLE 300-1. DENSITY REQUIREMENTS OF EMBANKMENT AND SUBGRADE MATERIALS**

S.No	Type of Work	Maximum laboratory dry unit weight when tested as per IS
:	2720 (Part 8)	
1	Embankments up to 3 metres height, not subjected to extensive flooding.	Not less than 15.2 kN/cu. m.
2	Embankments exceeding 3 metres height or embankments of any height subject to long periods of inundation	Not less than 16.0 kN/cu. m
3	Subgrade and earthen shoulders/ verges/backfill	Not less than 17.5 kN/cu. m

Notes: (1) This Table is not applicable for lightweight fill material e.g. cinder, fly ash etc.

(2) The Engineer may relax these requirements at his discretion taking into account the availability of materials for construction and other relevant factors.

(3) The material to be used in subgrade should also satisfy design CBR at the dry unit weight applicable as per Table 300-2

## 2.2 General requirements:

**2.2.1** The materials for embankment shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same Contract.

The work shall be so planned and executed that the best available materials are saved for the subgrade and the embankment portion just below the subgrade.

**2.2.2 Borrow materials:** Where the materials are to be obtained from designated borrow areas, the location, size and shape of these areas shall be as indicated by the Engineer and the same shall not be opened without his written permission. Where specific borrow areas are not designated by the Employer/the Engineer, arrangement for locating the source of supply of material for embankment and subgrade as well as compliance to environmental requirements in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests,

Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10 m.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Should the Contractor be permitted to remove acceptable material from the site to suit his operational procedure, then he shall make good any consequent deficit of material arising therefrom.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the subgrade material when compacted to the density requirements as in Table 300-2 shall yield the design CBR value of the subgrade.

**TABLE 300-2 COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE**

Type of work/ material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part8)
1. Subgrade and earthen shoulders	Not less than 97
2. Embankment	Not less than 95

3. Expansive Clays

a) Subgrade and 500 mm portion just below the subgrade Not allowed

b) Remaining portion of embankment Not less than 90

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

- (i) The values of maximum dry density and optimum moisture content obtained in accordance with IS : 2720 (Part 7) or (Part 8), as the case may be, appropriate for each of the fill materials he intends to use.
- (ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.
- (iii) The Dry density-moisture content - CBR relationships for light, intermediate and heavy compactive efforts (light corresponding to IS : 2720 (Part 7), heavy corresponding to IS : 2720 (Part 8) and intermediate in-between the two) for each of the fill materials he intends to use in the subgrade.

Once the above information has been approved by the Engineer, it shall form the basis for compaction.

**3 Construction Operations**

**3.1 Setting out:** After the site has been cleared to Clause 201, the work shall be set out to Clause 301.3.1. The limits of embankment/subgrade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment/subgrade shall be built sufficiently wider than the design dimension so that surplus material may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.

**3.2 Dewatering:** If the foundation of the embankment is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore it to original condition or compensate the damage at his own cost.

If the embankment is to be constructed under water, Clause 305.4.6 shall apply.

**3.3 Stripping and storing topsoil:** In localities where most of the available embankment materials are not conducive to plant growth, or when so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment

foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

- 3.4 Compacting ground supporting embankment/subgrade:** Where necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling so as to achieve minimum dry density as given in Table 300-2.

In case where the difference between the subgrade level (top of the subgrade on which pavement rests) and ground level is less than 0.5 m and the ground does not have 97 per cent relative compaction with respect to the dry density as given in Table 300-2, the ground shall be loosened upto a level 0.5 m below the subgrade level, watered and compacted in layers in accordance with Clause 305.3.5 and 305.3.6 to not less than 97 per cent of dry density as given in Table 300-2.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Embankment or subgrade work shall not proceed until the foundations for embankment/subgrade have been inspected by the Engineer for satisfactory condition and approved.

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed by borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which an embankment is to be built has any of the material types (a) to (f) in Clause 305.2.1, at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

### **3.5 Spreading material in layers and bringing to appropriate moisture content**

- 3.5.1** The embankment and subgrade material shall be spread in layers of uniform thickness not exceeding 200 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per Clause 305.3.6. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.
- 3.5.2** Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be

made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, discing or harrowing until a uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS : 2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with IS : 2720 (Part 7) or IS : 2720 (Part 8) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the subgrade.

- 3.5.3** Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations steeper

than 1 vertical on 4 horizontals, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

All permanent faces of side slopes of embankments and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

- 3.6 Compaction:** Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Smooth wheeled, vibratory, pneumatic tyred, sheepsfoot or pad foot rollers, etc. of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of vibratory roller of 80 to 100 kN static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.

The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density gauge used in accordance with agreed procedure and the gauge is calibrated to provide results identical to that obtained from tests in accordance with IS : 2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurements reveal any soft areas in the embankment /subgrade/earthen shoulders, further compaction shall be carried out as directed by the Engineer. If in spite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

- 3.7 Drainage:** The surface of the embankment/subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent pounding.



- 3.8 Repairing of damages caused by rain/spillage of water:** The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density in accordance with Clause 305.3.6. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery/equipment for the purpose.
- 3.9 Finishing operations:** Finishing operations shall include the work of shaping and dressing the shoulders/verge/roadbed and side slopes to conform to the alignment, levels, cross-sections and dimension shown on the drawings or as directed by the Engineer subject to the surface tolerance described in Clause 902. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil, removed and conserved earlier (Clause 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moistened slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirement of Clause 308.

When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

#### **4 Construction of Embankment and Subgrade under Special Conditions**

- 4.1. Earthwork for widening existing road embankment:** When an existing embankment and/or subgrade is to be widened and its slopes are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment/subgrade material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment/subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of small vibratory



rollers/plate compactors/power rammers or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

- 4.2 Earthwork for embankment and subgrade to be placed against sloping ground:** Where an embankment/subgrade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed/scarified as required in Clause 305.4.1 before placing the embankment/subgrade material. Extra earthwork involved in benching or due to ploughing/scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall and subsoil drains at the lowest point shall be provided as per the drawings, before the fill is placed against sloping ground.

Where the Contract requires construction of transverse subsurface drain at the cut-fill interface, work on the same shall be carried out to Clause 309 in proper sequence with the embankment and subgrade work as approved by the Engineer.

- 4.3 Earthwork over existing road surface:** Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below:

- (i) If the existing road surface is of granular or bituminous type and lies within 1m of the new subgrade level, the same shall be scarified to a depth of 50mm or more if specified, so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.
- (ii) If the existing road surface is of cement concrete type and lies within 1 m of the new subgrade level the same shall be removed completely.
- (iii) If the level difference between the existing road surface and the new formation level is more than 1 m, the existing surface shall be permitted to stay in place without any modification.

- 4.4 Embankment and subgrade around structures:** To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has given by the Engineer

but in any case not until the concrete or masonry has been in position for 14 days. The embankment and subgrade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS : 2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in Appendix 6 of IRC : 78 (Standard Specifications and Code of Practice for Road Bridges-Section VII) in respect of the type of material, the extent of backfill, its laying and compaction etc. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2502/309.3.2 (B) unless otherwise specified in the Contract.

Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

**4.5 Construction of embankment over ground incapable of supporting construction equipment:** Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the embankment shall be constructed as specified in Clause 305.3.

**4.6 Embankment construction under water:** Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise

approved by the Engineer. Acceptable granular material shall consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

- 4.7 Earthwork for high embankment:** In the case of high embankments, the Contractor shall normally use the material from the specified borrow area. In case he desires to use different material for his own convenience, he shall have to carry out necessary soil investigations and redesign the high embankment at his own cost. The Contractor shall then furnish the soil test data and design of high embankment for approval of the Engineer, who reserves the right to accept or reject it.

If necessary, stage construction of fills and any controlled rates of filling shall be carried out in accordance with the Contract including installation of instruments and its monitoring.

Where required, the Contractor shall surcharge embankments or other areas of fill with approved material for the periods specified in the Contract. If settlement of surcharged fill results in any surcharging material, which is unacceptable for use in the fill being surcharged, lying below formation level, the Contractor shall remove the unacceptable material and dispose it as per direction of the Engineer. He shall then bring the resultant level up to formation level with acceptable material.

- 4.8 Settlement period:** Where settlement period is specified in the Contract, the embankment shall remain in place for the required settlement period before excavating for abutment, wing wall, retaining wall, footings, etc., or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the Contract or as directed by the Engineer.

**5 Plying of traffic:**

Construction and other vehicular traffic shall not use the prepared surface of the embankment and/or subgrade without the prior permission of the Engineer. Any damage arising out of such use shall, however, be made good by the Contractor at his own expense as directed by the Engineer.

**6 Surface Finish and Quality Control of Work**

The surface finish of construction of subgrade shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised in accordance with Clause 903.

**7 Subgrade Strength**

- 7.1** It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR.

- 7.2** Subgrade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of construction subgrade shall be determined on undisturbed samples cut out from the compacted subgrade in CBR mould fitted with cutting shoe or on remoulded samples, compacted to the field density at the field moisture content.

## **8 Measurements for Payment**

Earth embankment/subgrade construction shall be measured separately by taking cross sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic metres by the method of average end areas.

The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cu. m of suitable material brought to site from road and drainage excavation forms one cu. m. of compacted fill and all bulking or shrinkage shall be ignored.

Construction of embankment under water shall be measured in cu. m.

Construction of high embankment with specified material and in specified manner shall be measured in cu. m.

Stripping including storing and reapplication of topsoil shall be measured in cu. m.

Work involving loosening and re-compacting of ground supporting embankment / subgrade shall be measured in cu. m.

Removal of unsuitable material at embankment/subgrade foundation and replacement with suitable material shall be measured in cu. m.

Scarifying existing granular/bituminous road surface shall be measured in square metres.

Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cu. m.

## **9 Rates**

**9.1** The Contract unit rates for the items of embankment and subgrade construction shall be payment in full for carrying out the required operations including full compensation for:

- (i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;
- (ii) Setting out;

- (iii) Compacting ground supporting embankment/subgrade except where removal and replacement of unsuitable material or loosening and recompacting is involved;
- (iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and subgrade as applicable;
- (ii) Cost of watering or drying of material in borrow areas and/or embankment and subgrade during construction as required;
- (iii) Spreading in layers, bringing to appropriate moisture content and compacting to Specification requirements;
- (iv) Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners;
- (v) Restricted working at sites of structures;
- (vi) Working on narrow width of embankment and subgrade;
- (vii) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and subgrade site with all lifts and leads unless otherwise provided for in the Contract;
- (xi) All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications;
- (xii) Dewatering; and
- (xiii) Keeping the embankment/completed formation free of water as per Clause 311.

**9.2** In case the Contract unit rate specified is not inclusive of all leads, the unit rate for transporting material beyond the initial lead, as specified in the Contract for construction of embankment and subgrade shall be inclusive of full compensation for all labour, equipment, tools and incidentals necessary on account of the additional haul or transportation involved beyond the specified initial lead.

**9.3** Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil and of reapplication of topsoil.

**9.4** Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment/subgrade foundation.

**9.5** Clause 301.9.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material respectively.

**9.6** The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work.

This will also comprise of handling, salvaging, stacking and disposing of the dismantled materials within all lifts and lead or as otherwise specified.

- 9.7 Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.
- 9.8 The Contract unit rate for providing and laying filter material behind abutments shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.
- 9.9 Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.
- 9.10 Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.

**1.31 SPECIAL FILL BEHIND RETAINING WALL**

**Backfilling above the water table with selected granular materials from selected excavated / selected borrow area at OMC to 95 % proctor density by using vibratory roller for compaction as per the specifications, drawings and as directed by the Engineer**

The back filling shall follow in sequential manner after placing of each lift of retaining wall heights/levels as shown in the approved drawings.

Selected granular borrow base fill material of quality as specified in section 305 of MORT&H specifications (August 2001) shall be used, placed and compacted in the Active Zone behind the Reinforced Retaining Wall as shown in the drawings, for all purposes of back filling with following modifications/ additions.

The fill materials in Active Zone shall conform to the grading requirements given in Table 300-3, class III of MORTH Specifications (August 2001). Mechanically stabilised earth shall be of good quality, free draining, granular and/or selected fill. The recommended soil gradation is in the range of).02 mm to 6mm or as indicated in the drawings.

The phi (angle of repose) values shall not be less than 30 degrees.

The back filled materials shall be compacted to the extent relative compaction as percentage of maximum laboratory dry density worked out as per IS: 2720 (Part 8) shall not be less than 95% modified proctor density.

All required care shall be taken for keeping Retaining wall intact and to ensure that they are not damaged while dumping, spreading, watering and compacting of the backfilled materials.

**The measurements for this item shall be in Cubic meter and the rate shall be inclusive of followings:**

1. Cost of arrangement of land as a source of material of required quality and quantity for construction.
2. Compacting ground supporting Backfilling / Sub-grade.
3. Cost of watering or drying of material in borrow area during construction as required.
4. Spreading in layers bringing to appropriate moisture content and compacting to specification requirements.
5. Spreading and dressing top and slopes of the filling including rounding of corners.
6. All labour, material, tools, equipments and incidentals necessary to complete the work to the specifications.

**Before starting the work of this item, the contractor shall submit the method statement for scrutiny of the Engineer. No work shall be commenced for this item before the method statement given by the contractor is approved.**

Successive layers shall not be placed until the layer under construction has been thoroughly compacted so that relative compaction as percentage of maximum laboratory dry density tested as per IS: 2720 (Part-B) shall not be less than 95.

All care shall be taken by the contractor for not disturbing / damaging the Retaining wall.

To the extent available, selected surplus soils from the excavation shall be used as backfill as may be directed by the Engineer and after obtaining his concurrence before actually taking any action in the re-use of this excavated stuff. Fill material shall be free from clots, salts, sulphates, and organic or other foreign deleterious materials. All clots of earth shall be broken or removed. The contractor may use the back filling material available from river bed if found suitable.

If any selected fill material is required to be borrowed the contractor shall make arrangement for bringing the material from outside borrow pits. The material sources shall be subject to the prior approval of the Engineer. The contractor shall make necessary access roads to such borrow areas at his own cost, if such access roads do not exist.

Backfilling shall be carried out in such a manner as not to cause undue thrust on any part of the structure. Annular space around foundations shall be back filled with coarse sand after clearing it of all debris and in layers of 150 mm. loose thickness, watered and compacted to the satisfaction of the engineer in charge and up to the original surface level. The remaining back filling shall be done in like manner as aforesaid, using excavated earth if approved or by borrowed earth from approved source.

Where necessary to facilitate compaction of the ground to 95% relative compaction as stated above, a further depth of maximum of 0.20-meter thickness shall be loosened, watered and compacted in accordance with Clause 305.3.5 and 305.3.6 to not less than 95% of maximum dry density, determined in accordance with IS:2720 (Part i)

### **Borrow materials**

No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for embankment and sub grade as well as compliance to the different environmental requirements in respect of excavation and borrow areas as stipulated, from time to time, by the Ministry of Environmental and



Forest, Government of India and the local bodies, as applicable shall be the sole responsibility of the Contractor. The contractor shall follow all mining rules and pay royalties and other taxes as applicable.

The contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

- i) The Values of maximum dry density and optimum moisture content obtained in accordance with IS: 2720 (Part 8) for each fill material he intends to use.
- ii) The graphs showing values of density against moisture content from which each of the values in (i) above of the maximum dry density and optimum moisture content were determined.

The dry density-moisture content-CBR relationship for each of the fill materials he intends to use in the backfilling.

**CW 02.00****RCC and PCC Work****General note for all concrete works:**

1. All formwork should be rigid & water tight using best quality of ordinary timber planking / shuttering ply / steel plates with supporting system of MS adjustable steel props / spans / frames for any shapes, sizes, planes including strutting, propping, bracing, staging, scaffolding, lift, pumping, admixtures etc charges. etc., complete to give smooth & fair finish & including false staging work.
2. Rate quoted shall be for all heights, all places, & all shapes inclusive of grouting the tie rod holes, providing grooves at all openings etc.as per drawing or instruction of Engineer in charge.
- 2.01 Providing and laying in position Plain cement concrete (PCC) of specified grade including finishing, curing, formwork (if required) etc. complete as directed by the engineer-in-charge - For All work upto Plinth level, Roads, Pavements, Plinth Protection, Kerbing etc.
  - 2.01.1 1:2:4 (1 Cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size)
  - 2.01.2 1:3:6 (1 Cement: 3 coarse sand: 6 graded stone aggregate 20 mm nominal size)
  - 2.01.3 1:3:6 (1 Cement: 3 coarse sand: 6 graded stone aggregate 40 mm nominal size)
  - 2.01.4 1:4:8 (1 Cement: 4 coarse sand: 8 graded stone aggregate 40 mm nominal size)
  - 2.01.5 1:5:10 (1 Cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size)
  - 2.01.6 1:2:3½:9 (1 ordinary portland cement: 2 Fly ash: 3½ coarse sand: 9 graded stone aggregate 40 mm nominal size)
  - 2.01.7 1:2½:4:11 (1 ordinary portland cement: 2½ Fly ash: 4 coarse sand: 11 graded stone aggregate 40 mm nominal size)
- 1.0 **Material**
  - 1.1 **Water**
    - 1.1.1 Water shall conform to M-1.
  - 1.2 **Cement**
    - 1.2.1 Cement shall conform to M-3.
  - 1.3 **Coarse Sand**
    - 1.3.1 Sand shall conform to M-6.
  - 1.4 **Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

## **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 4.2.1 to 4.2.14 shall be followed.

## **2.2 General**

2.2.1 Before commencing the concreting, the depth and width of the excavated foundation shall be checked as per the drawing. The bed of foundation trenches shall be cleared off of all loose materials, leveled, watered and rammed, as directed by engineer-in-charge.

2.2.2 The cost of the formwork shall be included or excluded as per the item description.

## **2.3 Inspection**

2.3.1 Contractor shall give the Architect and Engineer-in-charge due notice before reinforcement bars are placed in position, to permit him to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the Contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned. Contractor shall proper access with railing for inspection of work.

2.3.2 Centering design and its erection shall be got approved from the Engineer-in-charge. Sufficient carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited after reinforcement is laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks/ PVC cover of suitable size and thickness as per the drawing shall be tied to the reinforcement. Timber, kapachi or stone pieces shall not be used for this purpose. For exposed concrete members PVC blocks of grey color shall only be used.

2.3.3 All formwork shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Architect and Engineer-in-charge has been obtained.

### **2.3.4 Formwork for Exposed concrete surface (If indicated)**

2.3.4.1 All vertical members for formwork shall be of steel like acroprops, H frames / cup lock system etc. Care shall be taken to set all formwork in perfect line, level (or in required camber or slope as specified) and plumb. Formwork propping shall be strong, rigid and sturdy. The formwork shall be as per pattern, design shown in drawings. Formwork shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off

of all rust, dust and loose materials. Mould release agent of approved make or as per the Architect / Engineer in charge shall be applied on sheathing before placing the reinforcement steel. Also the formwork material will be of laminated plywood/best quality steel sheathing or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour and texture. After deshuttering, all concrete surfaces shall be properly rendered with sand paper or emery stone. The sample of the exposed concrete shall be got approved by the architect or engineer in charge.

For walls and columns, the sheathing plates shall be bolted with special nuts and bolts-spring coils and PVC cone spacer. No through bolts shall be allowed for basement walls and water retaining structure for which no extra amount shall be paid for.

**2.3.4.2** For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used.

For exposed concrete element specified in the drawing, steel shuttering made out of CR MS sheet not less than 2mm thickness (14 guage) or laminated plywood not less than 12 mm with MS angle steel supporting frame work shall be used.

For other concrete shuttering material shall be as follows:

- **Columns: Moulds from marine ply with wooden battens or steel plates**
- **Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make steel plates and soldiers.**
- **Beam: steel plates and marine ply with battens**

**2.3.5 Formwork for Exposed Work**

**2.3.5.1 Exposed / Ordinary fair finished formwork for walls, columns, beams of basement and water retaining structures**

For water retaining structure the shuttering plates on either side shall be bolted with tie rods made from spring coils on either side, welded with two nos. 8mm MS rods. PVC cone shall be placed on either side of the tie rod. The whole tie rod assembly along-with PVC cone shall be placed/ fixed with special type of bolts on either side of the shuttering plates. Length of the tie rod along-with PVC cone shall be equal to the width / thickness of the element to be shuttered. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

**2.3.5.1 Exposed / Ordinary fair finished formwork For walls, columns, beams of Super structure**

For walls, columns and beams, the shuttering plates on either side shall be bolted with through tie rods made from round bars minimum 12 mm with heavy quality PVC sleeves and minimum 25 mm thick PVC cones on either side of the sleeve. The whole tie rod

assembly along-with PVC cone shall be placed /fixed with through bolts on either side of the shuttering plates. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

## 2.4 Sampling and testing of concrete

2.4.1 The contractor shall set up a site laboratory to carry out various tests as specified. The laboratory shall include equipment's like cube testing machine, slump cone, cube moulds for concrete and mortar, mechanical balance, sieve set, flakiness testing apparatus, core cutter etc.

2.4.2 Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Qty. of concrete in the work day	No. of samples of concrete for testing at 28 day
1-5 m <sup>3</sup> .	1
6-15 m <sup>3</sup> .	2
16-30 m <sup>3</sup> .	3
31-50 m <sup>3</sup> .	4
51 and above	4 + one additional for each additional 50 m <sup>3</sup> or part thereof.

**NOTE:** At least 1 sample shall be taken from each shift. Three test specimens shall be made for each sample for testing at 28 days. Additional samples must be taken to determine strength at 7 or 3 days or at the time of striking the formwork, or to determine the duration of curing, or to check the testing error. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Architect and Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

2.4.3 The test results of the sample shall be average of the strength of 3 specimens. The individual variation shall not be 15% of the average strength of the sample. The compressive mean strength for the group of 4 non-overlapping consecutive test results shall be as per col. 2 table 11 of IS 456:2000 and individual test results shall be as per col. 3 of table 11 of IS 456:2000.

## 2.5 stripping

- 2.5.1 The Architect and Engineer-in-charge shall be informed in advance by the Contractor of his intention to strike the formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperature are above 20°C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in IS 456:2000 11.3.1 page 25 for respective item of formwork.
- 2.5.2 All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stress due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm covers to the finished concrete surface. Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Architect and Engineer in-charge. After removal of formwork and shuttering the Engineer-in-charge shall inspect the work and satisfy by random checks that concrete produced is of good quality.
- 2.5.3 The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.
- 2.5.4 Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of atleast 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine mortar lines caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned saturated with water and carefully pointed and rendered true with mortar of cement and fine sand. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces, which are pointed, shall be kept moist for a period of 24 hours. For repairing concrete members, suitable bonding agent shall be used as directed by the consultant.
- 2.5.5 If rock pockets/honeycombs in the opinion of Architect and Engineer-in-charge are of such an extent or character so as to effect the strength of the structure, materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portion of the structure affected with no extra cost.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant Nabhi's commentary on CPWD specifications clause no. 4.2.15.1 to 4.2.15.5 and 4.2.15.7 shall be followed.
- 3.2 All structural elements like footing, slab, beam, columns, walls, lintels, chajjas, etc. shall not be classified, measured and paid separately.
- 3.3 The rate includes the cost of material, labour, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed by engineer-in-charge curing and all other incidental expenses for producing concrete of specified strength, for all floors, all shapes at any height and level, and in any position.
- 3.4 The rate shall be for an unit of one cum. The cost of formwork shall be included as excluded as per the item description.

#### **2.02 Providing and laying cast in situ cement concrete in kerbs, steps and the like at or near ground level excluding the cost of centering, shuttering and finishing etc. complete as directed by engineer-in-charge.**

##### **2.02.1 1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)**

Relevant specifications of item no. 2.01 shall be followed except the concrete is to be used for kerbs, steps and like at or near ground level.

#### **2.03.a Providing, hoisting ( By manual means if the weight of element is upto 300 kg), fixing precast cement concrete work for elements like copings, bed plates, anchor blocks, window sills, shelves, louvers, steps, staircase, concrete tree pits, kerbs, edgings, soild concrete block, hollow concrete block etc. for following mix including the cost of exposed centering, shuttering, rendering, erecting and keeping in position with cement mortar 1:3 (1 cement : 3 coarse sand)and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge**

##### **2.03.a.1 1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)**

##### **2.03.a.2 1:3:6 (1 Cement : 3 coarse sand : 6 graded stone aggregate 10 mm nominal size)**

Relevant specifications of item no. 2.01 shall be followed except the concrete is to be used for Precast element as specified in the item.

#### **2.03.b Providing, hoisting ( By Mechanical means), fixing precast cement concrete work for elements like copings, bed plates, anchor blocks, window sills, shelves, louvers, steps, staircase, concrete tree pits, kerbs, edgings, soild concrete block, hollow concrete block etc. for following mix including the cost of exposed centering, shuttering, rendering,**

**erecting and keeping in position with cement mortar 1:3 (1 cement : 3 coarse sand) and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge.**

**2.03.b.1 1:2:4 (1 Cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)**

Relevant specifications of item no. 2.01 shall be followed except the concrete is to be used for precast element as specified in the item.

**2.04 Providing and laying damp-proof course of following thickness with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 12.5mm nominal size).**

**2.04.1 40 mm thick**

**2.04.2 50 mm thick**

Nabhi's commentary on CPWD specifications clause no. 4.5 shall be followed.

**2.05 Extra for providing and mixing water proofing chemical additives or admixtures, as approved by the Architect & Engineer-in-charge, as per the specifications stipulated by the manufacturer. (The make and its technical specifications (from approved make list only) must be specified herein.)**

**1.0 Materials**

1.1 Nabhi's commentary on CPWD Technical specifications clause no. 4.1.3 and manufacturer's specification for the material is to be followed after getting approval from engineer-in-charge.

**2.0 Workmanship**

2.1 The additives and admixtures used for different purpose shall be as specified by the manufacture.

**3.0 Mode of Measurement and Payment**

3.1 The Mode of measurement shall be as per unit of Kg / cement bags as specified by the manufacture.

**2.06 Providing and laying BBCC (Brick Bat cement concrete) of specified grade including finishing, curing, form work (if required) etc. complete as directed by engineer in charge. In foundations and Plinth.**

**2.06.1 1:3:6 (1 Cement: 3 Coarse Sand: 6 graded brickbats 40 mm maximum nominal size)**

**2.06.2 1:4:8 (1 Cement: 4 Coarse Sand: 8 graded brickbats 40 mm maximum nominal size)**

**1.0 Materials**

**1.1 Water**

1.1.1 Water shall conform to M-1.



## **1.2 Cement**

1.2.1 Cement shall conform to M-3.

## **1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

## **1.4 Brick Bat**

1.4.1 Brick Bat shall conform to M-15.

## **2.0 Workmanship**

2.1 The relevant specifications of item no. 2.01 shall be followed except brickbats are to be used instead of stone aggregate. In BBCC concrete shall be compacted with iron rammer.

## **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 2.01 shall be followed.

## **REINFORCED CEMENT CONCRETE**

**2.07 Providing and laying in position volume batched, machine mixed, machine vibrated ordinary cement concrete of specified grade for grade slab of 100 to 150 mm thick with nominal steel as per drawing including curing, shuttering & finishing but excluding the cost of reinforcement etc. complete as directed by engineer-in-charge.**

### **2.07.1 M20 grade concrete**

#### **1.0 Materials**

##### **1.1 Water**

1.1.1 Water shall conform to M-1.

##### **1.2 Cement**

1.2.1 Cement shall conform to M-3.

##### **1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

##### **1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

##### **1.5 Reinforcement**

1.5.1 Reinforcement shall conform to M-17.

#### **2.0 Workmanship**

- 2.1 Nabhi's commentary on CPWD specifications clause 5.4.1 to 5.4.10 shall be followed.
- 2.2 Relevant specifications of item no. 2.01 shall be followed for inspection, sampling and testing of concrete, stripping except concrete work shall be for the grade slab instead of Plain cement concrete work.

### **3.0 Mode of Measurement and Payment**

- 3.1 Nabhi's commentary on CPWD specifications clause 5.4.11.1, 5.4.11.4, 5.4.11.5, 5.4.12, 5.4.13.1, 5.4.13.2, 5.4.13.4 shall be followed. The rate includes the cost of formwork but excludes the cost of reinforcement.
- 3.2 All structural elements like footing, slab, beam, columns, walls, lintels, chajjas etc. shall not be classified, measured and paid separately.
- 3.3 The rate includes the cost of material, labor, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed by engineer-in-charge curing and all other incidental expenses for producing concrete of specified strength, for all floors, all shapes at any height and level, and in any position.
- 3.4 The rate shall be for an unit of one cum. The cost of formwork shall be included or excluded as per the item description.

**2.08 Providing and laying in position machine mixed machine vibrated reinforced cement concrete (ordinary concrete with volume batching) for columns, pillars, piers, abutments, beams, balconies, chajjas, lintels, kerbs, steps, arches, doms, shells, valults, chimneys, shafts, etc. of following grades at all floors including finishing, curing and excluding the cost of centering, shuttering etc. complete as directed by the engineer-in-charge.**

**2.08.1 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size)**

**2.08.2 1:1.5:3 (1 cement: 1.5 coarse sand: 3 graded stone aggregate 20 mm nominal size)**

#### **1.0 Materials**

##### **1.1 Water**

1.1.1 Water shall conform to M-1.

##### **1.2 Cement**

1.2.1 Cement shall conform to M-3.

##### **1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

##### **1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

## **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause 5.4.1 to 5.4.10 shall be followed.

2.2 Relevant specifications of item no. 2.01 for inspection, sampling and testing of concrete, stripping shall be followed.

2.3 All concrete work shall have fair finished surface unless otherwise specified in the item.

## **3.0 Mode of Measurement and Payment rendering**

3.1 Nabhi's commentary on CPWD specifications clause 5.4.11.1, 5.4.11.4, 5.4.11.5, 5.4.12, 5.4.13.1, 5.4.13.2, 5.4.13.4 shall be followed. The rate includes the cost of formwork but excludes the cost of reinforcement.

3.2 All structural elements like footing, slab, beam, columns, walls, lintels, chajjas etc. shall not be classified, measured and paid separately.

3.3 The rate includes the cost of material, labour, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed by engineer-in-charge curing and all other incidental expenses for producing concrete of specified strength, for all floors, all shapes at any height and level, and in any position.

3.4 The rate shall be for an unit of one cum. The cost of formwork shall be included or excluded as per the item description.

**2.09.a Providing, hoisting (By manual means if the weight of element is upto 300 kg), fixing fair finished / exposed precast cement concrete work in M25 grade with minimum cement content 360 Kg per cum for elements like lintels, beams, columns, slabs, window sills, shelves, moulding, cornices etc. including the cost of exposed centering, shuttering, rendering, erecting and keeping in position with cement mortar 1:3 (1 cement: 3 coarse sand) and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge.**

## **1.0 Materials**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

### **1.2 Cement**

1.2.1 Cement shall conform to M-3.

### **1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

#### **1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

#### **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 5.6 and relevant specifications of item 2.08 shall be followed except the item will be executed for precast element.

2.2 All precast members shall be cast on site and not obtained from any manufacturing unit. Sufficient curing shall be done before placement of the same.

2.3 The method of transporting and placing the precast members shall be as approved by the Engineer-in-charge. Members shall be so transported that no breakage or undue stresses are induced in them.

2.4 All members shall have a key provided on both the faces i.e. top and bottom surfaces, of adequate size so as to fill the same with concrete while laying. The function of this key is to avoid the leakage through the joint between the precast member and the member on which it is laid.

2.5 While fixing the precast member, the key provided in the member shall be filled with ordinary cement concrete made of same proportion as that of the member except that grit shall be used instead of stone aggregate. Except for the key, cement mortar of proportion 1:1 (1 cement : 1 sand) shall be spread over the surface on which the member is to be laid. The mortar shall be of dry consistency as is possible to use. The member and the surface shall be thoroughly cleaned before placement and both shall be kept moist for a sufficient period after placement.

2.6 Rendering exposed surface for the exposed RCC precast elements shall be carried out and the rate for the same shall be included in this item.

#### **3.0 Mode of measurement and Payment**

3.1 The relevant specifications of item no. 2.08 shall be followed. The rate includes the cost of centering and shuttering but excludes the cost of reinforcement.

3.2 The rate shall be for an unit of one cum.

**2.09.b Providing, hoisting (By Mechanical means) fixing fair finished / exposed precast cement concrete work in M25 grade with minimum cement content 360 Kg per cum for elements like lintels, beams, columns, slabs, window sills, shelves, moulding, cornices, kerbing, tree guard, spiral staircase tread etc. including the cost of exposed centering, shuttering, rendering, erecting and keeping in position with cement mortar 1:3 (1 cement: 3 coarse sand) and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge.**

Relevant specifications of item no. 2.09.a shall be followed except the hoisting is to be done by mechanical means instead of manual means.

**2.10 Providing and laying in position machine mixed machine vibrated reinforced cement concrete (ordinary concrete with volume batching) for exposed RCC elements like sills, lintels, chajjas, pattas, sill slabs, corbellings etc. of M25 grade with minimum cement content 360 Kg per cum at all floors including finishing, curing, cost of exposed centering, shuttering but excluding the cost of reinforcement etc. complete as directed by the engineer-in-charge.**

**1.0 Materials**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.3 Cement**

1.2.1 Cement shall conform to M-3.

**1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

**1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause 5.4.1 to 5.4.10 shall be followed.

2.2 Relevant specifications of item no. 2.01 shall be followed for inspection, sampling and testing of concrete, stripping work done at site.

2.3 Centering and shuttering for exposed work is to be done for the element.

2.4 For placing the reinforcement Nabhi's commentary on CPWD specification clause no. 5.3 shall be followed.

**3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 2.08 shall be followed. The rate includes the cost of centering and shuttering but excludes the cost of reinforcement.

3.2 The rate shall be for an unit of one cum.

**2.11.a Providing and fixing precast fair finished exposed cement concrete Jali as per architectural design of M20 grade including centering and shuttering, cleaning,**

**finishing and fixing in cement mortar 1:3 (1 cement: 3 fine sand), curing excluding cost of reinforcement as directed by engineer-in-charge**

**2.11.a.1 100 mm thick (reinforced as per drawing)**

**2.11.a.2 75 mm thick(reinforced as per drawing)**

Nabhi's commentary on CPWD specifications clause no. 5.7 shall be followed in accordance with the relevant specifications of item no. 2.09. The rate of item includes the cost of centering, shuttering but excludes the cost of reinforcement.

**2.11.b Providing and fixing precast fair finished exposed cement concrete Jali as per architectural design of M20 grade including centering and shuttering, cleaning, finishing and fixing in cement mortar 1:3 (1 cement: 3 fine sand), curing excluding cost of reinforcement as directed by engineer-in-charge.**

**2.11.b.1 50 mm thick (reinforced as per drawing)**

**2.11.b.2 40 mm thick (reinforced as per drawing)**

**2.11.b.3 25 mm thick (reinforced as per drawing)**

Nabhi's commentary on CPWD specifications clause no. 5.7 shall be followed in accordance with the relevant specifications of item no. 2.09. The rate of item includes the cost of centering, shuttering but excludes the cost of reinforcement.

**2.12 Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth finish cement concrete of M20 grade with minimum cement content 325 Kg per cum of concrete for reinforced cement concrete work for foundations, footings, RCC wall, slabs, beams, columns, staircase, vertical and horizontal fins, domes, shells and vaults of any shape, all places, all heights including laying of concrete to site by any means like pumping or tower crane etc., finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, to improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be inclusive of providing grooves, drip moulds, ghisis, pockets, cutouts etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL.**

**2.12.1 Excluding the cost of centering, shuttering and reinforcement**

**2.12.2 Including the cost of centering, shuttering excluding the cost of reinforcement**

**1.01.0 Materials**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.4 Cement**

1.2.1 Cement shall conform to M-3.

**1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

**1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications of item no. 5.8.1, 5.8.3, 5.8.4, 5.8.5, 5.8.6, 5.8.7 shall be followed. The relevant specifications of item no. 2.08 and 2.01 shall be followed.

2.2 Before quoting the rate, contractor shall confirm the exposure condition for the design of concrete. Mix design shall be carried out for environmental exposure condition as given in IS 456:2000 page 18 table 3.

2.3 All concrete work shall have fair finish concrete surface unless otherwise specified.

**2.4 For exposed concrete element specified in the drawing fair finish steel shuttering made out of MS sheet not less than 14 gauge/ laminated plywood and supporting frame work shall be of steel. Proper care shall be taken in MS shuttering at the time of concreting during monsoon to achieve rust free concrete surface. The concrete surface shall be rendered if required to give fair finish.**

For other concrete shuttering material shall be as follows:

- **Columns: Moulds from marine ply with wooden battens or MS steel plates**
- **Straight walls / Curved wall in plan: Marine plywood with wooden battens of Acro make or equivalent make plates and soldiers.**
- **Beam: Bottom - timber / steel plates, Sides - Steel plates / marine ply with battens**

2.4 The concrete shall be designed as per relevant IS code- IS 10262 and SP 23, with or without chemical admixture to provide the grade of concrete having required workability and characteristic strength as per IS 456:2000. The proportion of cement, sand and coarse aggregates shall be determined by weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The design mix shall be got approved by Engineer in-charge before starting the concrete work. The minimum cement content shall depend on the exposure condition of the concrete. The minimum cement content given in table (IS 456:2000, table 5) shall be adopted

irrespective of whether the contractor achieves the desired strength with less quantity of cement. The strength requirements of different grades of concrete shall be as under:

Grade of Concrete	Compressive strength of 15 cm. cubes in N/mm <sup>2</sup> . at 7 and 28 days conducted in accordance with IS: 516-1959.		
	At 7 days	At 28 days	Max size of agg. In mm
M-10	7	10	20
M-15	10	15	20
M-20	13.5	20	20
M-25	17	25	20
M-30	21	30	20
M-35	24	35	20
M-40	28	40	20

In all cases, the 28 days compressive strength specified in above table be the criteria for acceptance or rejection of the concrete.

2.5 Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

2.6 The Contractor shall take necessary care to avoid sand streaks, air holes, honey combining etc., on finished concrete surface.

## 2.7 Proportioning

2.7.1 The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work and the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregate, in different sizes and blending them in the right proportions as required. Aggregate of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading, as approved for samples used in the preliminary tests.

2.7.2 In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighed separately, to check the net weight, where cement is weighed from bulk stocks at site and not by bags. It shall be weighed separately from the aggregates. Water shall either be measured by



volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked and calibrated in standard laboratory.

2.7.3 It is most important to keep the specified water cement ratio constant and at its correct value. Moisture content in both fine and coarse aggregates shall be determined by the engineer-in-charge according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates IS : 2386 (Part III) shall be referred. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content.

2.7.4 The minimum cement content for the various mixes shall be as under

<u>MIX</u>	<u>MINIMUM CEMENT CONTENTS</u>	<u>MIX</u>	<u>MINIMUM</u>	<u>CEMENT</u>
	<u>CONTENTS</u>			
	<u>PER CU.M. OF CONCRETE</u>		<u>PER CU.M. OF CONCRETE</u>	
M-150	285 Kg.	M-250	360 Kg.	
M-175	300 Kg.	M-300	400 Kg.	
M-200	325 Kg.	M-350	430 Kg.	

2.7.5 All RCC works shall be carried out as per the detailed drawings and direction of Architects and Engineer-in-charge. The concrete shall be placed at all heights, levels and for all shapes.

### **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 5.4.11.1, 5.4.11.4, 5.4.11.5, 5.4.12, 5.4.13 shall be followed. The rate shall be included or exclude the cost of centering and shuttering will be as specified in the item.

3.2 The rate shall be for a unit of one cum.

3.3 The rate shall be inclusive of chemical admixture like plasticizer etc. as directed by the engineer-in-charge. No extra payment shall be paid for.

**2.13 Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth finish cement concrete of M25 grade for reinforced cement concrete work for foundations, footings, columns, slabs, beams, planter wall, pillars, staircase, vertical and horizontal fins, doms, shells and vaults of any shape including pumping laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve**

**workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be inclusive of providing grooves, drip moulds, ghis, pockets, cutouts etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL. Rate shall include cost of formwork but exclude cost of reinforcement.**

**2.13.1 Excluding the cost of centering, shuttering and reinforcement**

**2.13.2 Including the cost of centering, shuttering as per specification 3.01.a for all height and all lift but excluding the cost of reinforcement**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M25 grade instead of M20 grade and minimum cement content shall be 360 Kg per cum of concrete.

**2.14 Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth finish cement concrete of M30 grade with minimum cement content 400 Kg per cum of concrete for reinforced cement concrete work for foundations, footings, columns, slabs, beams, pillars, staircase, vertical and horizontal fins, doms, shells and vaults of any shape including pumping laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be inclusive of providing grooves, drip moulds, ghis, pockets, cutouts etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL.**

**2.14.1 Excluding the cost of centering, shuttering and reinforcement**

**2.14.2 Including the cost of centering, shuttering excluding the cost of reinforcement**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M30 grade instead of M 20 grade and minimum cement content shall be 400 Kg per cum of concrete.

**2.15 Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth finish cement concrete of M35 grade with minimum cement content 430 Kg per cum of concrete for reinforced cement concrete work for foundations, footings, columns, slabs, beams, staircase, vertical and horizontal fins, doms, shells and vaults elements of any shape including pumping laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be inclusive of providing grooves, drip moulds, ghis,**

**pockets, cutouts etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL.**

**2.15.1 Excluding the cost of centering, shuttering and reinforcement**

**2.15.2 Including the cost of centering, shuttering excluding the cost of reinforcement**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M35 grade instead of M 20 grade and minimum cement content shall be 430 Kg per cum of concrete.

**2.16 Providing and laying Ready Mixed Concrete as per mix design of specified grade in fully automatic batching plant as per the design mix standards at RMC manufacture's site and transported to the place of work in transit mixer for upto 10 Km lead having continuous agitated mixture for reinforced cement concrete work. The concrete is made using graded black trap stone aggregates of maximum 20mm nominal (down graded) size obtained from approved quarry including fine aggregates conforming to latest IS 383 and cement all as per the design mix proportions conforming to IS 10262 with minimum cement content for durability including supplying and providing concrete cover etc., which shall be followed as per latest IS 456 including pumping from transit mixer to all heights, placing, spreading, vibrating, compaction, finishing to required levels, curing etc., complete all as per specifications but excluding cost of formwork and steel reinforcement. Rate to include charges for providing and mixing additives or admixtures in recommended proportions as per IS : 9103 to accelerate / retard setting of concrete, improve workability without impairing strength and durability, and labour for keeping embedment, insert sleeves) if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL.**

**Note**

- (i) Ready Mixed Concrete should be from reputed manufacturers like ACC, L&T, Ready Mix, Birla RMC etc., and contractors have to obtain prior approval of EIC with respect to supplier of RMC.  
Rate to include the transportation with all leads from RMC plant to the place of work and pumping of concrete to any height and the rate shall be for all leads.
- (ii) Cement concrete delivered at site should be workable and should satisfy all the required standard tests like cube test and slump test etc or item description as specified in code of practice. Samples taken at site only will be deciding factor.
- (iii) It is the responsibility of contractor ensures proper co-ordination for the timely supply of concrete and approved quality product.
- (iv) Contractor has to make arrangement for proper approach road (for which nothing extra

shall be paid for) to enable the vehicle carrying concrete to move freely without any extra cost to the department before ordering the concrete. However existing approach road may be made use of for this purpose.

- (v) Contractor has to ensure proper strong shuttering / centering to receive the concrete at all heights.
- (vi) The design mix of RMC for the manufacturer / supplier of RMC has to be obtained well in time and approval of Engineer in Charge to be obtained prior to use. The design mix should be based on latest IS 456. This approval has to be obtained whenever the design mix is changed. The RMC should be supplied confirming to the approved design mix which shall be continuously checked during the progress of work. All the quality checks as per IS stipulations should be scrupulously followed during the concreting. The work shall be carried out at all heights.

2.16.1 M15 grade with minimum cement content 285 Kg per cum

2.16.2 M20 Grade with (minimum cement 260 Kg + Flyash in required proportion) per cum

2.16.3 M25 Grade with (minimum cement 288 Kg + Flyash in required proportion) per cum

2.16.4 M30 Grade with (minimum cement 320 Kg + Flyash in required proportion) per cum

2.16.5 M35 grade with minimum cement content 430 Kg per cum

## **1.0 Materials**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

### **1.5 Cement**

1.2.1 Cement shall conform to M-3.

### **1.3 Coarse Sand**

1.3.1 Sand shall conform to M-6.

### **1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

### **1.5 Fly ash**

1.5.1 Fly ash shall conform to M-93.

## **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 5.8.8 shall be followed.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in cum. The rate excludes the cost of reinforcement and formwork.

**2.17.a Supplying, fabricating and placing in position TMT reinforcement bars FE 415 confirming to IS-1786 reinforcement for RCC structure / items as per design including transporting steel to the work site, handling wastage, decoiling, cutting, bending, cranking, fabricating to required shape, placing in position, binding with 18 guage (1.22 mm) MS wires, welding if necessary by using approved welding rods etc. for all levels etc. complete as directed by the engineer-in-charge. The quoted rate should be inclusive the cost of binding wire and the same will not be measured and paid separately. (rolling margin's and wastage shall not be paid.) Measurement will be made on the length basis and converted into weight by using standard co-efficient).**

The reinforcement shall be

**2.17.a1Mild steel reinforcement, yield stress not less than 250 N/mm<sup>2</sup>**

**2.17.a2High yield deform steel bars Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**

**2.17.a3TMT bars- Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**

**2.17.a4TMT bars Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**

**2.17.a5TMT bars Fe- 550, yield stress not less than 550 N/mm<sup>2</sup>**

**2.17.a6TMT bars- CRS Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**

**2.17.a7TMT bars- CRS Fe-550, yield stress not less than 550 N/mm<sup>2</sup>**

### **1.0 Material**

#### **1.1 Reinforcement**

1.1 Reinforcement shall conform to M-17.

#### **1.2 Binding Wire**

1.2 Binding Wire shall conform to M-18.

### **2.0 Workmanship**

2.1 CPWD Technical specifications clause no. 5.3.1 and 5.3.2 is to be followed.

2.2 The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.

- 2.3 Bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.
- 2.4 All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 18 gauge MS binding wire as approved by Engineer-in charge. The rebars shall be placed with stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars at 1m c/c , Precast cover blocks in cement mortar 1:2 ( 1cement : 2 coarse sand) about 4 X 4 cm square section or 4 cm dia round section or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In charge or Architect. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 2.5 Bars crossing each other where required shall be secured by 16 gauge GI binding wires (annealed) of size not less than 1 mm., in such manner than they do not slip over each other at the time of fixing and concreting.
- 2.7 As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. Where directed and practicable overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick, twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movement is maximum in beam and slab.
- 2.8 Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than

normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS : 226.

- 2.9 When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S electrodes used for welding shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed. Welding shall be done by electric arc process as per IS : 816 and IS : 823.
- 2.10 At the time of concreting, a bar fitter shall remain at site to keep the reinforcement in position.
- 2.11 Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer -in charge.

### **3.0 Mode of Measurement and Payment**

- 3.1 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones by using standard IS co-efficient. Length shall include hooks at the ends. The wastage of steel and binding wires shall not be measured and paid extra. The rolling margin of steel shall not be paid extra.
- 3.2 The rate for reinforcement shall include the cost of labour and material required for all operations described above like cleaning of reinforcement bars, straightening, cutting, hooking, bending, binding, welding placing in position etc. as per the drawing or directed by the Architect or engineer-in-charge Rate shall also include the cost of GI binding wires of 16 to 18 gauge, devices like chairs, pins, spacer bars, cover blocks of PVC or cement mortar etc. for keeping reinforcement in position. The rate shall for an unit of MT.

**2.17.b Extra over for binding, keeping in position the reinforcement by welding with approved welding rod instead of binding with MS binding wire of 18 gauge (1.22 mm).**

**The reinforcement shall be**

- 2.17.b1 Mild steel reinforcement, yield stress not less than 250 N/mm<sup>2</sup>**
- 2.17.b2 High yield deform steel bars Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**
- 2.17.b3 TMT bars- Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**
- 2.17.b4 TMT bars Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**
- 2.17.b5 TMT bars Fe- 550, yield stress not less than 550 N/mm<sup>2</sup>**
- 2.17.b6 TMT bars- CRS Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**
- 2.17.b7 TMT bars- CRS Fe-550, yield stress not less than 550 N/mm<sup>2</sup>**

Relevant specifications of item no. 2.17.a shall be followed except the reinforcement shall be binded and keeping in position by welding with approved welding rod instead of MS binding wire of 16 gauge to 18 gauge (1.63 mm to 1.22mm)

- 2.18 Labour charges for fabricating and fixing in position steel reinforcement for RCC structures as per design including handling at site, cutting, bending and binding with wires, welding if necessary etc. for all floors complete as directed by Engineer. Measurement will be made on the length basis and converted into weight by using standard IS co-efficient (rolling margin's and wastage will not be paid).**

**The reinforcement shall be**

- 2.18.1 Mild steel reinforcement, yield stress not less than 250 N/mm<sup>2</sup>**
- 2.18.2 High yield deform steel bars Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**
- 2.18.3 TMT bars- Fe-415, yield stress not less than 415 N/mm<sup>2</sup>**
- 2.18.4 TMT bars Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**
- 2.18.5 TMT bars Fe- 550, yield stress not less than 550 N/mm<sup>2</sup>**
- 2.18.6 TMT bars- CRS Fe- 500, yield stress not less than 500 N/mm<sup>2</sup>**
- 2.18.7 TMT bars- CRS Fe-550, yield stress not less than 550 N/mm<sup>2</sup>**

The relevant specifications of item no. 2.17 shall be followed except the rate shall be for only handling, cutting, bending, placing, binding, welding and fixing in position as shown on the drawings and as directed by engineer-in-charge. It shall also include all devices like chairs, Cement mortar covers / PVC covers, pins, binding wires, etc. for keeping reinforcement in approved position. The cost of reinforcement shall not be included. This item will be operable when the Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be



considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer –in charge.. The rate shall be for an unit of MT.

**2.19 Charges for making holes in RCC walls, slabs or any other RCC member by core cutting machine of HILTI or equivalent including disposing the debris. Measurement will be taken for the depth of holes in running meter for specified diameter. For disposal of the debris specification of relevant items shall be followed.**

**2.19.1 Holes of 52 mm, 67 mm, 77mm clear diameter**

**2.19.2 Holes of 102mm clear diameter**

**2.19.3 Holes of 152 mm clear diameter**

**2.19.3 Holes of 200 mm clear diameter**

**1.0 Materials and Workmanship**

1.1 Marking of holes is to be approved by Architect or engineer-in-charge. Holes in RCC walls, slabs, beams or any other RCC member by Core cutting machine of HILTI or equivalent is to be done. RCC surface is cleaned after drilling including disposing of debries as specified in the disposal item. Necessary platform for the machine location and electrical wire management shall be adhere to safety standards.

**2.0 Mode of Measurement and Payment**

2.1 The rate shall be for an unit of running meter length.

2.2 Rate shall be inclusive of scaffolding, cleaning, disposing of debries etc. complete as directed by engineer-in-charge.

**2.20 Providing in position UPVC sleeves of 6Kg/cm<sup>2</sup> and length upto 500 mm for following diameters of**

**2.20.1 200 mm dia**

**2.20.2 160 mm dia**

**2.20.3 110 mm dia**

**2.20.4 63 mm dia**

**1.0 Materials and Workmanship**

1.1 Before pouring the concrete PVC sleeves are placed in between the reinforcement as per drawing. Both ends of the sleeves shall be closed with thermocol or gunny bags. Care shall be taken that sleeves remain in position while concreting.

**2.0 Mode of Measurement and Payment**

2.1 The item shall be measured in each.

**2.21 Providing additional cement in design mix of RCC to achieve desired exposed finish surface**

Relevant specifications of item 2.01 shall be followed. Item shall be measured and paid in Kg.

**2.22.1 Providing and fixing in 25mm expansion joints, SILFLEX/Capcell HD 100 Supreme or equivalent (Polyurethane foam filler) of the best quality, including in all shapes and all levels etc. complete as directed by Engineer-in-Charge and as per specification.**

**1.0 Material**

1.1 Polyurethane Foam Filler shall conform to M-19.

**2.0 Workmanship**

2.1 The Capcell HD 100 board shall be cut neatly with all edges even and to the size required (size of the structure at the expansion joint.). The concrete surfaces must be clean, dry and free of dirt, grease, oil or other contaminants that would interfere with proper adhesion. It shall be placed resting on the existing structure at the joint before the structure adjoining to the joint is constructed. The board shall be snugly filled the gap in between the expansion joint. The board shall be provided 40mm recessed on the exposed side, to accommodate supreme backup polyurethane rod of 30mm diameter and 12mm polysulphide sealant. At the time of concreting, the recessed 40mm gap, shall be filled with the capcell HD board with a both side adhesive tape to keep it in position. The same shall be removed until the gap is sealed with the polysulphide sealant.

**3.0 Mode of Measurement and Payment**

3.1 The item will be measured and paid in sqm as per the actual area done. Wastage will not be paid for.

**2.22.2 Providing and fixing in 12mm expansion joints, SILFLEX/Capcell HD 100 Supreme or equivalent (Polyurethane foam filler) of the best quality, including in all shapes and all levels etc. complete as directed by Engineer-in-Charge and as per specification.**

Relevant specifications of item 2.22.1 shall be followed except that joint thickness shall be 12 mm instead of 25 mm. The item will be measured and paid in sqm as per the actual area done. Wastage will not be paid for

**2.23 Providing and filling the expansion joints for 25 mm width & 12 mm depth, with polysulphide sealant with application of primer including scraping / removing the expansion filler materials from joints, cleaning, repairing of the edges with epoxy mortar of approved color and make, fixing of abro tapes on the edges to prevent the adjoining surface, etc. complete as directed by Engineer-in-Charge. The contractor should furnish a guarantee of 10 years as directed.**

**1.0 Material**

1.1 Polysulphide Sealant shall conform to M-20.

**2.0 Workmanship**

2.1 Polysulphide sealant shall be provided as per drawing and design. Before applying the sealant, the surface shall be properly cleaned, dried and free from any loose materials.

2.2 The expansion joint shall be cleaned and made dry completely. All loose material such as sand, concrete, dust, etc. shall be removed. The joint gap shall be in uniform width and depth after cleaning. Best quality back up material shall be used to bring the width and depth of the joint to the required dimensions.

2.3 The broken edges of the concrete element shall be repaired with epoxy mortar. After repairing primer is to be applied on the surface where polysulphide sealant is to be placed. Baker rod is placed above the Capcell HD board and remaining space is filled with polysulphide sealant.

2.4 The base and accelerator shall be thoroughly mixed to make a uniform mixture of grey colour, in which no white or black colour streaks shall be visible. Mixed Polysulphide base sealant shall be filled in the joints to the required depth. The filled sealant shall be pressed and fixed by required instruments till air trap is removed. The top surface shall be smooth and leveled. Required depth to width ratio shall be as per manufacture's specification.

2.5 The work shall be carried out in the best workmanship as directed by the engineer-in-charge as per manufacture's specification.

2.7 Water test shall be carried out after the completion with curing period of the work to check the water tightness of the structure.

2.8 The contractor should furnish a guarantee of 10 years for water leakage.

2.9 Unless otherwise specified polysulphide filling treatment shall be executed through approved specialized approved by client and authorized agency of manufacture. Contractor shall furnish a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same which is also to be signed by the specialized agency. However, soul responsibility shall be of main contractor for any leakages.

Copy of work order mentioning the rate issued to the specialized agency shall be attached with guarantee bond.

A guarantee bond on appropriately stamp paper shall be given by the contractor to the client in the manner form prescribed below:

**FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other form of humid condition, for a period of 10 years after completion of the work of polysulphide filling treatment as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of humid conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

### **3.0 Mode of Measurement and Payment**

3.1 The item will be measured and paid in Rmt as per the actual work done. Wastage shall not be measured and paid for.

**2.24 Providing and fixing in expansion joints, copper strip water stop of 1.25 mm thick & 125 mm wide with 'U' of 25 mm depth in middle with 3 mm dia copper rod 25 cm long, soldered on strip at an interval of 30 cm as specified in drawing, as per sample approved and as directed by Engineer-In-Charge.**

#### **1.0 General:**

1.1 Copper Strips shall conform to M-21.

#### **2.0 Workmanship:**

2.1 Copper strips are to be provided for expansion joints in RCC frame structure for internal as well as exposed joints.

2.2 Copper strip shall be 1.25mm thick and of 125 mm total width with U shape in the middle.

2.3 Copper strip shall have holdfast of 3 mm dia copper rod 25 cm long, soldered on strip at interval of about 30 cm, or as shown in the drawing or as directed.

2.4 The width of each flange of the copper strip to be embedded in the concrete work shall be 25 mm.

2.5 The depth of U provided shall be of 25 mm.

2.6 While concreting enough care is to be taken that strip shall remain in position.

#### **3.0 Mode of Measurement and Payment:**

3.1 Measurement shall be taken for actual length of copper strip fixed. Wastage will not be paid for.

3.2 Rate shall be for per Rmt

**2.25 Providing, laying and filling (with pneumatic gun) the expansion joints, grooves, cracks or gaps with silicone sealant of neutral cure including scraping / removing the**

**expansion filler materials from joints, cleaning, repairing of the edges with epoxy mortar of approved color and make, placing of backup material (polyethylene baker rod of Supreme), fixing of abro tapes on the edges to prevent the adjoining surface, etc. complete as directed by engineer-in-charge. The contractor should furnish a guarantee of 10 years as directed.**

## **1.0 Materials**

1.1 Silicone sealant shall be of GE (Silpruf) or WECKER brands and shall be used of 300 ml packing cartridge directly available from company.

## **2.0 Workmanship**

2.1 Silicone sealant shall be provided as and where directed as per detail drawing and design. Before applying the sealant, the surface shall be properly cleaned, dried and free from any loose materials. It shall be applied with cartridge.

2.2 The joint shall be cleaned and made dry completely. All loose material such as sand, concrete, dust, etc. shall be removed. Best quality back up material shall be used to bring the width and depth of the joint to the required dimensions.

2.3 Silicone sealant of required quality shall be used. The color of the sealant shall be grey, white, black or transparent Silicone sealant shall be filled in the joints to the required depth. The filled sealant shall be pressed and fixed by required instruments till air trapped is removed. The top surface shall be smooth and leveled. Required depth and width ratio shall be as per the supplier's specification. Polypropylene bond breaker tape shall be provided at the base of the expansion joint which will allow two sided adhesions. This will allow silicone sealant to stretch freely with the joint.

2.3 The work shall be carried out in the best workmanship as directed by the Architect and as per manufacture's specification in true line and level, for all heights, in any position.

2.4 The reconciliation of the cartridges shall be done at site. The no. of cartridges used at site shall be recorded.

## **3.0 Mode of Measurements and Payment**

3.1 The item will be measured and paid in terms of no. of cartridges consumed as per actual work done. Wastage shall not be measured and paid for.

3.2 Contractor has to maintain the day to day register of filled cartridges supplied, consumed and empty cartridges at site. The procedure of the records shall be as established by the client and architect.

**2.26 Providing, hoisting (By Mechanical means) fixing fair finished / exposed precast cement concrete work in M25 grade with minimum cement content 360 Kg per cum for elements like lintels, beams, columns, slabs, window sills, shelves, moulding, cornices, kerbing, tree guard, spiral staircase tread, spout, bollards etc. including the cost of**

exposed centering, shuttering, rendering, erecting and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge. Rate is inclusive of keeping in position with PCC of cement concrete of 1:3:6 (1 Cement: 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

**2.26.1 A) Bollard**

**2.26.2 B) Spout**

**2.26.3 C) Seating Slab**

Relevant specifications of item no. 2.09.a shall be followed except the hoisting is to be done by mechanical means instead of manual means. Except shall be paid in No.

**2.27 Providing, hoisting (By Mechanical means) fixing fair finished / exposed precast cement concrete work in M25 grade with minimum cement content 360 Kg per cum for elements like lintels, beams, columns, slabs, window sills, shelves, moulding, cornices, kerbing, tree guard, spiral staircase tread etc. including the cost of exposed centering, shuttering, rendering, erecting and necessary scaffolding at all floors, at any height and any level in any position etc. complete as directed by engineer-in-charge. Rate is Exclusive of keeping in position with PCC of cement concrete of 1:3:6 (1 Cement: 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)**

**2.27.1 A) Kerb**

Relevant specifications of item no. 2.09.a shall be followed except the hoisting is to be done by mechanical means instead of manual means. Except shall be paid in Rmt.

**2.29 Providing and laying in position Plain cement concrete (PCC) of specified grade including finishing, curing, formwork (if required) etc. complete as directed by the engineer-in-charge - For All work upto Plinth level, Roads, Pavements, Plinth Protection, Stone Flooring, Tree pit, Kerbing etc.**

**2.29.1 PCC M15 Grade**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.4 Cement**

1.4.1 Cement shall conform to M-3.

**1.5 Coarse Sand**

1.3.1 Sand shall conform to M-6.

**1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

#### **4.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 4.2.1 to 4.2.14 shall be followed.

#### **2.2 General**

2.2.1 Before commencing the concreting, the depth and width of the excavated foundation shall be checked as per the drawing. The bed of foundation trenches shall be cleared off of all loose materials, leveled, watered and rammed, as directed by engineer-in-charge.

2.2.2 The cost of the formwork shall be included or excluded as per the item description.

#### **2.3 Inspection**

2.3.1 Contractor shall give the Architect and Engineer-in-charge due notice before reinforcement bars are placed in position, to permit him to inspect and accept the false work and forms as to their strength, alignment and general fitness but such inspection shall not relieve the Contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned. Contractor shall proper access with railing for inspection of work.

2.3.5 Centering design and its erection shall be got approved from the Engineer-in-charge. Sufficient carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited after reinforcement is laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks/ PVC cover of suitable size and thickness as per the drawing shall be tied to the reinforcement. Timber, kapachi or stone pieces shall not be used for this purpose. For exposed concrete members PVC blocks of grey color shall only be used.

2.3.6 All formwork shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Architect and Engineer-in-charge has been obtained.

#### **2.3.7 Formwork for Exposed concrete surface (If indicated)**

2.3.7.1 All vertical members for formwork shall be of steel like acroprops, H frames / cup lock system etc. Care shall be taken to set all formwork in perfect line, level (or in required camber or slope as specified) and plumb. Formwork propping shall be strong, rigid and sturdy. The formwork shall be as per pattern, design shown in drawings. Formwork shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off

of all rust, dust and loose materials. Mould release agent of approved make or as per the Architect / Engineer in charge shall be applied on sheathing before placing the reinforcement steel. Also the formwork material will be of laminated plywood/best quality steel sheathing or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour and texture. After deshuttering, all concrete surfaces shall be properly rendered with sand paper or emery stone. The sample of the exposed concrete shall be got approved by the architect or engineer in charge.

For walls and columns, the sheathing plates shall be bolted with special nuts and bolts-spring coils and PVC cone spacer. No through bolts shall be allowed for basement walls and water retaining structure for which no extra amount shall be paid for.

**2.3.7.2** For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used.

For exposed concrete element specified in the drawing, steel shuttering made out of CR MS sheet not less than 2mm thickness (14 guage) or laminated plywood not less than 12 mm with MS angle steel supporting frame work shall be used.

For other concrete shuttering material shall be as follows:

- **Columns: Moulds from marine ply with wooden battens or steel plates**
- **Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make steel plates and soldiers.**
- **Beam: steel plates and marine ply with battens**

### **2.3.5 Formwork for Exposed Work**

#### **2.3.5.1 Exposed / Ordinary fair finished formwork For walls, columns, beams of basement and water retaining structures**

For water retaining structure the shuttering plates on either side shall be bolted with tie rods made from spring coils on either side, welded with two nos. 8mm MS rods. PVC cone shall be placed on either side of the tie rod. The whole tie rod assembly along-with PVC cone shall be placed/fixed with special type of bolts on either side of the shuttering plates. Length of the tie rod along-with PVC cone shall be equal to the width / thickness of the element to be shuttered. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

#### **2.3.5.1 Exposed / Ordinary fair finished formwork For walls, columns, beams of Super structure**

For walls, columns and beams, the shuttering plates on either side shall be bolted with through tie rods made from round bars minimum 12 mm with heavy quality PVC sleeves



and minimum 25 mm thick PVC cones on either side of the sleeve. The whole tie rod assembly along-with PVC cone shall be placed /fixed with through bolts on either side of the shuttering plates. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

## 2.4 Sampling and testing of concrete

2.4.1 The contractor shall set up a site laboratory to carry out various tests as specified. The laboratory shall include equipments like cube testing machine, slump cone, cube moulds for concrete and mortar, mechanical balance, sieve set, flakiness testing apparatus, core cutter etc.

2.4.3 Samples from fresh concrete shall be taken as per IS : 1199 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

---

Qty. of concrete in the work	No. of samples of concrete for testing at 28 day
------------------------------	--

---

1-5 m <sup>3</sup> .	1
6-15 m <sup>3</sup> .	2
16-30 m <sup>3</sup> .	3
31-50 m <sup>3</sup> .	4
51 and above	4 + one additional for each additional 50 m <sup>3</sup> or part thereof.

---

**NOTE :** Atleast 1 sample shall be taken from each shift. Three test specimens shall be made for each sample for testing at 28 days. Additional samples must be taken to determine strength at 7 or 3 days or at the time of striking the formwork, or to determine the duration of curing, or to check the testing error. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Architect and Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

2.4.3 The test results of the sample shall be average of the strength of 3 specimens. The individual variation shall not be 15% of the average strength of the sample. The compressive mean strength for the group of 4 non-overlapping consecutive test results shall be as per col. 2 table 11 of IS 456:2000 and individual test results shall be as per col. 3 of table 11 of IS 456:2000.

## 2.5 stripping

- 2.5.1 The Architect and Engineer-in-charge shall be informed in advance by the Contractor of his intention to strike the formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperature are above 20°C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in IS 456:2000 11.3.1 page 25 for respective item of formwork.
- 2.5.4 All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stress due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm covers to the finished concrete surface. Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Architect and Engineer in-charge. After removal of formwork and shuttering the Engineer-in-charge shall inspect the work and satisfy by random checks that concrete produced is of good quality.
- 2.5.5 The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.
- 2.5.4 Immediately after the removal of forms, all exposed bolts etc. passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of atleast 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine mortar lines caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned saturated with water and carefully pointed and rendered true with mortar of cement and fine sand. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces, which are pointed, shall be kept moist for a period of 24 hours. For repairing concrete members, suitable bonding agent shall be used as directed by the consultant.
- 2.5.6 If rock pockets/honeycombs in the opinion of Architect and Engineer-in-charge are of such an extent or character so as to effect the strength of the structure, materially or to endanger the life of the steel reinforcement, he may declare

the concrete defective and require the removal and replacement of the portion of the structure affected with no extra cost.

**5.0 Mode of Measurement and Payment**

3.1 Relevant Nabhi's commentary on CPWD specifications clause no. 4.2.15.1 to 4.2.15.5 and 4.2.15.7 shall be followed.

3.2 All structural elements like footing, slab, beam, columns, walls, lintels, chajjas, etc. shall not be classified, measured and paid separately.

3.3 The rate includes the cost of material, labour, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed by engineer-in-charge curing and all other incidental expenses for producing concrete of specified strength, for all floors, all shapes at any height and level, and in any position.

3.4 The rate shall be for an unit of one cum. The cost of formwork shall be included as excluded as per the item description.

**2.30 Supplying, fabricating and placing / fixing in position TMT reinforcement bars FE-500D confirming to IS-1786 reinforcement for RCC structures / items as per design including transporting steel to the work site, handling, decoiling, hooking, cutting, bending, cranking, fabricating to required shape, placing in position and tying / binding the system with MS 18 gauge wires, welding if necessary etc., for all floors / all levels / all heights complete as per specifications and direction of Engineer Incharge. Measurement will be made on the length basis and converted into weight by using standard coefficient (rolling margin's and wastage shall not be paid). The quoted rate should be inclusive the cost of Binding wire and the same will not be measured and paid separately. for all civil, plumbing, electrical & infrastructure works. The quoted rate should be inclusive the cost of Binding wire, laps, chairs, hooks for lifting, spacers etc and the same will not be measured and paid separately. For all civil, plumbing, electrical & infrastructure work.**

**1.0 Material**

**1.1 Reinforcement**

1.1 Reinforcement shall conform to M-17.

**1.2 Binding Wire**

1.2 Binding Wire shall conform to M-18.

**2.0 Workmanship**

2.1 CPWD Technical specifications clause no. 5.3.1 and 5.3.2 is to be followed.

- 2.2 The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.
- 2.3 Bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.
- 2.4 All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 18 gauge MS binding wire as approved by Engineer-in charge. The rebars shall be placed with stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars at 1m c/c , Precast cover blocks in cement mortar 1:2 ( 1cement : 2 coarse sand) about 4 X 4 cm square section or 4 cm dia round section or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In charge or Architect. Reinforcement after being placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.
- 2.5 Bars crossing each other where required shall be secured by 16 gauge GI binding wires (annealed) of size not less than 1 mm., in such manner than they do not slip over each other at the time of fixing and concreting.
- 2.11 As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. Where directed and practicable overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick, twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movement is maximum in beam and slab.
- 2.12 Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the

full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS : 226.

- 2.13 When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S electrodes used for welding shall conform to IS: 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed. Welding shall be done by electric arc process as per IS : 816 and IS : 823.
- 2.14 At the time of concreting, a bar fitter shall remain at site to keep the reinforcement in position.
- 2.11 Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer -in charge.

### **3.0 Mode of Measurement and Payment**

- 3.1 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones by using standard IS co-efficient. Length shall include hooks at the ends. The wastage of steel and binding wires shall not be measured and paid extra. The rolling margin of steel shall not be paid extra.
- 3.3 The rate for reinforcement shall include the cost of labour and material required for all operations described above like cleaning of reinforcement bars, straightening, cutting, hooking, bending, binding, welding placing in position etc. as per the drawing or directed by the Architect or engineer-in-charge Rate shall also include the cost of GI binding wires of 16 to 18 gauge, devices like chairs, pins, spacer bars, cover blocks of PVC or cement mortar etc. for keeping reinforcement in position. The rate shall for an unit of MT.

**2.31 RCC Coping (280mm width)**

Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth / exposed finish cement concrete of M25 grade with minimum cement content 360 Kg per cum of concrete work for RCC coping as per the drawing on retaining wall, staircase wall including exposed centering, shuttering, pumping, laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be exclusive of reinforcement and same shall be paid in relevant tender item. Rate shall be inclusive of providing grooves, drip moulds, ghis, pockets, cutouts, chipping out old concrete as required, etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL and cleaning of both side wall face & clearing of all loose material as well. (Sample to be approved)

**1 General**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M25 grade instead of M20 grade and minimum cement content shall be 360 Kg per cum of concrete.

**2 Mode of Measurements and Payment**

2.1 The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength, all shapes at any height and level, and in any position.

2.2 The rate shall be for a unit of one Rmt. (Running meter).

2.3

The cost of the formwork is included as per the item description.

2.4 The cost of reinforcement shall be considered in relevant item.

**2.31.1 RCC Coping (Other than 280mm width as per site condition)**

Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth / exposed finish cement concrete of M25 grade with minimum cement content 360 Kg per cum of concrete work for RCC coping as per the drawing on retaining wall, staircase wall, counterfort, flowerbed wall, planter wall including exposed centering, shuttering, pumping, laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting

of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be exclusive of reinforcement and same shall be paid in relevant tender item. Rate shall be inclusive of providing grooves, drip moulds, ghis, pockets, cutouts, chipping out old concrete as required, etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL and cleaning of both side wall face & clearing of all loose material as well. (Sample to be approved)

## **1 General**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M25 grade instead of M20 grade and minimum cement content shall be 360 Kg per cum of concrete.

## **2 Mode of Measurements and Payment**

- 2.1 The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed, curing and all other incidental expenses for producing concrete of specified strength, all shapes at any height and level, and in any position.
- 2.2 The rate shall be for a unit of one Cum.
- 2.3 The cost of the formwork is included as per the item description.
- 2.4 The cost of reinforcement shall be considered in relevant item.

### **2.31.2 For Terrazo Coping (finished 320 mm width)**

Providing and laying RCC M25 coping to be wire finish on retaining wall and access etc, including shuttering and deshuttering, laying of concrete as per drawing or as instructed by architect/engineer in charge at all levels, all places, all shapes in required lines and levels by any means, finishing and curing etc. and including Admixtures/bonding agent in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall also include providing drip moulds, ghis, pockets, cutouts, chipping out old concrete as required, etc. and labour for insert sleeves if any wherever required while casting. Rate shall be exclusive of reinforcement and same shall be paid in relevant tender item. (sample to be approved)

Relevant specification as per RCC coping item no.2.31.1 to be followed.

#### **Mode of Measurements and Payment**

The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed, curing and all other incidental



expenses for producing concrete of specified strength, all shapes at any height and level, and in any position.

The rate shall be for a unit of one Rmt. (Running meter).

The cost of the formwork is included as per the item description.

The cost of 3.8 mm dia hard drawn wire mesh also includes in the item with placing fixing and transporting charges.

## **2.32 Finishing for Terrazo Coping (finished 320 mm width)**

**Providing and laying minimum 10mm thick cast in situ terrazo coping on top and sides of RCC coping over Retaining wall, access with marble chips of approved colour sizes up to 4 mm laid in white cement marble powder mix 3:1 (3 white Cement: 1 marble powder) by weight in proportion of 2:3 (2 cement marble powder mix: 3 marble chips) admixed with approved shade and make nonfading pigment by volume including cement slurry, over 12 mm thick plaster jointed with neat cement slurry including rubbing, polishing and cleaning etc. complete as approved by Architects & Engineer-in-charge or all levels, all places, all shapes in required lines and levels by any means, finishing and curing etc.. as per drawing including laying and polishing in required line and levels including 6mm groove in terrazo and plaster as per drawing or instructed by Engineer in charge. Rate shall be also inclusive of 12mm under coat plaster in cement mortar 1:3 on RCC Coping top and sides (Sample to be approved before mass production).**

### **1.0 Material**

#### **1.1 Marble Chips**

1.1.1 Marble Chips shall conform to M-41.

#### **1.2 Cement Concrete**

1.2.1 Nabhi's commentary on CPWD specifications clause no. 11.2.1 shall be followed.

### **1.0 Workmanship**

1.1 Nabhi's commentary on CPWD Specification clause no. 11.6.1, 11.6.3 shall be followed.

1.2 Polishing shall be normally commenced after 21 days of laying the terrazo. Polishing to be done with 220, 320 of emery as per sample approved. All works shall be carried out as directed by the Architect and as specified in the item (no waxing will be permitted)

### **2.0 Mode of Measurement and Payment**

3.1 Item shall be measured in RMT and paid accordingly



- 3.2 The rate shall not include the cost of base concrete (under layer)
- 3.3 The rate shall include the cost of all materials and labour involved in all the operations described in the item above including cleaning of surface of RCC coping or base concrete and application of cement slurry but include the cost of plaster, cutting groove as specified in the item

**2.33 Densification of Terrazzo Coping (finished 320 mm width)**

**For Terrazzo Coping (finished 320 mm width)**

**Supply and apply "concrete grinding after 21 days of terrazzo finish coping by using planetary grinding machine to remove undulations up to 3mm depth and create flat surface followed by hardening due to densification using lithium silicate up to the saturation level of concrete then polishing of concrete up to the Grit size 3000 nos. of Diamonds and up to the level of expectation of EIC and Architect. Seal the surface using sealer and followed by buffing with Diamond buffing pad. After 72 hrs. Of the treatment water, tea, or any other fluid should not penetrate the concrete. The rate shall also include the cost of all materials and labour involved in all the operations described as per manufacturer's specifications from Engineer in charge/architect. (Sample to be approved before mass production).**

**1.1 Workmanship**

- 1.1 Concrete Grinding using planetary grinding machine to remove undulations up to 3mm depth and create flat surface.
- 1.2 Followed by hardening due to densification with Lithium Silicate up to the saturation level of concrete.
- 1.3 Polishing of concrete up to the Grit size 3000 nos Of Diamonds and up to the level of Expectation of EIC.
- 1.4 Seal the surface using sealer and followed by buffing with Diamond buffing pad.
- 1.5 After 72 hrs. Of the treatment water, tea, or any other fluid should not penetrate the concrete.
- 1.6 The process is finished with cross-check.

**2.0 Mode of measurement**

- 2.1 Rate shall be paid for per Rmt of terrazzo coping as specified in the drawing. The rate shall also include the cost of all materials and labour involved in all the operations described above.
- 2.2 Rate shall include all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work.

**2.34 Providing and fixing dowel bars in existing concrete by drilling 16 mm holes for 12 mm dia rebar grouting of HIT-HY200 (chemical) or equivalent for the depth of 260 mm**

**and grouting the anchors bars with epoxy resin, testing charges etc complete. The reinforcement will be paid separately in respective item.**

**1.0 Workmanship**

Providing, Drilling/Cleaning hole and injecting chemical and thereby inserting rebars with the help of dispenser, into a hole of dia & depth as per manufacturer specification and fixing rebars of the required diameter thereof.

Chemical should have ETA approval & Fire rating. Chemical should have tensile zone approval too.

On site 5% testing should be provided with valid test reports and Load details.

**2.0 Mode of Measurement & Payment.**

27.3.1 Rate shall be for per number.

27.3.2 Rate shall include all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work.

**2.35 Addition of Poly proplene fibre of Durocrete Micro Fibrillated PP Fibers or equivalent of length 6 mm in cement plaster/mortar of dosage 125-150 gms per cum and in under layer RCC M25 required fibre 16-20mm length of dosage 250-300g / cum in Terrazo coping as per manufacturer's specification or as per directions of Engineer-in-Charge.**

**Material** – PP fibre shall confirm to Conforms to ASTM C 1116, Type III, Synthetic Fibre)

**Mode of measurement** -Rate shall be paid in per kg.

**2.36 Finishing of retaining wall in line level below coping in RCC M25 grade with minimum cement content 360 Kg per cum of concrete for any type of shape, etc including pumping laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. Rate shall be inclusive of providing grooves, drip moulds, ghisis, pockets, cutouts etc. Rate also to include the cost of centering, shuttering, lift charges and scaffolding for all heights / depths from PFL / GL but excluding the cost of reinforcement and same shall be paid in relevant tender item. (Sample to be approved)**

Relevant specification for concrete item specification will be followed as per item no.14

**Mode of measurement** -Rate shall be paid in cum.

**2.37 MAKING GROOVE**

**Cutting and making of groove at specified distance as per the drawing by mechanical saw. Groove/sawed joints shall be made of 6 mm width and 25 to 50 mm depth as shown in the drawing. The sawing operation should be carried out as directed by Architect and Engineer-in-charge. The rate shall be inclusive of labour, grooves,**

**machinery cost and clearing of all debris & loose material from the site (Sample to be approved)**

**A) RCC Wall**

**1 Workmanship**

The contraction/sawed joints to be formed at by grooving with mechanical saw within 48 hrs. The width of 5mm and depth of the groove sawed joint should as shown in drawing, operation should be carried out as soon as concrete is ready to accept the saw cut with trowelling.

**2 Mode of measurement:**

- 2.1 The rate shall be inclusive of labour, grooves, machinery cost.
- 2.2 The item shall be measured and paid in Rmt. (Running meter)

**2.38 Providing and laying in expansion joint 225 mm wide PVC waterstop of approved make and as per specification as shown in the drawings.**

**General**

(a) Polyvinyl chloride (PVC) water stops shall normally have a centre bulb of 12.5 mm inside diameter and 25 mm out side diameter. It shall be 225 mm in width and shall have minimum of two or three longitudinal ribs on each side of the bulb evenly distributed between the bulb and the edge of the water stops. Each rib shall be 6.33 mm high and the rib adjacent to the centre bulb shall have web thickness 12.5 mm and the rib adjacent to the edge shall have a web thickness of 10 mm. For this purpose, the contractor shall submit to the Engineer-in-charge, for approval, four sets of drawings showing details of the water stops, including dimensions, shapes and details of intersections and splices between water stops of the same size and of different sizes. Fabrication and procurement of materials shall be made only after the approval of the drawings by the Engineer -in-charge. Any fabrication or procurement of materials performed prior to approval of the drawings shall be at the Contractor's risk.

The Engineer-in-charge shall have the right to ask the contractor to make any changes in the drawings, which may be necessary to make the finished installation conforming to the requirements and intent of these specifications without additional cost to the Corporation. Approval by the Engineer -in charge to the Contractor's drawings shall not re leave the contractor of his obligation to meet all the requirements at these specifications or of the responsibility for the correctness of the Contractor's drawings.

(b) One set of the above drawings will be returned to the Contractor either approved, disapproved, or conditionally approved and these shall be resubmitted for approval, if so directed.

(c) The water stops shall be dense, homogeneous and free from holes and other imperfections. The water stops shall meet the material and test requirements given hereinafter. The cross section of the water stops shall be uniform along its length and the thickness shall be symmetrical transversely. Tolerance for the dimensions given above shall be plus 5 mm in width, plus 2 mm in thickness and plus 1 mm for other dimensions.

(d) Certified copies of the laboratory test reports on the physical properties of the PVC water stops and a certificate stating that PVC water stops as furnished meeting with all other requirements of those specifications, be obtained by the Contractor from the manufacturer of the PVC water stops shall submit to the Engineer-in-charge with the test report of the PVC water stop carried out by the Contractor. Three samples of PVC water stop of 25 to 30 cm length shall be obtained by the Contractor from the supplier and shall be submitted to the Engineer-in-charge. These samples shall be furnished at least 60 days prior to embedment of any water stops in the structure.

(e) The Contractor shall arrange to obtain the water stops from the suppliers in rolls securely packed, containing a single length of not less than 12 linear meters and having inside diameter of not less than 0.3 meter.

### Materials

(a) The PVC water stops shall be fabricated by an extrusion process from the elastomeric plastic compound, the basic resin of which shall be virgin Polyvinyl chloride. No reclaimed Polyvinyl Chloride shall be used.

(b) The compound shall contain any additional resin, plasticizers inhibitors or other materials, needed to ensure that the finished product shall have the following physical characteristics as per the CWC specification for PVC seal.

1. Tensile strength Kg/cm<sup>2</sup> 116 minimum
2. Ultimate elongation % 300 minimum
3. Tear Resistance Kg/cm<sup>2</sup> 49 minimum
4. Stiffness in flexure Kg/cm<sup>2</sup> 24.6 minimum
5. Accelerated extraction
  - (a) Tensile strength minimum 105 kg/cm<sup>2</sup>
  - (b) Ultimate elongation minimum 250%

6. When tested in accordance with the effect of alkali test as described in the following paragraphs, the material shall not show an increase in weight of more than 0.25 percent or a loss in weight of more than 0.1 percent or loss in weight of more than 0.10 after 7 days, or more than 0.40 percent increase in weight or more than 0.30 percent loss in weight after 28 days. After 28 days' immersion the dimensions of the sample shall not differ from those of the original sample by more than 1.0 percent. After 7 days' immersion, the Durometer hardness reading of sample shall not differ by more than plus or minus 5 from the reading on the original sample.

7. When tested in accordance with the cold bend test described in the following paragraph, the material shall show no signs of cracking or chipping.

8. PVC water stop confirming to IS –12200 of standard make is only acceptable.

### Inspection and Tests

(a) All water stops shall be subject to laboratory tests before transport. Samples of the finished water stops and material for tests shall be furnished to the Engineer -in-charge. All tests shall be made by and at the expense of the contractor.

(b) Samples for laboratory tests to determine physical properties of the compound shall be taken in accordance with the random process to obtain following number of tests units from each lot received.

Size of lot received Number of tests

45 Meters	1
45 to 90 Meters	2
90 to 450 Meters	4
450 to 900 Meters	8
Over 900 Meters	Additional one test for every 100 m

(c) Laboratory tests to determine physical properties of the water stops required to be furnished under these specifications shall be performed on test specimens cut from test units taken from the finished products. The contractor shall furnish the specimens at his cost for test at places as directed.

(d) Test shall be made in accordance with the following methods.

- i) Tensile strength                      ASTM designation D 638
- ii) Elongation                              ASTM Designation D 638

- iii) Durometer hardness      ASTM Designation D 2240 (Type A)
- iv) Accelerated extraction.
- v) Effect of alkali
- vi) Cold bend test
- vii) Impact resistance.

### **Installation**

(a) Location and embedment of the PVC water stops shall be as shown on the drawings, with approximately one half of the width of the water stops embedded in the concrete on each side of the joint. In order to eliminate faulty installation that may result in leakage, care shall be taken that the water stops are correctly positioned and secured during installation. All water stops shall be installed so as to form a continuous watertight diaphragm in the joint, unless otherwise shown. Adequate provision shall be made to completely protect the water stops during the progress of the work.

(b) Additional vibration, over and above that used for adjacent concrete placement, shall be carried out to ensure complete embedment of the water stop in the concrete. Larger pieces of aggregate near the water stop shall be removed by hand during embedment to assure complete contact between the water stop and the surrounding concrete. Splices in the continuity or at the intersections of junctions of PVC water stops shall be performed by heat-sealing the adjacent surface in accordance with the Manufacturer's recommendations. A thermostatically controlled electric heat source shall be used to make all splices. The correct temperature at which splices should be made will differ with the material compounds but should be sufficient to melt. All splices shall be neat with the ends of the joined water stops in true alignment. A meter box guide and portable saw shall be provided and used to cut the ends to be joined to ensure good alignment and contact between joined surfaces. After splicing, a remoulding iron with ribs and corrugations to match the pattern of the water stop shall be used to reform the ribs at the splices. The continuity of the characteristics members of the cross sections of the water stop design (ribs, tubular centre axis, protrusions, and the like) shall be maintained across the splices.

(c) Where splices are required between water stops of different size, the splices shall be made as recommended by the manufacturer of the water stops and drawings showing the details of the splices shall be submitted to the Dep't. for approval, as required in paragraph "General" above.

(d) Prior to embedment, the edges of the water stops shall be secured to looped wire in the end bulbs to improve the Concrete bond as shown on the drawings. The bars shall conform to the provisions of section 5 "Reinforcement Steel fabrication and erection". The manner in which the water stop is secured to the reinforcing bars shall be subject to approval.

### **Measurement and Payment**

Measurement for payment, for furnishing and placing PVC water stops shall be made on the basis of linear meter measured along the centre line of the water stop with no allowance for lap at splices and intersection. The contractor unit rate includes complete item of PVC water stop. The payment shall be made at the rate quoted for the item with no allowance floor lap at splices and intersection. The unit price shall include making splices and intersections and of furnishing all labour, equipment, and materials, required for installing the water stops and protecting the water stops from damage during the progress of the work. The unit rate shall also include the cost of preparing and submitting the drawings, producing samples for approval of the Engineer-in-charge and costs of all incidental work needed to complete the work as per the specifications.

## **2.39 DRY LEAN CEMENT CONCRETE SUB-BASE**

**Providing and laying of dry lean cement concrete (DLC) of M15 grade below access lane, walkway and center verge and compacting the same with 8 to 10 Tone vibratory roller as per the specifications and as per drawing and as directed by the Engineer. Rate shall include cost of formwork if any.**

### **1.0 Scope**

- 1.1** The work shall consist of construction of dry lean concrete subbase for cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations, in connection with the work, as approved by the Engineer.
- 1.2.** The design parameters of dry lean concrete sub-base, viz., width, thickness, grade of concrete, details of joints, if any, etc. shall be as stipulated in the Contract drawings.

### **2. Materials**

- 2.1. Source of materials:** The Contractor shall indicate to the Engineer the source of all materials with relevant test data to be used in the lean concrete work sufficiently in advance and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work. If the Contractor later proposes

to obtain the materials from a different source, he shall notify the Engineer for his approval at least 45 days before such materials are to be used.

**2.2. Cement:** Any of the following types of cement may be used with prior approval of the Engineer;

- |       |                           |          |
|-------|---------------------------|----------|
| (i)   | Ordinary Portland Cement  | IS : 269 |
| (ii)  | Portland Slag Cement      | IS : 455 |
| (iii) | Portland Pozzolana Cement | IS :1489 |

If the subgrade is found to consist of soluble sulphates in a concentration more than 0.5 per cent, cement used shall be sulphate resistant and shall conform to IS: 6909.

Cement to be used may preferably be obtained in bulk form. It shall be stored in accordance with stipulations contained in Clause 1014 and shall be subjected to acceptance test prior to its immediate use.

**2.3. Aggregates:**

**2.3.1.** Aggregates for lean concrete shall be natural material complying with IS: 383. The aggregates shall not be alkali reactive. The limits of deleterious materials shall not exceed the requirements set out in IS: 383. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hours before batching, as directed by the Engineer.

**2.3.2. Coarse aggregate:** Coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of the coarse aggregate shall be 25 mm. The coarse aggregate shall comply with Clause 602.2.4.2.

**2.3.3. Fine aggregate:** The fine aggregate shall consist of clean, natural sand or crushed stone sand or a combination of the two and shall conform to IS: 383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica, organic and other foreign matter. The fine aggregate shall comply with Clause 602.2.4.3.

**2.3.4.** The coarse and fine aggregates may be obtained in either of the following manner:

- (i) In separate nominal sizes of coarse and fine aggregates and mixed together intimately before use.
- (ii) Separately as 25 mm nominal single size, 12.5 mm nominal size graded aggregates and fine aggregate of crushed stone dust or sand or a combination of these two.



The material after blending shall conform to the grading as indicated in Table 600-1.

Table 600-1. AGGREGATE GRADATION FOR DRY LEAN CONCRETE

Sieve designation	Percentage passing the sieve by weight
26.50 mm	100
19.00 mm	80-100
9.50 mm	55-75
4.75 mm	35-60
600.00 micron	10-35
75.00 micron	0-8

**2.4. Water:** Water used for mixing and curing of concrete shall be clean and free from injurious amounts of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS: 456.

**2.5. Storage of materials:** All materials shall be stored in accordance with the provisions of Clause 1014 of these Specifications and other relevant IS Specifications. All efforts must be made to store the materials in proper places so as to prevent their deterioration or contamination by foreign matter and to ensure their satisfactory quality and fitness for use in the work. The storage place must also permit easy inspection, removal and storage of materials. All such materials even though stored in approved godowns must be subjected to acceptance test immediately prior to their use. The requirement of storage yard specified in Clause 602.2.9. shall also be applicable.

### 3. Proportioning of Materials for the Mix

**3.1.** The mix shall be proportioned with a maximum aggregate cement ratio of 15:1. The water content shall be adjusted to the optimum as per Clause 601.3.2. for facilitating compaction by rolling. The strength and density requirements of concrete shall be determined in accordance with Clause 601.6 by making trial mixes.

**3.2. Moisture content:** The right amount of water for the lean concrete in the main work shall be decided so as to ensure full compaction under rolling and shall be assessed at the time of rolling the trial length. Too much water will cause the lean concrete to be heaving up before the wheels and picked up on the wheels of the roller and too little will lead to inadequate compaction, a low in-situ strength and an open-textured surface.

The optimum water content shall be determined and demonstrated by rolling during trial length construction and the optimum moisture content and degree of compaction shall be got approved from the Engineer. While laying in the main work, the lean concrete shall have a moisture content between the optimum and optimum +2 per cent,

keeping in view the effectiveness of compaction achieved and to compensate for evaporation losses.

**3.3. Cement content:** The minimum cement content in the lean concrete shall not be less than 150 kg/cu.m. of concrete. If this minimum cement content is not sufficient to produce concrete of the specified strength, it shall be increased as necessary without additional cost compensation to the Contractor.

**3.4. Concrete strength:** The average compressive strength of each consecutive group of 5 cubes made in accordance with Clause 903.5.1.1. shall not be less than 10 MPa at 7 days. In addition, the minimum compressive strength of any individual cube shall not be less than 7.5 MPa at 7 days. The design mix complying with the above Clauses shall be got approved from the Engineer and demonstrated in the trial length construction.

#### **4. Subgrade**

The subgrade shall conform to the grades and cross sections shown on the drawings and shall be uniformly compacted to the design strength in accordance with these Specifications and Specification stipulated in the Contract. The lean concrete subbase shall not be laid on a subgrade softened by rain after its final preparation; surface trenches and soft spots, if any, must be properly back-filled and compacted to avoid any weak or soft spot. As far as possible, the construction traffic shall be avoided on the prepared subgrade. A day before placing of the sub-base, the subgrade surface shall be given a fine spray of water and rolled with one or two passes of a smooth wheeled roller after a lapse of 2-3 hours in order to stabilise loose surface. If Engineer feels it necessary, another fine spray of water may be applied just before placing sub-base.

#### **5. Construction**

**5.1. General:** The pace and Programme of the lean concrete sub base construction shall be matching suitably with the Programme of construction of the cement concrete pavement over it. The sub-base shall be overlaid with cement concrete pavement only after 7 days after sub-base construction.

**5.2. Batching and mixing:** The batching plant shall be capable of proportioning the materials by weight, each type of material being weighed separately in accordance with Clause 602.9.3.2. The cement from the bulk stock shall be weighed separately from the aggregates. The capacity of batching and mixing plant shall be at least 25 per cent higher than the proposed capacity for the laying arrangements. The batching and mixing shall be carried out preferably in a forced action central batching and mixing plant having necessary automatic controls to ensure accurate proportioning and mixing. Other types of mixers shall be permitted subject to demonstration of their satisfactory performance during the trial length. The type and capacity of the plant shall be got approved by the Engineer before commencement of the trial length. The weighing balances shall be

calibrated by weighing the aggregates, cement, water and admixtures physically either by weighing in the large weighing machine or in a weigh bridge. The accuracy of weighing scales of the batching plant shall be within  $\pm 2$  per cent in the case of aggregates and  $\pm 1$  per cent in the case of cement and water.

The design features of Batching Plant should be such that the shifting operations of the plant will not take very long time when they are to be shifted from place to place with the progress of the work.

**5.3. Transporting:** Plant mix lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering the tippers/dumpers with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to paving site shall be such that the travel time available from mixing to paving as specified in Clause 601.5.5.2 will be adhered to.

**5.4. Placing:** Lean concrete shall be laid/placed by a paver with electronic sensor. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that after compaction the total thickness is as specified. The paving machine shall have high amplitude tamping bars to give good initial compaction to the sub-base.

The laying of the two-lane road subbase done either in full width or lane by lane. Preferably the lean concrete shall be placed and compacted across the full width of the road, by constructing it in one go or in two lanes running forward simultaneously. Transverse and longitudinal construction joints shall be staggered by 500-1000 mm and 200-400 mm respectively from the corresponding joints in the overlaying concrete slabs.

### **5.5. Compaction**

**5.5.1.** The compaction shall be carried out immediately after the material is laid and levelled. In order to ensure thorough compaction which is essential, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is closed. The minimum dry density obtained shall be 97 per cent of that achieved during the trial length construction vide Clause 601.7. The densities achieved at the edges i.e 0.5 m from the edge shall not be less than 95 percent of that achieved during the trial construction vide Clause 601.7.

**5.5.2.** The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be so arranged as to ensure that the time between the mixing of the first batch of concrete in any transverse section of the layer and the final finishing of the same shall not exceed 90 minutes when the concrete

temperature is above 25 and below 30 degrees Celsius and 120 minutes if less than 25 degrees Celsius. This period may be reviewed by the Engineer in the light of the results of the trial run but in no case shall it exceed 2 hours. Work shall not proceed when the temperature of the concrete exceeds 30 degrees Celsius. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35° C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

**5.5.3.** Double drum smooth-wheeled vibratory rollers of minimum 80 to 100 kN static weight are considered to be suitable for rolling dry lean concrete. In case any other roller is proposed, the same shall be got approved from the Engineer, after demonstrating its performance. The number of passes required to obtain maximum compaction depends on the thickness of the lean concrete, the compatibility of the mix, and the weight and type of the roller etc., and the same as well as the total requirement of rollers for the job shall be determined during trial run by measuring the in-situ density and the scale of the work to be undertaken.

**5.5.4.** In addition to the number of passes required for compaction there shall be a preliminary pass without vibration to bed the lean concrete down and again a final pass without vibration to remove roller marks and to smoothen the surface.

Special care and attention shall be exercised during compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these points, use of plate vibrator shall be made, if so directed by the Engineer.

**5.5.5.** The final lean concrete surface on completion of compaction and immediately before overlaying, shall be well closed, free from movement under roller and free from ridges, low spots, cracks, loose material, pot holes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material laid and compacted as per Specification. For repairing honeycombed surface, concrete with aggregates of size 10 mm and below shall be spread and compacted. It is necessary to check the level of the rolled surface for compliance. Any level/thickness deficiency should be corrected after applying concrete with aggregates of size 10 mm and below after roughening the surface. Similarly, the surface regularity also should be checked with 3 m straight edge. The deficiency should be made up with concrete with aggregates of size 10 mm and below.

**5.5.6.** Segregation of concrete in the dumpers shall be controlled by premixing each fraction of the aggregates before loading in the bin of the batching plant, by moving the dumper

back and forth while discharging the mix on it and other means. Even paving operation shall be such that the mix does not segregate.

**5.6. Joints:** Contraction and longitudinal joints shall be provided as per the drawing.

At longitudinal or transverse construction joints, unless vertical forms are used, the edge of compacted material shall be cut back to a vertical face where the correct thickness of the properly compacted material has been obtained.

**5.7. Curing:** As soon as the lean concrete surface is compacted, curing shall commence. One of the following two methods shall be adopted:

- (a) The initial curing shall be done by spraying with liquid curing compound. The curing compound shall be white pigmented or transparent type with water retention index of 90 per cent when tested in accordance with BS 7542. Curing compound shall be sprayed immediately after rolling is complete. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet hessian for three days.
- (b) Curing shall be done by covering the surface by gunny bags/hessian, which shall be kept continuously moist for 7 days by sprinkling water.

**6. Trial Mixes**

The Contractor shall make trial mixes of dry lean concrete with moisture contents like 5.0, 5.5, 6.0, 6.5 and 7.0 per cent using cement content specified and the specified aggregate grading but without violating the requirement of aggregate-cement ratio specified in Clause 601.3.1. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot as described in Clause 903.5.1.1. After establishing the optimum moisture, a set of six cubes shall be cast at that moisture for the determination of compressive strength on the 3<sup>rd</sup> and the seventh day. Trial mixes shall be repeated if the strength is not satisfactory either by increasing cement content or using higher grade of cement. After the mix design is approved, the Contractor shall construct a trial section in accordance with Clause 601.7.

If during the construction of the trial length, the optimum moisture content determined as above is found to be unsatisfactory, the Contractor may make suitable changes in the moisture content to achieve a satisfactory mix. The cube specimens prepared with the changed moisture content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis so that the moisture content could be adjusted. The mix finally designed should neither stick to the rollers nor become too dry resulting in ravelling of surface.

**7. Trial Length**

- 7.1.** The trial length shall be constructed at least 14 days in advance of the proposed date of commencement of work. At least 30 days prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a "Method Statement" giving detailed description of the proposed materials, plant, equipment, mix proportion, and procedure for batching, mixing, laying, compaction and other construction procedures. The Engineer shall also approve the location and length of trial construction which shall be a minimum of 60 m length and for full width of the pavement. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and freshly laid sub-base. The construction of trial length will be repeated till the Contractor proves his ability to satisfactorily construct the subbase.
- 7.2.** In order to determine and demonstrate the optimum moisture content which results in the maximum dry density of the mix compacted by the rolling equipment and the minimum cement content that is necessary to achieve the strength stipulated in the drawing, trial mixes shall be prepared as per Clause 601.6.
- 7.3.** After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method with 20 cm dia density cone. Three density holes shall be made at locations equally spaced along a diagonal that bisects the trial length; average of these densities shall be determined. These main density holes shall not be made in the strip 50 cm from the edges. The average density obtained from the three samples collected shall be the reference density and is considered as 100 per cent. The field density of regular work will be compared with this reference density in accordance with Clauses 601.5.5.1 and 903.5.1.2. A few cores may be cut as per the instructions of the Engineer to check segregation or any other deficiency.
- 7.4.** The hardened concrete shall be cut over 3 m width and reversed to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the gradation of the mix to eliminate segregation of the mix. The lower surface shall not have honey-combing and the aggregates shall not be held loosely at the edges.
- 7.5.** The trial length shall be outside the main works. The main work shall not start until the trial length has been approved by the Engineer. After approval has been given the materials, mix proportions, moisture content, mixing, laying, compaction plant and construction procedures shall not be changed without the approval of the Engineer.
- 8. Tolerances for Surface Regularity, Level, Thickness, Density and Strength**
- The tolerances for surface regularity, level, thickness, density and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with section 900.
- 9. Traffic**

No heavy commercial vehicles like trucks and buses shall be permitted on the lean concrete sub-base after its construction. Light vehicles if unavoidable may, however, be allowed after 7 days of its construction with prior approval of the Engineer.

#### **10. Measurements for Payment**

The unit of measurement for dry lean concrete pavement shall be the cubic metre of concrete placed, based on the net plan areas for the specified thickness shown on the drawings or as directed by the Engineer.

#### **11 Rate**

The Contract unit rate payable for dry lean concrete sub-base shall be payment in full for carrying out the required operations including full compensation for all labour, materials and equipment, mixing, transport, placing, compacting, finishing, curing, testing and incidentals to complete the work as per Specifications, all royalties, fees, storage and rents where necessary and all leads and lifts.

#### **2.40 CEMENT CONCRETE BROOM FINISH**

**Providing and laying cement concrete broom finish floor in required thickness and slope with M30 concrete as shown in the drawing and as specified by the Architect / Engineer-in-charge. Rate shall be inclusive of concrete (to be laid in alternate panels) with steel channel formwork, labour, material, tools, equipments etc. to complete the work to the satisfaction of engineer in charge. Temperature reinforcement will be provided in C.C Broom finish which will be paid separately in reinforcement item. The contractor unit rate also include cost of providing and laying 125micron PVC sheeting shown with existing concrete slab prior to construction of broom finish (Sample to be approved).**

Relevant specifications of item no. 2.12 shall be followed except grade of concrete shall be M30 grade instead of M20 grade and minimum cement content shall be 400 Kg per cum of concrete.

##### **Mode of Measurements and Payment**

1. The rate includes cost of all materials, labour, tools, PVC sheeting and plant required for mixing, placing in position, vibrating and compacting, finishing, rendering as directed, curing and all other incidental expenses for producing concrete of specified strength, all shapes at any height and level, and in any position.
2. The rate shall be for a unit of one Cum. (m<sup>3</sup>).
3. The cost of the formwork is included as per the item description.

#### **2.41 VACUUM DEWATERING SYSTEM / TRIMIX**



**Extra for carrying out vacuum dewatering & Power floater treatment in cement concrete floors, well compacted, mechanically vibrated, finished to required levels, floated with neat cement and power trowelled to get desired broom finish, over a leveling course, including MS shuttering, curing for 10 days with gunny bags etc complete. The rate shall include all labour, material, tools, equipments, other incidental necessary to complete the work. (Sample to be approved)**

## **7.1 Material and Workmanship:**

### **7.1.1 General**

The Contractor shall improve the quality of all concrete floor slabs by placing the concrete according to the Trimix system as indicated on the drawings and as specified herein.

### **7.1.2 Technical Assistance/Training of Labour**

During the placement of concrete, the Contractor shall have a minimum of one person present at all times who has been adequately trained by a representative of the equipment manufacturer. This person shall be experienced in the vacuum dewatering process, and in the operation of all related equipment and shall direct all concrete dewatering work performed. The Contractor shall provide the services of a representative from the manufacturer of the vacuum dewatering equipment on site for a period of time of at least eight (8) hours. The manufacturer's representative shall provide technical assistance for the vacuum dewatering process on the initial day of operation.

### **7.1.3 Equipment for compacting, placing, vacuum processing and finishing of slab**

All process equipment to be used shall be of a design representative of the state of the art, and shall be subject to the approval of the engineer. Equipment shall be Trimix or approved equal. System shall have a demonstrated five years' history of performing such work. The vacuum pumps shall be able to generate a minimum vacuum of 609mm (24 inches) of mercury (0.80 atmospheres) in actual operation using the maximum number and size of suction mats required for this work.

The Contractor shall have at the job site sufficient equipment (vacuum pumps, mats, fitter pads and accessories) to ensure that the vacuum dewatering process continues uninterrupted to completion. Stand by equipment is sometimes required.

### **7.1.4 Mix Design**



The Contractor is responsible for the mix designs of the class as called for on the drawings and must submit the mix proposed for use in the contract before any work is started. All mix parameters must conform to the values specified in Trimix recommendations and design mix report.

The Contractors shall utilize a knowledgeable and experienced concrete technician for the design and production of mix (mixes) meeting all the requirements of the specifications.

Do not deliver any concrete to the construction site until all the approvals have been obtained.

#### **7.1.5 Quality Control**

The Contractor has the responsibility for achieving the quality of concrete specified by controlling the concrete mixes, placing, vacuum process finishing and curing. The concrete technician in charge must be present at the site when work is in progress.

The Contractor shall be responsible for mix adjustments, performing necessary tests, correcting deficiencies and trouble shooting in general.

The Contractor shall be required to maintain control charts showing individual test results for aggregate gradation, slump, air content, cement content and compressive strength.

#### **7.1.6 Planning of Placing**

The Contractors shall submit for review shop drawings for floor slabs detailing the location of all construction joints and the sequence of the slab placement and manufacturer's literature describing the equipment to be used. In addition to the shop drawings, the Contractor shall indicate the quantity of each piece of dewatering equipment that will be located at the construction site and shall include the dimensions of all suction mats.

Before concreting is started the work should be planned with a view to determine areas to be placed daily, the required amount of equipment, size of vacuum mats, length of vacuum hoses, arrangement of rails, if any, or screeds etc. Crew required for the vacuum process is two men to handle the mats and the pump. Note that placing, vibration, vacuum treatment and floating follow immediately behind each other.

Check position of vacuum pump in relation to vacuum mat location to find whether extra vacuum hoses are required.

#### **7.1.7 Concrete Materials**

Note: All concrete mix design shall meet the requirements of this section and section TRIMIX concrete mix design recommendations.

#### 7.1.7.1 Cement

Portland cement of normal grinding fineness, which corresponds to a specific surface of 2600-3500 cm<sup>2</sup>/g, is required. Cement of higher grinding fineness, e.g. rapid-hardened Portland cement of larger specific surfaces shall be avoided especially in concrete mixes with a cement content 590 lb/sq.yd. Recommended content is 421 to 590 LB/sq.yd.

#### 7.1.8 Equipment Specification Trimix System

Poker vibrator with high frequency preferably 335 hz (20000 vibr/min) dia. 1 to 1 1/2".

Surface vibrator type double beam with beam spacing 12".

Preferably one-piece beam in full length exceeding bay width 8" to 24". Beam should easily be adjusted to absolute straightness and controlled every morning before placing of concrete starts.

Suction mat type RM 60 100% tight plastic material weight 650 gram/m<sup>2</sup>. Width same as bay size and length 20' for capacity and flexibility.

Filter Pad type RD 12 weight 600 g/m<sup>2</sup>, width 4' length-bay width-minus 8".

Vacuum Pump P 4001 8 with 10 HP engine and specially designed pump unit with heavy duty chrome housing and sealing. Adjustable vacuum by valve on top of tank for ease of operation with different mix designs.

Skim floater type G 900/G 700 with disc which allows direct floating of dewatered concrete. Weight maximum 90kg (200 pounds) for 40"(W.disc.) Finishing is done with G 900, using blades only and is normally done with 30 minutes' intervals between passes.

The above equipment specified should be used for the production of quality concrete floors according to the Trimix System. Inter-changeability of equipment is not recommended.

#### 7.1.9 Execution Trimix System

##### 7.1.9.1 General

The work shall be planned and executed so that there is no delay between the placement, screeding, dewatering and floating of the concrete. Concrete to be vacuum dewatered shall be handled and placed so as to prevent segregation. The concrete shall be internally vibrated prior to screeding.

### 7.1.9.2 Leveling

Immediately following placement, the concrete shall be leveled with a vibrating screeding running on a true surface, set at the proper elevation required to provide the specified finished elevation. The concrete surface shall be screeded high by 2% of the slab's thickness to compensation for the compaction caused by the vacuum dewatering process. (Slabs to have an aggregate hardener shall have compensation made to maintain elevation). The vibrating screed shall be moved forward as rapidly as proper consolidation allows. The proper surcharge of concrete must be maintained in front of the leading edge of the screed.

### 7.1.9.3 Vacuum

Immediately after leveling, the concrete shall be covered with filter pads and suction mats in strict accordance with the recommendation of the manufacturer to have the slab fully dewatered. The suction mat shall extend 4 inches beyond the edge of the filter pad on all sides. The pads shall extend to within 4" of the edge of concrete slab, and the mats shall cover entire slab. Before connecting the hose on the suction mat to the vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum shall then be applied to the mat. After a minute the gauge on the vacuum pump should indicate a minimum vacuum of 0.70 atmospheres (24.0 in. Hg) and if not, the mat must be checked for leakage. For concrete that dewater readily the vacuum should then be maintained awt 0.70-0.80 atmospheres (24.0-25.5 in Hg) For concrete which dewater less efficiently (e.g. air-entrained concrete) the vacuum shall then be reduced to 0.50-0.60 atmospheres (15.0-18.0 in. Hg). After approximately 10 minutes the vacuum can then be increased to 0.80 atmospheres.

The vacuum shall be maintained for at least 3 minutes per inch of concrete thickness at 0.80 atmospheres. (Where aggregate hardeners are specified, sufficient moisture shall be maintained to meet manufacturer's requirements). The suction mats and filter pads shall then be removed and moved to the next section in leapfrog manner.

Stop the vacuum dewatering when light footprints only are left in the concrete when stepped upon. A suitable suction time can also be checked with a Proctor-apparatus, which should show 1.5-2 kp/cm<sup>2</sup>.

### 7.1.9.4 Floating

Upon removal of the suction mats and filter pads the concrete surface shall be power-floated without delay until all imprints from the vacuum process are

removed. If crusting occurs, the floating operation must be delayed till the concrete carries the machine.

The higher speed is recommended for the floating operation. Two passes with the floating disc should be made in the junction of two mats in order to avoid risk for cracking.

#### **7.1.9.5 Finishing**

The waiting time after the floating operation depends on concrete temperature and humidity and varies from 10 minutes to 2 hours.

The trowelling operation cannot take place before the concrete has hardened enough to carry the machine, i.e. the trowelling blades will not leave any marks on the concrete. Repeated trowelling. With intervals between the passes, which are adapted to the setting of the concrete, greatly improves the surface characteristics. The surface will be more wear resistant and less dusty.

At least two passes are recommended for floors, which are not to be covered.

#### **7.1.9.6 Curing**

Vacuum dewatered concrete should be cured like any other quality concrete in order to achieve a good final result with ponding.

#### **7.2 Mode of measurement:**

The item shall be measured and paid in sqmt (m<sup>2</sup>) excluding cost of concrete. The cost of concrete shall be measured & paid separately under relevant items. Rate of shuttering with MS channels is inclusive.

#### **2.42 MAKING GROOVE**

**Cutting and making of groove in cement concrete floor at specified distance as per the drawing by mechanical saw within 24 hrs. Groove/sawed joints shall be made of 5mm width and 25 mm to 40mm depth as shown in the drawing. The sawing operation should be carried out as soon as concrete is ready to accept the saw cut etc as directed by Architect and Engineer-in-charge. The rate shall be inclusive of labour, grooves, machinery cost and clearing of all debris & loose material from the site and groove cutting shall be carried out within 24hr or something as shown in drawing (Sample to be approved)**

#### **8.1 Workmanship**

The contraction/sawed joints to be formed at by grooving with mechanical saw within 4 hrs. The width of 5mm and depth of the groove sawed joint should as show in drawing, operation should be carried out as soon as concrete is ready to accept the saw cut with trowelling.

**8.2 Mode of measurement:**

8.2.1 The rate shall be inclusive of labour, grooves, machinery cost.

8.2.2 The item shall be measured and paid in Rmt. (Running meter)

### CW 03.00 Form Work

**3.01.a Providing form work of ordinary timber planking and/or shuttering plywood and /or steel plates with supporting system of adjustable steel props and steel spans (purlin) so as to give smooth/ fair finish, including centering, shuttering, strutting and propping, etc. complete, height of propping and centering below supporting floor to ceiling not exceeding 4.5 m., and removal of the same for in-situ reinforced concrete and plain concrete work, in foundations, footings, bases of columns, retaining walls etc. and mass concrete. All concrete surface shall be fair finished concrete.**

#### 1.0 Materials:

- 1.1 The shuttering to be provided shall be of ordinary timber planks/shuttering ply /steel sheets shall conform to M-22A, M-22B & M22C respectively. Supporting system of the shuttering plates/ply shall be of adjustable steel props/H frames or equivalent steel scaffolding and MS adjustable spans (purlin).
- 1.2 The dimensions of scantling and battens shall conform to the design. The strength of the form work shall not be less than that assumed in the design

#### 2.0 Workmanship:

- 2.1 The form work shall conform to the shape, lines and dimensions as shown on the drawings and shall be so constructed so as to remain sufficiently rigid and water-tight, during the placement and compaction of the concrete. Adequate arrangement shall be made by the Contractor to safe guard against any settlement of the form work during the course of concreting and after concreting. The formwork of shuttering, centering, scaffolding, bracing, etc. shall be as per the design. False staging should be erected with MS – adjustable props or H frames or equivalent system. No through tie-rod shall be allowed for water retaining structures and basements. For water retaining structure and basements **special tie-rod assembly shall be used at no extra cost.**
- 2.2 **Cleaning & Treatment of Forms:** All rubbish, particularly chipping, shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be coated with mould releasing agent, applied before concreting is done. Shuttering releasing agent of approved manufacture may be applied. Care shall be taken that the coating is not applied on the construction joints surface and steel reinforcement bars. **Shuttering oil will not be allowed as mould releasing agent.**
- 2.3 **Stripping Time:** In normal circumstances and where ordinary portland cement is used, form work may be struck after expiry of the following periods but **subject to approval/confirmation from Engineer in charge:**
  - (a) Sides of walls columns and vertical faces of beams - 24 to 48 hours.
  - (b) Beam soffits (Props left under) - 7 days.

**(c) Removal of props for slabs - (i) Slabs spanning upto 4.5 m. - 7 days.**

**(ii) Slabs spanning over 4.5 m. - 14 days.**

**(d) Removal of props to beams and Arches - (i) Spanning upto 6 m. - 14 days.**

**(ii) Spanning over 6 m. - 21 Days.**

2.4 **Procedure while removing the form work:** All form work shall be removed without such shocks or vibrations as would damage the reinforced concrete surface. Before the soffit form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary, in order to ascertain that the concrete has sufficiently hardened.

2.5 **Centering:**

2.5.1 The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete till it achieved full strength. Watch should be kept to see that behavior of centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

2.5.2 The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads, without any settlement.

2.5.3 The centering and form work shall be inspected and approved by the Engineer-in-charge, before concreting. But this will not relieve the Contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, the Contractor shall be responsible for the damages to the work, injury to life and damage to property.

2.6 **Scaffolding:**

2.6.1 All scaffolding, hoisting arrangements and ladders, etc. required for facilitating of concreting shall be provided and removed on completion work by Contractor, at his own expense. The scaffolding, hoisting arrangement, ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, Contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen, etc.

2.6.2 The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.

2.7 **Reuse:** Before re-use, all forms shall be inspected by the Engineer-in-charge and their suitability shall be ascertained. If, any of the forms are found to be unsuitable, they shall be immediately removed from the site. The forms ascertained for re-use, shall be scarred,

cleaned, and joints gone over and repaired, wherever required. The inside surface shall be retreated to prevent adhesion to concrete.

**3.0 Mode of Measurements and Payment:**

3.1 Form work shall be measured as an area in m<sup>2</sup> of shuttering in contact with concrete except in the case of inclined members and portion of curved pro-files, in which case, only area of underside shall be measured for payment.

3.2 Form work to secondary beams shall be measured upto the sides of main beams but no deduction shall be made from the form work of the main beam at the inner section point. No deduction shall be made from the form work of a column at inner section of beams.

3.3 The rate is applicable to all conditions of working and height up to 4.0m –unsupported height from floor to ceiling. The rate shall include the cost of materials, its transportation at site and labour for various operations involved such as:

(a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering, strutting, propping, bolting, nailing, wedging, easing, striking and removal.

(b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm. width to beams, columns and the like.

(c) Temporary opening in the forms for pouring concrete.

(d) Scarring, removal of rubbish, dressing with approved shuttering releasing agent to prevent adhesion of concrete with shuttering,

(e) Raking or circular cutting.

(f) Making necessary grooves, ghis using 10 mmX10 mm PVC battens of Accucell or equivalent, cut-outs, pockets and drip moulds (grooves) and fixing embankment if any. If the grooves, ghis, drip-mould (groove) are not provided during execution the same shall be carried out by cutting with concrete cutter & finishing smooth /rendering at no extra cost as per the instruction and approval of EIC.

(g) All holes for tie rods shall be grouted (5mm recess) with cement mortar and bonding agent so as to match with surrounding exposed concrete as directed by the Engineer in charge. Rate of formwork shall be inclusive grouting the holes.

(h) Concrete surfaces kept exposed as per architectural design shall be measured for the payment for

The rate is for the completed item.

3.4 The rate shall include in the item of RCC works.



**3.01.b Providing form work rigid and water tight, centering and shuttering using best quality of ordinary timber planking and/or shuttering plywood /steel plates with supporting system of MS adjustable steel props / spans / Frames or all RCC works all heights / all levels / all depths / all floors in horizontal / vertical / slanting surfaces of any shape and size including strutting, propping, bracing, staging etc. complete, so as to give smooth/fair finish and careful removal of formwork etc. complete all as per specifications and direction of Engineer-in-charge. The Height of propping and centering below supporting floor to ceiling not exceeding 5.0 mtrs. For all civil, plumbing & electrical works.**

The relevant specifications of item no. 3.01.a shall be followed except that, shuttering plywood, steel sheathing and/or steel plates shall be used instead of ordinary timber planking **with supporting system as specified in SOQ.**

**3.02.a Extra for providing and erecting false staging with MS props or MS H frames for each additional height of propping and centering where the height of propping and centering exceeds 4.5 m. between supporting floor to ceiling, including temporary masonry work or stone pillars for supporting as required with adequate bracing / propping with steel props / H Frames etc. including cost of deshuttering and centering at all levels (height more than 4.5 m. and upto 9.0 m.) Note: Plan area to be measured for payment.**

**1.0 Material and Workmanship:** The relevant specification of item no. 3.01.a shall be followed except that the height of propping and centering between supporting floor to ceiling exceeds 5.0m. upto 9.0 m **with supporting system as specified in SOQ.**

**2.0 Mode of Measurements and Payment:**

2.1 The payment shall be made for the false staging work. This will be paid only if there is no slab/platform in between and extra staging is necessary. Extra over and above the payment made for form work of slab in relevant items. The work of false staging shall be measured in m<sup>2</sup>. The relevant specification of item no. 3.01.a shall be followed. The rate includes the cost of providing stone or masonry temporary pillars for supporting, as required without any extra cost.

2.2 The rate shall be for an unit of one m<sup>2</sup>.

2.3 False staging for vertical RCC elements like column, beam & wall etc. shall not be measured & paid

**3.02.b Extra for further additional height of propping and centering where the height of propping and centering exceeds 9.0 m. between supporting floor to ceiling including temporary brick or stone pillars for supporting as required (height more than 9.0 m. and upto 18 m.)**

The relevant specification of item no. 3.02.a shall be followed except that the height of propping and centering exceeds from 9.0 m. upto 18 m. between supporting floor to ceiling.

**3.03.a Exposed shuttering**

Extra for providing formwork for exposed concrete surfaces (vertical or horizontal surface) in desired pattern and size as per drawing and specifications, including rendering with white cement and grey cement, using laminated shuttering plywood, for vertical and steel or laminated plywood shuttering for horizontal surfaces for all types RCC elements like slabs, walls, columns, beams, sill, coping, lintels, jambs, loft, beam hunching, vertical fins, pardi etc. including neat cleaning the exposed concrete surface, as directed by the engineer-in-charge. Rate shall be applicable for all levels, all places and all shapes. Rate shall be measured for only exposed surface. The contractor shall submit shutterng pattern including tie-rod hole position based on architectural conceptual drawings. (Same kind of shuttering material should be only used for standard and residual sizes.) Rate shall be inclusive for using tie rod assembly of PVC cone and coil on both side of basement and water retaining structure's vertical walls. Rate shall be measured and paid for only exposed surface shown on drawing & kept exposed.

**1.0 Materials and Workmanship:** The relevant specification of item No.3.01.a shall be followed except that the extra rate shall be paid for using laminated shuttering plywood and steel plates(without rivets) instead of ordinary timber planks/normal shuttering ply steel plates, to obtain a desired smooth exposed finish of surface as per pattern. Only similar type of material shall be used for the entire work. The surface shall be presentable without further treatment.

**2.0 Mode of Measurements and Payment:**

2.1 The measurement of form work shall be taken for the form work done with laminated shuttering plywood, extra over the rate of concrete work of the respective item of concrete work done. The relevant specification of respective item No. 3.01.a shall be followed.

2.2 Shuttering work shall be as per shuttering pattern drawing including, cleaning, rendering and making surface uniform by finishing the surface as per sample approved & detail specifications mentioned in item number 3.01. a

2.2 The rate shall be for a unit of one m<sup>2</sup>. Only exposed surface shown on drawing & kept exposed shall be measured & paid for.

**3.03. b Extra for providing and erecting false staging with MS props or MS H-frames for each additional height of propping and centering where the height of propping and centering exceeds 5 m between supporting floor to ceiling, including temporary masonry work or**

**stone pillars for supporting as required No staging shall be measured for vertical walls & beam sides. (Plan area shall be measured.)**

**a) Height up to 5.0 to 6.0 m**

**b) height More than 6.0 m to up to 10.0 m**

**1.0. Material and Workmanship:** The relevant specification of item no. 3.01.a shall be followed except that the height of propping and centering between supporting floor to ceiling exceeds **5.0m. with supporting system as specified in BOQ.**

**2.0 Mode of Measurements and Payment:**

2.1 The payment shall be made for the false staging work. This will be paid only if there is no slab/platform in between and extra staging is necessary. Extra over and above the payment made for form work of slab in relevant items. The work of false staging shall be measured in  $m^2$ . The relevant specification of item no. 3.01.a shall be followed. The rate includes the cost of providing stone or masonry temporary pillars for supporting, as required without any extra cost.

2.2 The rate shall be over & above for shuttering up to 4.0 meter for steel props only. No wooden ballies shall be allowed for false staging.

2.3 The staging for the slab above 6.0 meter shall be carried out H frame or equivalent shuttering system.

2.4 The rate shall be for a unit of one  $m^2$ .

2.5 False staging for vertical RCC elements like column, beam & wall etc. shall not be measured & paid

## **CW 04.00**

### **Brick Work**

**4.01 Providing and laying brick work using common burnt clay conventional building bricks conforming to IS 1077-1992 having compressive strength not less than 50 Kg/cm<sup>2</sup> in any shape and all depth including curing, scaffolding etc. complete as directed by engineer-in-charge.**

#### **4.01.1 In foundations and Plinth**

**(i) CM 1:4 (1 Cement: 4 coarse Sand)**

**(ii) CM 1:5 (1 Cement: 5 coarse Sand)**

**(iii) CM 1:6 (1 Cement: 6 coarse Sand)**

#### **4.01.2 Super structure above plinth for all levels**

**(i) CM 1:4 (1 Cement: 4 coarse Sand)**

**(ii) CM 1:5 (1 Cement: 5 coarse Sand)**

**(iii) CM 1:6 (1 Cement: 6 coarse Sand)**

### **1.0 Material**

#### **1.1 Water**

1.1.1 Water shall conform to M-1.

#### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

#### **1.3 Brick**

1.3.1 Brick shall conform to M-23.

### **2.0 Workmanship**

#### **2.1 Proportion**

2.2.1 The proportion of the cement mortar shall be as specified in item and conform to relevant IS standards.

#### **2.2 Soaking of Brick**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 6.2.3 shall be followed.

#### **2.3 Laying**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 6.2.4 shall be followed.

2.3.2 In a day brick work shall not be laid more than 1m or 10 courses in height.

2.3.3 The frames of doors, windows, cupboards, etc. shall be housed into the brick work at the correct location and level, as directed while executing the masonry work. The heavy steel

doors, windows frames, etc. shall be built in with brick work, but for ordinary steel doors and windows, required opening for frames, hold-fasts, etc. shall be left in the wall and frames shall be embedded later on in order to avoid damage to the frames.

## **2.4 Joints**

2.4.1 Nabhi's commentary on CPWD specifications clause no. 6.2.5 shall be followed except in case of nonmodular bricks thickness of four course and four joints shall be 35 cm and thickness of mortar at the joint shall be 12 mm.

2.4.2 At the end of day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.

## **2.5 Curing**

2.5.1 Nabhi's commentary on CPWD specifications clause no. 6.2.6 shall be followed.

## **2.6 Scaffolding**

2.6.1 Nabhi's commentary on CPWD specifications clause no. 6.2.7 shall be followed.

2.6.2 No through holes shall be left in brickwork to support the scaffolding. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.

## **2.7 Preparation of foundation bed**

2.7.1 If the foundation is to be laid directly on the excavated bed, the bed shall be leveled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened, cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.

## **3.0 Mode of Measurement and Payment**

3.1 Brickwork shall be measured in cubic meter unless otherwise specified. Dimensions shall be measured correct to the nearest to 0.01m. Areas shall be calculated to the nearest 0.01 sqm and cubic contents shall be worked out to the nearest 0.01 cum. Half brick wall thick shall be measured separately in sqm stating the thickness.

3.2 The measurement shall be taken for the brick masonry fully completed in foundation upto plinth or above plinth for all levels, heights, shapes and locations as per the item description. Battered, tapered and curved portions shall be measured net as walls.

3.3 No deduction shall be made from the quantity of brick work, nor shall any extra payment be made for embedding in masonry or making holes in respect of following items

(1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 0.1 m<sup>2</sup>.

- (2) Architectural openings in walls, parapet and compound walls, not exceeding 0.1 m<sup>2</sup> area.
  - (3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 cm. and the bearing does not extend to the full thickness of wall.
  - (4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining.
  - (5) Iron fixtures, pipes upto 300 mm. dia. holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.
  - (6) Forming chases of section not exceeding 350 cm<sup>2</sup> in cross section or 50 cm in girth.
- 3.2 Apertures for fire places shall not be deducted nor shall extra labor required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural moldings like corbelling, pattas, etc.
- 3.3 The rate shall be for a unit of one cum.
- 4.02 Providing and laying brick work using common burnt clay conventional building bricks conforming to IS 1077-1992 having compressive strength not less than 50 Kg/cm<sup>2</sup> in any shape and all depth including curing, scaffolding etc. complete as directed by engineer-in-charge**
- 4.02.1 Super structure above plinth for all levels**
- (i) **CM 1:4 (1 Cement: 4 coarse Sand)**
  - (ii) **CM 1:5 (1 Cement: 5 coarse Sand)**
  - (iii) **CM 1:6 (1 Cement: 6 coarse Sand)**
- The relevant specifications of item no. 4.01 shall be followed except item shall be executed for super structure above plinth for all levels.
- 4.03. a Brick work in plain arches (with uncut bricks) in superstructure including centering and shuttering complete for span up to 6 meters with conventional brick of crushing strength not less than 50 kg/cm<sup>2</sup> in cement mortar 1:3 (1 cement: 3 coarse sand).**
- Nabhi's commentary on CPWD specifications clause no. 6.3 shall be followed.

**4.03. b Brick work in gauged arches (with cut or moulded bricks) in superstructure including centering and shuttering complete for span up to 6 metres with conventional brick of crushing strength not less than 50 kg/cm<sup>2</sup> in cement mortar 1:3 (1 cement: 3 coarse sand).**

Nabhi's commentary on CPWD specifications clause no. 6.3 shall be followed.

**4.03.c Extra for additional cost of centering for arches exceeding 6m span including all shuttering, bolting, wedging and removal (Area of the soffit to be measured)**

Relevant Nabhi's commentary on CPWD specifications clause no. 6.3 shall be followed.

**4.04.a Providing and laying Half brick, 115mm thick masonry using common burnt clay conventional building bricks confirming to IS 1077-1986, having crushing strength not less than 35 Kg/cm<sup>2</sup>, for all floors / all heights / all levels in any shape, in any position, in CM 1:4 (1 cement : 4 coarse sand) including curing, scaffolding, etc. complete, as directed including racking out the joints etc. (without reinforcement). RCC M20 grade vertical mullions of 230 x 115mm at 4.5 mt. distance & horizontal stiffeners / bands of 75mm thick at every approximately 1000 mm, shall be provided as per drawing, specification or as directed by Engineer in Charge. The concrete including shuttering and reinforcement shall be paid in relevant tender items.**

**4.04. a.1 With reinforcement including providing 2 nos. of 6 mm dia. MS round bars after every 3 courses embedded in the mortar**

**(A) 115 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

**(B) 75 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

**4.04.a.2 Without Reinforcement**

**(A) 115 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

**(B) 75 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11

**1.3 Brick**

1.3.1 Brick shall conform to M-23.

**2.0 Workmanship**

**2.1 Proportion**

2.1.1 The proportion of the cement mortar shall be as specified in item and conform to accepted standards.

**2.2 Soaking of Brick**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 6.2.3 shall be followed.

**2.3 Laying**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 6.4 shall be followed.

2.3.2 In a day brick work shall not be laid more than 1m or 10 courses in height.

2.3.3 Relevant specifications of item no. 4.01 shall be followed except the bricks shall be laid in stretcher bond. When half bricks is to be reinforced, 2 nos. MS bars of 6 mm dia shall be embedded at every third courses as given in the item. (the dia of bars shall not exceed 6 mm dia) These shall be securely anchored at their end where the partitions end. The free ends of the reinforcement shall be keyed into the mortar of the main brickwork to which the brickwork is joined. The mortar used for the reinforcement of the brickwork shall be rich dense cement mortar 1:4. Overlap of the reinforcement shall not be less than 30 cm. The mortar interposes between the reinforcement bars and the brick shall not be less than 5 mm.

**2.4 Joints**

2.4.1 Nabhi's commentary on CPWD specifications clause no. 6.2.5 shall be followed.

2.4.2 At the end of day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.



## 2.5 Curing

2.5.1 Nabhi's commentary on CPWD specifications clause no. 6.2.6 shall be followed.

## 2.6 Scaffolding

2.6.1 Nabhi's commentary on CPWD specifications clause no. 6.2.7 shall be followed.

2.6.2 No through holes shall be left in brickwork to support the scaffolding. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.

## 3.0 Mode of Measurement and Payment

3.1 Nabhi's commentary on CPWD specifications clause no. 6.4.1 and relevant specifications of item no. 4.01 shall be followed.

3.2 The half brick masonry work for all heights, levels, locations and shapes shall be measured under this item. The limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall not be measured and paid for. The rate shall exclude the reinforcement if it is given in the item description and shall be paid in relevant item.

3.3 The rate shall be measured in sqm.

**4.04. b Providing and laying half brick masonry with common burnt clay building bricks having compressive strength not less than 50 Kg/cm<sup>2</sup> at all heights, levels, locations and shapes etc. including vertical mullions at every 3m and horizontal ties at 1m, curing, scaffolding etc. complete as directed by the engineer-in-charge. Concrete and reinforcement shall be paid in relevant item.**

**4.04.b.1 Without Reinforcement (2 nos. of 6 mm dia. MS round bars after every 3 courses) but with RCC ties and mullions**

**(A) 115 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

**(B) 75 mm thick**

**(i) CM 1:3 (1 Cement: 3 coarse Sand)**

**(ii) CM 1:4 (1 Cement: 4 coarse Sand)**

Relevant specifications of item no. 4.04.a shall be followed except the vertical mullions (115 x 115 to 230mm) are to be provided at every 3m and horizontal ties (115 x 75 mm) of concrete (1:2:4 or M20) are to be provided at every 1m. Concrete and reinforcement are to be provided

as per the drawing or as directed by the engineer-in-charge and shall be measured and paid in relevant item.

**4.05 Providing and laying half bricks thick Honey comb brick work with burnt clay conventional building bricks having compressive strength not less than 50 Kg/cm<sup>2</sup> in CM 1:4 (1 cement: 4 coarse sand) including curing, scaffolding, etc. complete as directed by engineer-in-charge.**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**1.3 Brick**

1.3.1 Brick shall conform to M-23.

**2.0 Workmanship**

2.1 The relevant specifications of item no. 4.04.a shall be followed.

2.2 Nabhi's commentary on CPWD specifications clause no. 6.6 shall be followed.

**3.0 Mode of Measurement and Payment**

3.1 For measurement Nabhi's commentary on CPWD specifications clause no. 6.6.1 shall be followed.

3.2 The rate includes the cost of materials and labor required for all operations as described above. The rate shall be for all heights, all levels and positions.

**4.06 Extra over and above of providing and laying brickwork for cavity walls of thickness as per the drawing with brick strength not less than 50 Kg/cm<sup>2</sup>, in CM 1:4 (1-part cement: 4-part sand), including providing galvanized iron, mild steel, wrought iron or RCC wall ties, forming weep (below) and vent(upper) holes, scaffolding, curing, etc. complete as directed by engineer-in-charge for all floors, levels and shapes. The cavity wall shall be constructed with**

**4.06.1 2 Leaves of 115 mm each**

**4.06.2 2 leaves one of 115 and other of 230mm**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

## **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used

## **1.3 Brick**

1.3.1 Brick shall conform to M-23.

## **2.0 Workmanship**

2.1 For proportion, soaking of brick, laying, joints, curing, scaffolding specifications of item no. 4.01 shall be followed except the brick work shall be carried out for cavity walls constructed using bricks or blocks so arranged to provide an air space within the wall.

2.2 Usually, cavity wall is constructed of 2 leaves of 115mm thick, with a cavity in between. The bricks are laid flat as stretchers in each course, breaking joints. Each leaf of the cavity wall shall not be less than 115 mm. thick. If the 2 leaves are of different thickness, the thicker leaf shall be made on the outside.

## **2.3 Metal Ties**

2.3.1 Nabhi's commentary on CPWD specification clause no. 6.11.1 shall be followed.

## **2.4 Bonding Units**

2.4.1 Nabhi's commentary on CPWD Specifications clause no. 6.11.2 shall be followed.

## **2.5 Spacing**

2.5.1 Nabhi's commentary on CPWD Specifications clause no. 6.11.3 shall be followed.

## **2.6 Restrictions**

2.6.1 Nabhi's commentary on CPWD Specifications clause no. 6.11.4 shall be followed except the cavity walls shall not be built more than 4.5m in height and 9meter in length. Where longer lengths and heights are desired the walls are divided into panels with intermediate RCC vertical mullions and horizontal runners.

## **3.0 Mode of Measurement and Rate**

3.1 Nabhi's commentary on CPWD Specifications clause no. 6.11.5 shall be followed except the closing of cavities at jambs, sills and heads of the openings shall be closed by bricks which shall be measured and paid under this item. If it is closed by RCC shall be measured and paid in relevant item.

3.2 The cost of RCC runner / ties, mullions shall be paid separately in relevant item.

**4.07.a Providing and laying precast concrete block masonry as per drawing (including quoin block, jamb block, closer etc.) with solid concrete precast blocks of approved size made of cement concrete 1:3:6 in cement mortar 1:4 for all floors, levels, heights and shapes etc. complete as directed by engineer-in-charge.**

**4.07.a.1 390 x 190 x 190**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.6 Cement**

1.2.1 Cement shall conform to M-3.

**1.7 Sand**

1.3.1 Sand shall conform to M-6.

**1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

**1.5 Cement Mortar**

1.5.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**1.6 Solid Concrete Block**

1.6.1 Solid concrete block shall conform to M-28 and size and proportion of CC as per item description.

**2.0 Workmanship**

2.1 The blocks need not be wetted before or during lying in the walls. In case climatic conditions so required the top and the sides of block may only be slightly moistened so as to prevent absorption of water from the mortar and ensure the development of required bond with mortar.

**2.2 Joints**

2.2.1 Operations of laying precast cement concrete block masonry shall be carried out in accordance with instructions detailed in IS: 6042-1962. The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose its plasticity thereby resulting in poor bond. For most of the work mortar shall be spread over the entire top surface of the block so that the horizontal joint shall be 10 mm. thick except in the case of extended joint construction. The mortar joints shall be struck off flush with wall surface and when the mortar has started stiffening, it shall be compressed with

rounded or U-shaped tool. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened in effect intimate contact between the mortar and the masonry unit and obtained a weather tight joint. Normally full mortar bedding shall be adopted as it shall enable full utilisation of the load carrying capacity, however, where walls shall carry lighter loads, the mortar shall be spread only over the front and rear shells and not on the webs. This shall arrest the seepage of water through the joints.

- 2.2.2 To maintain uniform thickness of the jointing mortar, wooden batten 10mm x 10mm shall be placed on either side of the block for each layer. The batten shall be removed once the mortar attains sufficient strength.
- 2.2.3 For vertical joints, the mortar shall be applied on the vertical edges of the front and rear shells of the blocks. It shall be more convenient to apply mortar on the edges of the succeeding units and then placing it horizontally well pressed against the previously laid unit. It may be necessary to add mortar, particularly to the vertical joints, to ensure that they are well filled.

### **2.3 Laying**

- 2.3.1 The first course shall be laid with great care, making sure that it is properly aligned, levelled and plumbed. The blocks for this course shall be first laid without mortar, over the footing, along the string lightly stretched, to determine the correct position and also adjust their spacing. When the blocks are set in proper position, the 2 corner blocks are removed, a full mortar bed is spread for them on the footing and are then laid back again in place, truly level and plumb. The string is then stretched tightly along the faces of the two corner blocks. Thereafter, each block shall be removed and re-laid over a bed of mortar, with their faces to coincide with the string line. After every 3 or 4 blocks have been laid, their correct alignment, level and verticality shall be checked. Special C shaped blocks (Biaxial) shall be used to make provision for service pipe lines, holdfasts, lintel etc.

### **2.3 Quoins and Closer**

- 2.4.1 Special quoins blocks (with a return face equal to half the length of normal face) shall be cast for all building blocks and slabs and for external work. Proper half length closer shall be cast and not cut from full size blocks. The returned ends of blocks for door and windows reveals and quoins shall be finished with a fair face in the mould
- 2.4.2 Construction of the wall may be started either at the corners first or from one end proceeding on the other direction. If the corners shall be built first, they shall be built four or five courses higher than the center of the wall. Each block shall be checked with a level or straight edge to ascertain that the blocks are in one plane. Each course, shall be stepped back by half-block and the horizontal spacing of the block shall be checked by placing a mason's level diagonally across the corners of the block.

### **2.5 Curing**

2.5.1 The curing of the concrete block shall be done for 7 days.

### **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 4.01 shall be followed.

3.2 The work for concrete block masonry shall be for all floors inclusive of labour and material required for executing the material as specified above.

3.3 The rate shall be for an unit of one cum.

**4.07.b Providing and laying precast concrete block masonry as per drawing (including quoin block, jamb block, closer etc.) with solid concrete precast blocks of approved size made of cement concrete 1:3:6 in cement mortar 1:3 for all floors, levels, heights and shapes etc. complete as directed by engineer-in-charge.**

#### **4.07.b.1 390 x 90 x 190 (For Partition wall)**

##### **1.0 Material**

##### **1.1 Water**

1.1.1 Water shall conform to M-1.

##### **1.8 Cement**

1.2.1 Cement shall conform to M-3.

##### **1.9 Sand**

1.3.1 Sand shall conform to M-6.

##### **1.4 Coarse Aggregate**

1.4.1 Coarse Aggregate shall conform to M-12.

##### **1.5 Cement Mortar**

1.5.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

##### **1.6 Solid Concrete Block**

1.6.1 Solid concrete block shall conform to M-28 and size and proportion of CC as per item description.

##### **2.0 Workmanship**

2.1 The relevant specifications of item no. 4.07.a shall be followed except the size of solid concrete blocks is 390 x 90 X 190 mm and shall be suitable for 100 mm wall.

### 3.0 Mode of Measurement

- 3.1 The relevant specifications for item no. 4.04.a shall be followed.
- 3.2 The item shall be measured in sqm.

**4.08.a Providing and laying precast concrete block masonry as per drawing (including quoin block, jamb block, closer etc.) with hollow concrete precast blocks of approved size made of cement concrete 1:3:6 in cement mortar 1:3 (1 cement : 3 coarse sand) for all floors, levels, heights and shapes etc. complete as directed by engineer-in-charge.**

#### 4.08.a.1 390 x190 x 190

##### 1.0 Material

##### 1.1 Water

- 1.1.1 Water shall conform to M-1.

##### 1.10 Cement

- 1.2.1 Cement shall conform to M-3.

##### 1.11 Sand

- 1.3.1 Sand shall conform to M-6.

##### 1.4 Coarse Aggregate

- 1.4.1 Coarse Aggregate shall conform to M-12.

##### 1.5 Cement Mortar

- 1.5.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

##### 1.6 Hollow Concrete Block

- 1.6.1 Hollow concrete block shall conform to M-27 and size and proportion of CC as per item description.

##### 2.0 Workmanship

- 2.1 The relevant specifications of item no. 4.07.a shall be followed and in addition to that the following shall be followed:

For provision of Door and window frames :

- a) A course of solid block masonry shall be provided under the door and window openings or a 10 cm thick precast concrete sill-block under the windows. This solid course shall extend for at least 20 cm. beyond the opening, on either side.

b) For jambs of very large doors and windows, either solid block shall be provided or the hollow blocks used shall be filled with concrete mix of 1:3:6.

c) Mild steel holdfasts shall be so fixed that they coincide with the block course level. Their ends shall be embedded in the hollow, which has to be filled with concrete mix 1:3:6.

### **3.0 Mode of Measurement**

3.1 The relevant specifications of item no. 4.01 shall be followed.

3.2 The work for concrete block masonry shall be for all floors inclusive of labour and material required for executing the material as specified above.

3.3 The rate shall be for an unit of one cum

**4.08.b Providing and laying precast concrete block masonry as per drawing (including quoin block, jamb block, closer etc.) with hollow concrete precast blocks of approved size made of cement concrete 1:3:6 in cement mortar 1:3 (1 cement : 3 coarse sand) for all floors, levels, heights and shapes etc. complete as directed by engineer-in-charge.**

#### **4.08.b.1 390 x 90 x 190 (For Partition wall)**

##### **1.0 Material**

1.1 Relevant specifications of item no. 4.08.a shall be followed.

##### **2.0 Workmanship**

2.1 The relevant specifications of item no. 4.08.a shall be followed except the size of hollow concrete blocks is 390 x 90 X 190 mm and shall be suitable for 100 mm wall.

##### **3.0 Mode of Measurement**

3.1 The relevant specifications for item no. 4.04.a shall be followed.

3.2 The item shall be measured in sqm.

**4.09 Providing and fixing 190mm x 190 mm x 80 mm glass bricks of approved make and design with white CM 1:2 (1 white cement: 2 sand). Two numbers of 5 mm thick GI wires to be passed through PVC spacers in each joint horizontal as well as vertical by drilling holes in surrounding surface (brick or RCC) and filling the same with Hilti or equivalent chemical (rebaring). The PVC concealed spacer (with provision for passing the 2 no. GI wires in horizontal and vertical direction) shall be provided to maintain grooves/spaces for GI wire and white cement mortar at the junction of two glass bricks. The sample of the glass brick shall be got approved by Architect. The glass bricks shall be fixed with placing GI wires vertically as well as horizontally after passing through the spacer and having minimum lap length of + 200 mm as per the site conditions at all the places, heights and shapes, etc. complete, as per the details and drawing to the**



**satisfaction of Engineer-in-charge. Joints along the periphery of glass bricks to be filled with approved make and color weather silicone sealant of DOW corning 789 or equivalent.**

**1.0 Material**

- 1.1 Glass Brick shall conform to M-26.
- 1.2 PVC spacer and GI wire shall be of approved quality shall be used.

**2.0 Workmanship**

- 2.1 The glass brick shall be fixed with best workmanship as and where directed, at all heights with necessary scaffolding. The glass brick shall be fixed with white CM 1:2 ( 1 white cement : 2 white sand) as directed.
- 2.2 Before starting of the work, markings of the glass bricks @ 200 mm c/c shall be done on surfaces where glass bricks are to be laid.
- 2.3 Two numbers of 5mm thick GI wires dowels to be anchored in each joint horizontal as well as vertical by drilling holes in adjoining surface and filling the same with HILTI or equivalent chemical.
- 2.4 The PVC concealed spacer (with provision for passing the 2 no. GI wires in horizontal and vertical direction) shall be provided to maintain grooves/ space for GI wire and cement mortar at the junction of two glass bricks.
- 2.5 The sample of the glass brick partition made of 1mx1m shall be got approved by the engineer in charge.
- 2.6 The glass brick shall be fixed with placing GI wires vertically as well horizontally after passing through the spacer and having minimum lap length of  $\pm 200$ mm as per the site condition at all places, heights and shapes. After completion of the placing of the bricks, joints between the bricks and around it shall be finished with white cement and cleaned properly.
- 2.8 Additionally, as the glass bricks cannot be broken, the opening etc. shall be so designed that full size bricks can be used at all places.
- 2.9 The vertical joints in this type of work shall be truly vertical and the horizontal shall be truly horizontal, so that the pattern within the brick also gives a true to line and level appearance.

**3.0 Mode of Measurement and Payment**

- 3.1 The relevant specifications of item no. 4.01 shall be followed.
- 3.2 The rate shall be for a unit of one sqm inclusive of grooves of 10 mm on all sides for a visible area of work done. No wastage shall be permitted, measured and paid for.

**4.10 Extra for providing exposed finish to brickwork at all heights, shapes in any position. The bricks used shall be**

**a) Wire Cut bricks (Machine moulded)**

**b) Best quality hand moulded bricks**

**1.0 Materials**

1.1 Bricks for exposed work shall conform to M-24.

**2.0 Workmanship**

2.1 Relevant specifications of item no. 4.01 shall be followed.

2.2 The bricks shall be used shall be laid true line, level and plumb.

2.3 The bricks shall be laid as per the courses specified in the drawing.

2.4 The dimension of opening for doors, windows etc shall be kept as per the details given in the drawing.

2.5 The thickness of joints shall not exceed 12 mm. and shall be even in thickness. For the same, wooden fillets 10 mm. thick and 12 mm. wide shall be placed at the edge of the joints so that no mortar comes onto the surface of the bricks and a regular thickness of the joint is maintained. The face joints shall be raked out as directed by raking tools daily, during the progress of work, when the mortar is still green so as to provide key for pointing to be done, subsequently. All horizontal joints shall be truly horizontal and all vertical shall be truly vertical.

2.6 The surface shall be cleaned thoroughly of all mortar dropping. The surface shall be rendered to give a good surface finish.

2.7 Double scaffolding shall be used either of steel or bamboo during execution of this work. No holes shall be provided in the wall for the support of scaffolds etc.

2.8 Water used for curing shall be free from salts - Sodium and calcium as they may cause leeching on the surface of the brick masonry.

**3.0 Mode of Measurement and Payment**

3.1 The rate shall be over and above the rate for normal masonry work for using best quality brick (hand moulded or wire cut. The rate shall be for a unit of sqm. The rate shall include cost of cleaning, rendering, removing efflorescences on completion by washing with ammonia and distilled solution (1:6) as directed etc. complete.

3.2 The rate shall only be paid for visible brickwork surface i.e. the surface, which is pointed and rendered, irrespective of the thickness of the brick work.

3.3 The other relevant specifications of item no. 4.01 shall be followed.

## **RUBBLE MASONRY WORK**

**4.11 Providing and laying uncoursed (random) rubble masonry brought to the course with hard stone of approved quality in foundations and plinth in following CM including leveling, etc. complete as directed by engineer-in-charge.**

**4.11.1 Cement mortar 1:6 (1 cement: 6 coarse sand)**

- a) Granite with crushing strength 1000 Kg / sqcm
- b) Basalt with crushing strength 400 Kg / sqcm
- c) Lime Stone with crushing strength 200 Kg / sqcm
- d) Sand Stone with crushing strength 300 Kg / sqcm
- e) Marble with crushing strength 500 Kg / sqcm
- f) Quartzite with crushing strength 800 Kg / sqcm

**4.11.2 Cement mortar 1:5 (1 cement: 5 coarse sand)**

- a) Granite with crushing strength 1000 Kg / sqcm
- b) Basalt with crushing strength 400 Kg / sqcm
- c) Lime Stone with crushing strength 200 Kg / sqcm
- d) Sand Stone with crushing strength 300 Kg / sqcm
- e) Marble with crushing strength 500 Kg / sqcm
- f) Quartzite with crushing strength 800 Kg / sqcm

**1.0 Material**

**1.1 Stone for rubble masonry**

1.1.1 Stone shall conform to M-29.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**2.0 Workmanship**

**2.1 General**

2.1.1 Nabhi's commentary on CPWD specification clause no. 7.1.2, 7.1.3, 7.1.4 shall be followed.

**2.2 Dressing and Mortar**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 7.1.5 shall be followed.

### **2.3 Laying**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 7.1.7 shall be followed.

### **2.4 Bond Stones**

2.4.1 Nabhi's commentary on CPWD Specifications clause no. 7.1.8 shall be followed.

### **2.5 Quoins**

2.5.1 The quoins or corner stone shall be selected stone neatly dressed with hammer and/or chisel to form the required corner angle and laid header and stretcher alternatively. The bed and top surface of quoins shall be chiseled, dressed to give horizontal joints. The quoins shall have a uniform chisel draft of at least 25 mm. width at four edges of each exposed face, all the edges of the same face being in one plane. No quoin stones shall be smaller than 0.025 m<sup>3</sup> in volume.

### **2.6 Jamb Stones**

2.6.1 The jamb stone shall be made with stone specified for quoins, except that the stone provided on the jambs shall have their length equal to thickness of wall upto 600 mm. and a line of headers shall be provided for walls thicker than 600 mm. as specified for bond.

### **2.7 Joints**

2.7.1 Nabhi's commentary on CPWD Specifications clause no. 7.1.10 shall be followed.

### **2.8 Scaffolding**

2.8.1 Single or double scaffolding is to be used. The scaffolding shall be strong and sound.

2.8.2 Nabhi's commentary on CPWD specifications clause no. 7.1.11 shall be followed.

### **2.9 Curing**

2.9.1 Nabhi's commentary on CPWD specifications clause no. 7.1.12 shall be followed.

### **2.10 Protection**

2.10.1 Nabhi's commentary on CPWD specifications clause no. 7.1.13 shall be followed.

### **3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 7.1.14.1, 7.1.14.2, 7.1.14.3, 7.1.14.5, 7.1.14.8, 7.1.14.9 shall be followed.

3.2 Square, rectangular and circular pillars shall be measured as walls and extra will not be paid for.

3.3 For rate Nabhi's commentary on CPWD specifications clause no. 7.1.15 shall be followed.

**4.12 Providing and laying coursed rubble masonry (first sort) with hard stone of approved quality in foundation and plinth in following CM including leveling etc. complete as directed by engineer-in-charge.**

**4.12.1 Cement mortar 1:6 (1 cement: 6 coarse sand)**

**4.12.2 Cement mortar 1:5 (1 cement: 5 coarse sand)**

**4.12.3 Cement mortar 1:4 (1 cement: 4 coarse sand)**

**4.12.4 Cement mortar 1:3 (1 cement: 3 coarse sand)**

- a) Granite with crushing strength 1000 Kg / sqcm
- b) Basalt with crushing strength 400 Kg / sqcm
- c) Lime Stone with crushing strength 200 Kg / sqcm
- d) Sand Stone with crushing strength 300 Kg / sqcm
- e) Marble with crushing strength 500 Kg / sqcm
- f) Quartzite with crushing strength 800 Kg / sqcm

**1.0 Material**

**1.1 Stone**

1.1.1 Stone shall conform to M-29.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**2.0 Workmanship**

**2.1 Size of Stone**

2.1.1 Nabhi's commentary on CPWD specification clause no. 7.2.2 shall be followed.

**2.2 Dressing and Mortar**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 7.2.3 and 7.2.4 shall be followed.

**2.3 Laying**

2.3.1 Nabhi's commentary on CPWD specifications clause n. 7.2.5 shall be followed.

**2.4 Bond Stones**

2.4.1 Nabhi's commentary on CPWD specifications clause no. 7.2.6 shall be followed.

## **2.5 Quoins**

2.5.1 Nabhi's commentary on CPWD specifications clause no. 7.2.7 shall be followed.

## **2.6 Joints**

2.6.1 Nabhi's commentary on CPWD specifications clause no. 7.2.8 shall be followed.

## **2.7 Scaffolding**

2.7.1 Single or double scaffolding is to be used. The scaffolding shall be strong and sound.

2.7.2 Nabhi's commentary on CPWD specifications clause no. 7.1.11 shall be followed.

## **2.8 Curing**

2.8.1 Nabhi's commentary on CPWD specifications clause no. 7.1.12 shall be followed.

## **2.9 Protection**

2.9.1 Nabhi's commentary on CPWD specifications clause no. 7.1.13 shall be followed.

## **3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 7.1.14.1, 7.1.14.2, 7.1.14.3, 7.1.14.5, 7.1.14.8, 7.1.14.9 shall be followed.

3.2 Square, rectangular and circular pillars shall be measured as walls and extra will not be paid for.

3.3 For rate Nabhi's commentary on CPWD specifications clause no. 7.1.15 shall be followed.

**4.13 Providing and laying Random rubble masonry brought to the course, roughly leveled at intervals varying from 30 cm to 90 cm in height according to the size of the stone with hard stone of approved quality for superstructure above plinth and for all floors in CM 1:6 (1 cement: 6 coarse sand) including curing, leveling, etc. complete as directed by engineer-in-charge.**

- a) Granite with crushing strength 1000 Kg / sqcm
- b) Basalt with crushing strength 400 Kg / sqcm
- c) Lime Stone with crushing strength 200 Kg / sqcm
- d) Sand Stone with crushing strength 300 Kg / sqcm
- e) Marble with crushing strength 500 Kg / sqcm
- f) Quartzite with crushing strength 800 Kg / sqcm

Relevant specifications of item no. 4.11 shall be followed except that work is to be carried out for superstructure above plinth for all floors and work is to be carried out with CM 1:6 (1 cement: 6 coarse sand) including curing, leveling etc. complete as directed by engineer-in-charge.

**4.14 Providing and laying coursed rubble masonry with hard stone of approved quality for superstructure above plinth and for all floors in CM 1:6 (1 cement: 6 coarse sand) including curing, leveling, etc. complete as directed by engineer-in-charge.**

- a) Granite with crushing strength 1000 Kg / sqcm
- b) Basalt with crushing strength 400 Kg / sqcm
- c) Lime Stone with crushing strength 200 Kg / sqcm
- d) Sand Stone with crushing strength 300 Kg / sqcm
- e) Marble with crushing strength 500 Kg / sqcm
- f) Quartzite with crushing strength 800 Kg / sqcm

Relevant specifications of item no. 4.12 shall be followed except that work is to be carried out for superstructure above plinth for all floors and work is to be carried out in CM 1:6 (1 cement : 6 coarse sand) including curing, leveling etc. complete as directed by engineer-in-charge.

#### **HOLOOW CONCRETE BLOCK MASONRY**

**4.15 Providing and laying of hollow concrete block masonry confirming to IS 2185 Part I grade A (7.0) in composite mortar 1:4 (1-part cement and 4 parts sand) in the line and level and in pattern as directed from time to time including raking out of joints on both the sides and pointing in 1:2 cm (1-part cement, 2-part sand) with finishing, curing at all heights with necessary scaffolding etc complete as per the drawing and direction of Engineer incharge. The rate shall also include for use of 'C' type (Biaxial) blocks to make provision for service pipe lines, holdfasts, structural requirements (refer cl. 2.8.1) etc. as per the drawing and design. The thickness of the block shall be**

- a) 190mm
  - b) 140mm
  - c) 90mm
- 1.0 Materials**

#### **1.1 Water**

1.1.1 Water shall conform to M-1.

#### **1.2 Cement Mortar**



1.2.1 Cement Mortar shall conform to M-11.

**1.3 Lime**

1.3.1 Lime shall conform to M-2.

**1.4 Sand**

1.4.1 Sand shall conform to M-6.

**1.5 Flyash shall conform to relevant IS codes.**

**1.6 Hollow Concrete Blocks (Open Cavity)**

**1.6.1 Block Dimensions**

1.6.1.1 Nominal block Dimensions for through and through hollow (open cavity) concrete blocks shall be as below:

a) 200 mm. x 400 mm. x 200 mm.

b) 150 mm. x 400 mm. x 200 mm.

c) 100 mm. x 400 mm. x 200 mm.

1.6.1.2 The term "nominal" means that the dimensions include the thickness of the mortar joint of 10 mm. on all sides. The actual dimensions shall be 10 mm. short of the nominal dimensions.

**1.6.2 Tolerances:**

1.6.2.1 The maximum variation in the length of the unit shall not be more than  $\pm 5$  mm. and maximum variation in width and height of the unit, not more than  $\pm 3$  mm.

1.6.2.2 Face shells and webs shall increase in thickness from the bottom to the top of the unit (flared web and face shells).

**1.6.3 Ingredients:**

1.6.3.1 **Fly Ash:** Fly Ash should be confirming to IS 3812 (Part III) 1966 (upto a maximum of 20% of fine aggregates).

1.6.4 **Additives and Admixtures:** Additives used may be as below:

a) Plasticizer and air entraining admixtures confirming to IS 9103 - 1979.

b) Fly Ash confirming to IS 3812 (Part III).

**1.6.5 Manufacturing Process:**

- 1.6.5.1 The concrete mixed used for blocks shall not be richer than one part by volume of cement & 6 parts by volume of combined aggregates.
- 1.6.5.2 The concrete to be machine pressed at a pressure of @ 15000 psi with a w/c ratio of @ 0.35 with hydro-pneumatic vibrations and pressing.
- 1.6.6 **Curing:** The blocks to be steam cured after they are sufficiently hardened to enable handling for one-day duration and then to be cured by water spray for seven before they are ready for dispatch.
- 1.6.7 **Surface Texture and Finish:** In case of building not required plaster the surface texture of the unit shall be fine-close texture which shall be painted by 2-3 coats of cement paint to render it resistant to rain water. If it is intended to plaster concrete masonry, the block shall have sufficiently rough texture to afford a good key to the plaster.
- 1.6.8 **Physical Requirements:**
- 1.6.8.1 **General:** All units shall be sound & free of crack and other defects which interfere with the proper placing of the unit, or impair the strength or performance of the construction. Minor chipping resulting from the customary methods of handling during delivery, shall not be deemed grounds for rejection.
- 1.6.8.2 **Dimensions:** The overall dimensions of the units when measured as per appendix A of IS 2185 Part I shall be in accordance with 1.1.1 subject to the tolerance mentioned in 1.1.2.
- 1.6.8.3 **Block Density:** The net density of the concrete used shall be 2000 Kg/m<sup>3</sup>.
- 1.6.8.4 **Compressive Strength:** The minimum compressive strength at the time of despatch, being the average of eight units shall not be less than 70 kg/cm<sup>2</sup> on gross area.
- 1.6.8.5 **Water absorption:** The water absorption, being an average of three units determined in the manner prescribed in appendix 'D' of IS 2185 part I shall not be more than 8% by mass.
- 1.6.8.6 **Drying Shrinkage:** The drying shrinkage of the units when unrestrained being the average of three units, determined in the manner prescribed in appendix 'E' of IS 2185 part I, shall not exceed 0.1%.
- 1.6.8.7 **Moisture movement:** The moisture movement of dry blocks on immersion in water, being an average of three units, when determined in the manner prescribed in appendix 'F' of IS 2185 part I shall not exceed 0.09%.
- 1.6.9 **Tests:** As described in appendices A to F of IS 2185 part I on sample of units selected.
- 1.7 **Masonry Mortar:**

- 1.7.1 **Grade of Mortar:** Masonry mortar used shall be of proportion 1:1:6 (1-part cement, 1-part lime and 6 parts sand) Minimum grade as per IS 2250 - 1981 to be MM 3.
- 1.7.2 **Preparation of Masonry Mortar:**
- 1.7.2.1 **Proportioning:** It shall be proportioned only by full bags Hydrated lime and aggregates shall be measured by volume using gauge boxes of suitable capacity.
- 1.7.2.2 **Preparation:** When coarse sand is used the lime putty and sand in the required proportions shall after preliminary mixing on a water-tight platform, with necessary addition of water, be ground in a mortar shall taking care to rake up continuously the mortar particularly at the corners, and also adding water as and when required during grinding.
- 1.7.2.3 The mix shall then be transferred to a mechanical mixer to which the required quantity of cement is added and the content mixed for at least three minutes.
- 1.7.2.4 When fine sand is used the mixing operations shall be as above except that grinding may be omitted for the preliminary mixing of lime putty and sand. (P.S.: when factory made hydrated lime conforming to IS: 712-1973 is used, grinding of lime and sand is not necessary).
- 1.7.2.5 If the mixture of lime putty and sand is not used immediately for mixing with cement, it shall be kept protected from drying out till the time of use.
- 1.7.2.6 When adding water in the mortar during mixing operations, it shall be ensured that it is added only to the extent necessary for obtaining working consistency for the mortar and not more.
- 2.0 Workmanship and Construction Methods:**
- 2.1 **Modular Co-ordination:**
- 2.1.1 Hollow concrete block walls shall preferably be planned on the basis of modular co-ordination with a view to making the maximum use of full and half length units.
- 2.1.2 The cutting of units at the site shall be restricted to the minimum. Attention shall be paid to modular co-ordination while fixing the overall length and height of the wall; width and height of door, window and other openings; and wall dimensions between doors, windows and corners. All horizontal dimensions shall be in multiples of nominal half-length of the units and all vertical dimensions shall be multiples of full-height units.
- 2.2 **Avoidance of Crack Formation:** The major causes of cracks in the structure of hollow concrete block wall or partition and measures for their prevention are as below:

- 2.2.1 **Structural Movements:** Cracks may arise from alterations in length, curvature or orientation of the structural members enclosing a wall or partition due to load settlement, thermal expansion or changes in moisture content.
- 2.2.2 In the case of framed structures, erection partitions and panel walls shall be delayed wherever possible until the frame has taken up much as possible any deformation occurring due to structural loads.
- 2.2.3 **For floor deformation and movement:** The floor upon which a partition is built may deflect under load brought upon it after the partition is built. Where such deflections tend to create non-continuous bearing, the partition shall be strong enough to span between the points of least floor deflection or shall be capable of adapting itself to the altered conditions of support without cracking. This may be achieved by embedding horizontal reinforcement such as 6 mm. diameter bars or any other suitable reinforcement, or, if possible, by providing a reinforcement concrete band at every 40 cm height.
- 2.2.4 **Ceiling deflection or movement:** A ceiling above a wall or partition may deflect under loads applied after its erection, or through thermal or other movements. The wall or partition shall be separated from the ceiling by a gap, or by a layer of resilient material, to avoid cracking as a result of such deflection. Where this cannot be done, the risk of cracking, in the case of plastered finishes, may be diminished to some extent by reinforcement of the joint between the ceiling and the wall or partition, or by forming a cut between the ceiling plaster and the wall plaster.
- 2.3 **Storage and handling of materials:** The blocks shall be stored in such a way as to avoid any contact with moisture on the site. They shall be stock-piled on planks or other supports free from contact with the ground and covered to protect against wetting. The blocks shall be handled with care and damaged units shall be rejected.
- 2.4 **Wetting of Blocks:** The blocks need not be wetted before or during laying in the walls. In case the climatic conditions 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.
- 2.5 **Laying Concrete Block Masonry:**
- 2.5.1 **Use of Mortar in Masonry:** Hollow concrete block masonry in superstructure shall be laid in composite mortar comprising one part of cement, one part of lime and six parts of sand depending upon the grading of sand.
- 2.5.2 **Horizontal (Bedding) Joints:** Mortar shall be spread over the entire top surface of the block including front and rear shells as well as the webs to a uniform layer of one centimeter thickness. Normally full mortar bedding shall be adopted as it enables fuller utilization of the load-carrying capacity of the blocks. But where the walls carry light loads, such as panel walls, in a framed structure 'face shell' bedding may be used. In this type of

bedding, the mortar is spread only over the front and rear shells and not on hit webs, which help to arrest the seepage of water through the joints penetrating to the interior surface of the walls.

- 2.5.3 **Vertical (Cross) Joints:** For vertical joints, the mortar shall be applied on the vertical edges of the front and rear shells of the blocks. The mortar may be applied either to the unit already placed on the wall or to the next unit to be laid alongside of it. But it will be more convenient to apply mortar on the edges of the succeeding unit when it is standing vertically and then placing it horizontally well-pressed against the previously laid unit. However, whatever the method used for applying mortar, care must be taken to product well-compacted vertical joints.
- 2.5.4 In the case of two cell blocks, there is a slight depression on their vertical sides, which may also be filled up with mortar where is considered necessary to secure greater lateral rigidity.
- 2.5.5 Mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose its plasticity, thereby resulting in poor bond. For most of the work, the joints, both horizontal and vertical, shall be one centimeter thick. Except in the case of extruded-joint construction described later, the mortar shall be raked out from the joint with a trowel to a depth of about one centimeter as each course is laid to so as to ensure good bond of the plaster.
- 2.5.6 When the mortar has stiffened somewhat, it shall be firmly compacted with a jointing tool. This compaction is important, since mortar, while hardening, has a tendency to shrink slightly and thus pull away from the edges of the block. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened to effect intimate contact between the mortar and the masonry unit and obtain a weather-tight joint.
- 2.5.7 All the joints shall be now pointed with 1:2 cement mortar to ensure they are weather proof.

## 2.6 Operations for laying Block Masonry

- 2.6.1 **First Course:** The first course of concrete masonry shall be laid with great care, making sure that it is properly aligned, leveled and plumbed, as this shall assist the mason in laying succeeding courses to obtain a straight and truly vertical wall.
- 2.6.2 Before laying the first course, the alignment of the wall shall be marked on the foundation footings, rafts, plinth beams or on sub base. The blocks for this course shall first be laid dry, that is without mortar over the sub base along a string lightly stretched between properly located corners of the wall in order to determine the correct position of the blocks including those of the cross-walls jointing it and also adjust their spacing. When the blocks are set in proper position, the two corner blocks shall be removed, a full mortar bed spread shall be spread on the sub base and these blocks laid back in place truly level

and plumb. The string shall then be stretched tightly along the faces of the two corner blocks and the faces of the intermediate ones adjusted to coincide with the line. Thereafter each block shall be removed and re-laid over a bed of mortar. After every three or four blocks have been laid, their correct alignment, level and verticality shall be carefully checked.

- 2.6.3 The construction of walls may be started either at the corners first or started from one end proceeding in the other direction. If the corners of the wall are built first, they shall be built four or five courses higher than the centre of the wall. As each course is laid at the corner, it shall be checked for alignment and level and for being plumb. Each block shall be carefully checked with a level or straight-edge to make certain that the faces of the block are all in the same plane. This precaution is necessary to ensure truly straight and vertical walls.
- 2.6.4 The use of a storey-rod or course-pole, which is simply a board with markings 20 cm apart, provides an accurate method of finding the top of the masonry for each course. All mortar joints shall be one centimeter thick. Each course, in building the corners, shall be stepped back by a half-block and the horizontal spacing of the block shall be checked by placing a mason's level diagonally across the corners of the block.
- 2.6.5 When blocks are laid between the corner blocks, a mason's line shall be stretched from corner to corner for each course and the top outside edge of each block shall be laid to this line. The manner of handling or gripping the block shall be such as to position the block properly with minimum adjustment.
- 2.6.6 To assure satisfactory bond, mortar shall not be spread too far ahead of actual laying of the block or it will stiffen and lose its plasticity.
- 2.6.7 As each block is laid, excess mortar extruding from the joints shall be cut off with the trowel and thrown back on the mortar board to be reworked into the fresh mortar. If the work is progressing rapidly, the extruded mortar cut from the joints may be applied to the vertical face-shells of the block just laid. Should there be any delay long enough for the mortar to stiffen on the block, the mortar shall be removed from the mortar board and fresh mortar shall be prepared and used. Dead mortar that has been picked up from the scaffold or from the floor shall not be used.

## **2.7 Provision for Door & Window Frames**

- 2.7.1 A course of "C" channel block shall be provided under the doors and windows opening.
- 2.7.2 The jambs of doors and windows shall be grouted in the hollows of the 'c' channel blocks with concrete of mix 1:3:6.

2.7.3 Mild steel bar holdfasts should be so fastened to the door or window frames that these occur at 'c' block course level and their ends are embedded in the 'C' block hollow and grouted in 1:3:6 cement concrete.

## **2.8 Provision for Roof and Services**

2.8.1 The course immediately below the roof slab shall be built with 'c' shaped blocks with hollows facing upwards and shall be filled with 1:3:6 concrete later on, or else grouted alongwith the concreting of the roof slab with connecting steel carried on inside the roof slab. (in case of load bearing construction).

2.8.2 Alternatively (in RCC framed structure) course of solid blocks may be used as the top course.

2.8.3 'C' type blocks shall be used, vertically as well as horizontally, on each face, to cater the need of holdfasts of doors and windows, concealed piping (electrical and plumbing) wherever specified as per drawing and design.

## **2.9 Rendering and Other Finishes**

2.9.1 The plaster furnishes shall be applied in accordance with IS: 2402 - 1963 code of practice for external rendered finishes.

2.9.2 The concrete block masonry shall be rendered with at least one coat of 6 to 12 mm. thickness of 1:4 cement mortar. The sand to be used for the plaster shall be graded from 3 mm. downwards.

2.9.3 Where it is necessary to have the concrete block surface exposed, the wall shall be treated with two coats of approved quality of cement based paint.

## **3.0 Mode of Measurements and Payment**

3.1 The measurement of this item shall taken for the hollow concrete block masonry fully completed. The limiting dimensions not exceeding those shown on the drawings or as directed shall be final. Battered, tapered and curved portions shall be measured net.

3.2 No deduction shall be made from the quantity of block work, nor any extra payment shall be made for embedding in masonry or making holes in respect of following items:

(1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 cm<sup>2</sup>.

(2) Architectural openings in walls, parapet and compound walls, not exceeding 1.0 m<sup>2</sup> area.

(3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 cm. and the bearing does not extend to the full thickness of wall.

(4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining.

(5) Iron fixtures, pipes upto 300 mm. dia.; holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.

(6) Forming chases of section not exceeding 350 cm<sup>2</sup> in masonry.

3.3 Apertures for fire places shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural mouldings like corbelling, pattas, etc.

3.4 The concrete block masonry shall be measured in sq.mts. The finished work shall be inspected for faults/cracks, line level etc. and the length and height of the masonry wall shall be measured in meters. The sq.mt. of work executed shall so be arrived at (for both reinforced and non-reinforced block masonry).

**4.16 Providing and laying of concrete blocks conforming to IS 2185 Part I grade A (7.0) in composite mortar 1:4 (1 part cement and 4 part of sand) in line and level including providing and fixing of vertical and horizontal steel in hollows of the masonry as per design and grouting these reinforced hollows in cement concrete of the grade specified from time to time) including raking out of joints on both sides and pointing them with 1:2 cm (1 part cement, 2 part sand) with finishing curing at all heights with necessary scaffolding etc complete as per the drawing and direction of Engineer in charge. The cost of reinforcement and concrete should be excluded from total rate. The same shall be paid separately. The rate shall also include for use of 'C' type (Biaxial) blocks to make provision for service pipe lines, holdfasts, structural requirements (refer cl. 2.8.1) etc. as per the drawing and design. The concrete block shall be**

**a) 190mm thick**

**b) 140mm thick**

The relevant specification of item no. 4.15 shall be followed except that the hollow concrete block masonry shall be reinforced vertically as well as horizontally in hollows of the masonry as per design and grouting these reinforced hollows in cement concrete of the grade specified. The concrete and reinforcement shall be paid under the relevant item as per the specifications.



## **CW 5.00**

### **DOOR AND WINDOW WORKS**

#### **ALLUMINIUM WORKS**

**5.1 Providing and fixing in position frames for aluminum door / composite door-window / window / casement window and aluminum door shutters ( sliding / side hung/ pivot) window shutters (sliding / fixed / open able casement ), louvers, handles, sections as per approved shop drawings and aluminum sections of approved make like Jindal or equivalent having 50 micron super durable powder coating for non-exposed side of approved shade sections all floors / all levels / all heights / all shapes and for all sizes as per the drawing, specification or as directed by Architect or Engineer - in - Charge .**

**Rate shall be inclusive of providing aluminum sections (conventional or Euro-profile), cutting, fabrication, erecting and fixing to the best workmanship manner, including**

**1) Sheet metal screws and aluminum angle corner cleat of minimum 3mm thickness and of full width etc for assembling the frame and shutter;**

**2) Glazing clips for receiving infill panel;**

**3) Best quality wool pile where ever shutter touches the frame and EPDM rubber;**

**4) Anchor fasteners of HILTI HRDUGT or equivalent for fixing the frame assembly to the RCC or masonry surfaces. Minimum 1 anchor fastener shall be used for every 750mm length of section for stability of frame.**

**5) 10mm GI tie rod for connecting vertical stile at top and bottom.**

**but excluding,**

**1) Rough ground to fix a frame with wall or any surface**

**Work shall have to be carried out as per the approved shop drawings and approved sample.**

#### **1.0 Material**

**1.1 Material Technical specification – M (Aluminum) is to be followed.**

**1.2 CPWD specifications clause no. 24.1.1, 24.1.2 shall be followed.**

#### **2.0 Workmanship**

**2.1 The work is to be carried out as per the best workmanship manner as per the drawing as per the approved sample.**

- 2.2 The Contractor shall have to give a guarantee bond, for Powder Coating / anodizing, on appropriate Stamp paper for a period of 10 years. In this period, he shall attend to and rectify all complaints without causing any inconvenience to the Owners/Client. The form of Guarantee Bond shall be as prescribed below:
- "I/We ..... (Contractor) hereby guarantee that work shall remain unaffected and shall not be in any way damaged by atmospheric conditions, for a period of 10 years after the completion of the work of Powder Coating / anodizing the aluminum doors as per the terms and conditions of the Contract and guarantees to redo the affected work without claiming any extra cost."
- 2.3 The Contractor shall have to give a guarantee bond for the Hydraulic door closer and floor spring, on appropriate Stamp paper for a period of 1 year. In this period, he shall attend to and rectify all complaints without causing any inconvenience to the client. The form of Guarantee Bond shall be as prescribed below:
- "I/We ..... (Contractor) hereby guarantee that the hydraulic door closers or Floor Spring shall remain unaffected and shall not be in any way damaged by normal usage, pulls and pushes, for a period of 1 year after the completion of the work of supplying & fixing the Hydraulic Door Closers to aluminum doors as per the terms and conditions of the contract and guarantees to redo the affected work without claiming any extra cost."
- 2.4 Approved make selected clear glass (frosted) / wired glass / compact sheet / SS 316 wire mesh of specified thickness as mentioned in the drawings shall be used in doors. Wired glass / frosted glass louvers shall be provided wherever shown in the drawings after grinding the edges.
- 2.5 All gaskets used shall be 100% EPDM / siliconised rubbers gaskets of approved colour for long life guarantee.
- 2.6 Necessary operating device (as per design) for operation of louvers of windows, ventilators, sky lights, including necessary rods shall be provided as per item description.
- 2.7 Necessary provision for rain water disposal shall be done in the bottom guides/frames as per the drawing.
- 2.8 Work shall be carried out in co-operation and in coordination with all other agencies working at Site
- 2.9 The civil work as required for fixing of floor springs, hold fast or other works required for the erection and completion of doors/windows etc. shall be done by the Contractor without any extra cost.
- 2.10 The Contractor shall be responsible for the windows/doors/curtain wall glazing/grills etc. being set straight, in plumb level and for their satisfactory operations after the fixing is completed.

- 2.11 Wherever required and as directed strengthening of members shall be done by providing steel/M.S. Concealed members without extra cost.
- 2.12 The quantities are provisional and may vary to any extent. No claim will be taken into consideration in this matter.
- 2.13 Details/ arrangements for after sales / maintenance services shall be furnished. Work shall be carried out in co-operation and in coordination with all other agencies working at site as per the drawing.

### **3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm as per the drawing.
  - 3.2 The rates quoted shall be inclusive of manufacture, supply and installation at site and inclusive of all the necessary hardware as shown in the drawing.
  - 3.3 The rates shall also be inclusive of providing and applying neutral cure weather silicone sealant of Dow Corning or equivalent with ordinary gun or compressed air operated gun as per the requirement and making the joints aluminum doors, windows, curtain wall glazing etc. on the external periphery of the building at the junction of two different materials as directed by engineer-in-charge.
  - 3.4 Rate shall be inclusive of all wastages of aluminum, glass, filler panels, glazing clips, necessary EPDM rubber gasket between glazing clip and glass / filler sheet, C P Brass, Sheet metal or SS screws, fasteners, sealant masking tape etc. as per the drawing. Cutting, fabrication, erection, fixing, protecting & cleaning until handing over to client to the best workmanship manner as per the Architectural drawings and approved sample.
  - 3.5 The rates must be in accordance with detailed drawing with dimensions of aluminum sections in frames and shutters as shown in the drawing. Rate shall be valid also if any deviation is proposed.
- 5.2 Providing and fixing in position aluminium window frame and shutter ( openable, sliding and fixed louvered - partly glazed, partly panelled, fully glazed, fully panlled) made of extruded built up standard tubular sections / appropriate Z section or other sections of approved make conforming to IS 733, IS 737 and IS 1285 having minimum anodic coating of grade AC 25 of approved shade as per IS 1868/ minimum 50 micron thick powder coating of approved make and shade / miniimum 50 micron thick polyster powder coated sections as per the drawing and approved sample.(For anodizing contractor should furnish a guarantee bond for 10 years in prescribed format.) Aluminium sections shall be jointed with aluminium angle cleats of 50X50x 4 mm thick, GI tie rods of minimum 10 mm thick at top & bottom rail of the shutter etc.all complete as per architectural drawings or as directed by engineer-in-charge.**

Frame shall be fixed by using Hilti / fischer screws / expansion hold fasteners with 6 to 10mm wooden / water proof ply packing between wall and frame, filling the gap in between aluminum frame and adjacent RCC/ Brick/ Stone work by providing weather silicone sealant (minimum 6mm width X 6 mm depth) over Polyethylene baker rod / PVC or EPDM felt of approved make and colour at top, bottom and all sides as per drawings and direction of engineer-in-charge

Rate shall be inclusive of all wastages of aluminum, glass, filler pannels, glazing clips, necessary EPDM rubber gasket between glazing clip and glass / filler sheet, C P Brass, Sheet metal or SS screws, fastners, sealant masking tape etc as per the drawing. Cutting, fabrication, erection, fixing, protecting & cleaning uptill handing over to client to the best workmanship manner as per the Archetctural drawings and approved sample.

The relevant specifications of item no. 5.1 shall be followed except the item is to be executed for the windows instead of doors.

- 5.3.1 Providing and fixing fixed aluminum louvers made out of louver section no. 20552 of Jindal 2 mm thick @ 0.59 kg/mt) or equivalent of max. 1.5 m length each including fixing with the suitable aluminum flat of 45mm x 4 mm thickness (@ 0.49 kg. /mt) having powder coating of approved shade and then fixed to required door / window frame etc. complete as per drawing, specification and direction of Architect and / or Engineer in charge at all places, all levels, all heights. The aluminum frame shall be paid in relevant tender item.**

The work shall be carried out as per the best workmanship and as per manufacture's specification.

#### **Mode of Measurement and Payment**

The item shall be measured and paid in sqm as per the drawing.

The rates quoted shall be inclusive of supply, installation & powder coating of aluminium louvers at site and inclusive of all the necessary hardware as shown in the drawing if any.

- 5.3.2 Providing and fixing operable louvers manufactured by Domal using for frame Domal Pr. 19724/19724A (having moment of inertia not less than 7.1 cm<sup>4</sup> about the bending axis) for frame. The depth shall not be less than 40 mm. For Louver profile use Domal Pr. 16064. For Top and bottom covering profile use Domal Pr. 16947. The corner joints of frame shall be made at 45 deg. using die-cast aluminum corner cleats fixed with external buttons with a spring for rapid and secure joint assembly. For Louver Opening Adjuster use profile accessory 30K60. For fixing of Louvers into 30K60 use Domal side plugs 30K95. Handle for Adjuster Kit should be 30K93/94. Gaskets: Shall be of EPDM material. Wool Pile: Shall be accessory No. IHS40. For connecting the mullions and transoms use X / T connectors 40 E 01 /40 E 02 as required. The louvers should be with 20 micron anodising.**

The work shall be carried out as per the best workmanship and as per manufacture's specification.

- 5.4 Providing and fixing in position aluminium fixed glazing made of extruded built up standard curtain wall sections, glass of required size (as per the drawing) including main member, cap and pressure plate / appropriate Z sec coatins of approved make conforming to IS 733, IS 737 and IS 1285 having minimum anodic g of grade AC 25 of approved shade as per IS 1868/ minimum 50 micron thick powder coating of approved make and shade / minimum 50 micron thick polyester powder coated sections as per the drawing and approved sample.(For anodizing contractor should furnish a guarantee bond for 10 years in prescribed format.) Aluminum sections shall be jointed with aluminum angle cleats of 50X50x 4 mm thick, GI tie rods of minimum 10 mm thick at top & bottom rail of the shutter etc.all complete as per architectural drawings or as directed by engineer-in-charge.**

**Frame shall be fixed by using Hilti / Fischer screws / expansion hold fasteners with 6 to 10mm wooden / water proof ply packing between wall and frame, filling the gap in between aluminium frame and adjacent RCC/ Brick/ Stone work by providing neutral cure weather silicone sealant (789) of Dow corning (minimum 6mm width X 6 mm depth) over Polyethylene baker rod / PVC or EPDM felt of approved make and color at top, bottom and all sides as per drawings and direction of engineer-in-charge.**

**Rate shall be inclusive of all wastages of aluminum, glass, filler panels, glazing clips, necessary EPDM rubber gasket between glazing clip and glass / filler sheet, C P Brass ,Sheet metal or SS screws, fasteners, sealant masking tape, accessories required as per drawing etc as per the drawing, cutting, fabrication, erection, scaffolding, fixing, testing for water tightness, transporting, protecting & cleaning until handing over to client to the best workmanship manner as per the Architectural drawings and approved sample. Rate shall be inclusive of providing and fixing 75X 75X 8 mm GI bracket with chemical anchor fasteners of required size, GI nut bolts etc with RCC surface**

The relevant specifications of item no. 5.1 shall be followed except the item is to be carried out as per the drawing for aluminum fixed glazing made of extruded built up standard curtain wall sections.

- 5.5 Extra over for providing fully tampered glass of approved make in place of clear float glass. Clear visible area shall be measured and paid for. The difference between clear glass and fully tampered glass shall only be considered**
- 5.5.1 4 mm thick clear float glass**
- 5.5.2 5.5 mm thick clear float glass**

**5.5.3 8 mm thick clear float glass**

**5.5.4 6 mm thick wire glass**

Relevant specifications of item no. 5.01 shall be followed.

- 5.6 Providing and fixing 12mm fully tempered Clear float glass glazing of ASAHI make or equivalent, using 20-micron color anodized aluminium crocodile section (90X45X3mm) at top and bottom fixed with channel section of size (38.1X20mmX3mm) & at either sides using 45 X 12mm aluminium flat / 45 X 25 X 2mm aluminium box as per the drawings and approved sample. Glass to Glass and glass to side aluminium connection shall be 6 X 12 mm transparent structural silicone sealant of approved make. Necessary EPDM gaskets shall be used between glass and aluminium sections. Gaps around wall and floor shall be filled by using required size of polyurethane backer rod with neutral silicone weather sealant of minimum size 10X6mm. For fixing of aluminium sections Hilti/Fischer screw/anchor fasteners shall only be used at 450mm c/c. Rates shall be inclusive of fabrication, erection, wastage, cleaning of glass, transportation & all the prevailing taxes, etc. complete as directed by engineer-in-charge.**

Relevant specifications of item no. 5.4 shall be followed except the crocodile sections are to be used instead of curtain wall sections.

- 5.7 Providing and fixing in position aluminium door / window frame and shutter (single or double, hinged or pivoted - partly glazed, partly paneled, fully glazed, fully paneled) made of extruded built up standard tubular sections / appropriate Z section or other sections of approved make conforming to IS 733, IS 737 and IS 1285 having minimum anodic coating of grade AC 25 of approved shade as per IS 1868/ minimum 50 micron thick powder coating of approved make and shade / minimum 50 micron thick polyester powder coated sections as per the drawing and approved sample.(For anodizing contractor should furnish a guarantee bond for 10 years in prescribed format.) Aluminium sections shall be jointed with aluminium angle cleats of 50X50x 4 mm thick, GI tie rods of minimum 10 mm thick at top & bottom rail etc.all complete as per architectural drawings or as directed by engineer-in-charge.**

Relevant specifications of item no. 5.1 shall be followed and item shall be measured in Kg. Rate shall be inclusive of AC 25 anodized coating / 50-micron thick powder coating / 50 micron thick polyester powder coating.

- 5.8 Providing and fixing rough ground packing shall be fixed by using anchor fastener of Hilti / fischer screws / expansion hold fasteners, 6 to 10mm wooden / water proof ply (seasoned CP Teak wood / water proof marine ply confirming to IS 710 of width approx 70 mm and over all 30mm less then the width of the frame member) packing between wall and frame, filling the gap in between aluminium frame and adjacent RCC/ Brick/ Stone work on all sides and along the perimeter by Polyethylene baker rod / PVC or**

**EPDM felt and sealing the remaining gap in between by neutral grade weather silicone sealant of Dow corning or equivalent as per drawings and direction of engineer-in-charge**

Relevant specifications of item no. 5.01 shall be followed except the item consists of fixing the frame by Hilti screws, 6 to 10 mm wooden packing, filling the gap between aluminium frame and adjacent wall by polyethylene baker rod and sealing the remaining gap with neutral cure weather silicone sealant of approved make.

**5.9 Providing and fixing glazing in aluminum door, window, ventilator shutters and partitions etc. with EPDM rubber on the periphery of the glass, neutral cure weather Silicone sealant of Dow corning 789 etc. complete as per the architectural drawings and directions of engineer-in-charge. Cost of color anodized aluminum snap on beading shall be paid in Kg relevant item Clear visible area shall be measured and paid and wastage shall not be paid for.**

**5.9.1 4 mm thick clear float glass**

**5.9.2 6 mm thick clear float glass**

**5.9.3 8 mm thick clear float glass**

**5.9.4 6 mm thick wire glass**

Relevant specifications of item no. 5.01 shall be followed except the item consist of glazing with EPDM rubber on the periphery of the glass, neutral cure weather silicone sealant of Dow Corning 789 etc. as per the sample approved by Architect.

**5.10 Providing and fixing double glazed hermetically sealed glazing in aluminum windows, ventilators, partition etc. with 6 mm thick clear float glass both side having 12 mm air gap including providing EPDM gasket, perforated aluminum spacers, desiccants, neutral cure weather silicone sealant etc. as per specifications as per sample approved by architect**

Relevant specifications of item no. 5.01 shall be followed except the item is to be executed for hermetically sealed glazing in aluminum doors, windows with 6 mm thick clear float glass on both side having 12 mm air gap in between.

**5.11 Providing and fixing compact sheet in aluminum door, window, ventilator shutters and partitions etc. with EPDM rubber on the periphery of the glass, neutral cure weather Silicone sealant of Dow corning 789 etc. complete as per the architectural drawings and directions of engineer-in-charge. Cost of color anodized aluminum snap on beading shall be paid in Kg relevant item Clear visible area shall be measured and paid. Wastage shall not be paid for.**



Relevant specifications of item no. 5.01 shall be followed except the item is to be executed for compact sheet of specified thickness in the drawing.

- 5.12 Providing and fixing SS 316 wire mesh in aluminum door, window, ventilator shutters and partitions etc. with EPDM rubber on the periphery of the glass, neutral cure weather Silicone sealant of Dow corning 789 etc. complete as per the architectural drawings and directions of engineer-in-charge. Cost of color anodized aluminum snap on beading shall be paid in Kg relevant item clear visible area shall be measured and paid. Wastage shall not be paid for.**

Relevant specifications of item no. 5.01 shall be followed except the item is to be executed for SS 316 wire mesh of specified thickness as per drawing.

#### **HARDWARES**

- 5.13 Providing and fixing hydraulic floor spring with top adjustable pivot, sag wood one-piece packing SS cover plate of approved make for doors including cost of cutting doors as required, embedding in floors, making good as required and SS cover plates with brass pivot and single piece MS sheet outer box with slide plate etc. complete as the direction of engineer-in-charge. Rate shall be inclusive of furnishing the guarantee for period of one year**

**5.13.1 Single action floor spring**

**5.13.2 Double action floor spring**

Hydraulic floor spring shall be of approved make and high quality as shown in the drawing as per manufacture's specification.

- 5.14 Providing & fixing hydraulic rack and pinion door closer with screws to pivoted/ hinged door of approved make like Dorma or equivalent for specified door width with minimum one year guarantee. Rate shall be inclusive of fixing with using the templete as per supplier's specification & maintaing in good working condition uptill defect liability period.**

**a) with standard arm without mounitng backplate up to 1100 mm door width - TS 68**

Hydraulic door closer shall be of approved make and high quality as shown in the drawing as per manufacture's specification.

- 5.15 Providing & Fixing heavy quality brass nickel finish pivot of required diameter (top & bottom) pair with ss screws etc complete approved by Architect.**

Heavy quality brass nickel finish pivot shall be of approved make and high quality as shown in the drawing as per manufacture's specification.



- 5.16 Providing & fixing dead lock minimum 6 levers of Godrej or equivalent in doors with three keys with necessary screws including necessary cutting and making good as per drawing etc. complete as sample approved by Architect.**

Dead lock of Godrej or equivalent shall be of approved make and high quality as shown in the drawing as per manufacture's specification.

- 5.17 Providing & fixing \_\_\_mm diameter SS 316 \_\_\_\_\_ finish push-pull handles (simple or offset type) in pair of two of kitch or equivalent with necessary screws etc. complete, as per drawing as sample approved by Architect.**

\_\_\_mm diameter SS 316 \_\_\_\_\_ finish push-pull handles (simple or offset type) in pair of two as shown in the drawing as per manufacture's specification.

### **5.18.3 Hardware**

**Providing & fixing 150 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminum doors, with necessary screws etc. complete as approved by Engineer-in-charge.**

150 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminum doors, with necessary screws etc. shall be fixed as shown in the drawing as per manufacture's specification.

#### **Mode of Measurement and Payment**

The Item Shall be measured and paid in unit of Nos.

- 5.18.4 Providing & fixing 200 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/aluminum doors with necessary screws etc. complete as approved by Engineer-in-charge.**

Relevant specification of item no. 5.18.3 shall be followed except that Tower bolt shall be of 200 mm instead 150 mm.

- 5.19 Providing & fixing in position die cast concealed tower bolt of \_\_\_ mm length with necessary screws etc. complete as sample approved by Architect. Rate shall be inclusive of the cost of Extended G.I. Rod of minimum 300mm length and diameter as per tower bolt.**

\_\_\_ Mm length die cast concealed tower bolt shall be fixed as shown in the drawing as per manufacture's specification.

- 5.20 Providing & fixing rod handles \_\_\_ mm of SS 316 \_\_\_\_\_ finish with necessary screws etc. complete as sample approved by Architect.**

\_\_\_ Mm rod handles of SS 316 of \_\_\_ finish as shown in the drawing as per manufacture's specification.

**5.21 Providing & fixing 75mm S.S 316 satin finish baby latch with indicator bolt of occupancy (flat/round) with necessary screws etc. complete as sample approved by Architect.**

75 mm SS 316 satin finish baby latch with indication of occupancy (flat/round) as shown in the drawing as per manufacture's specification. The rate shall be for a unit of one no.

**5.22 Providing & fixing 150X6.4dia mm long Aluminum eye hook of with necessary screws etc. complete as sample approved by Architect.**

150 X 6.4 dia mm long Alluminium eye hook as shown in the drawing as per manufacture's specification.

**5.23 Providing & fixing 75 - 100 mm white PVC door buffer with necessary screws etc. complete as sample approved by the Architect.**

75-100 mm white PVC door buffer as shown in the drawing as per manufacture's specification.

The rate shall be for a unit of one no.

**5.24 Providing & fixing 10" long satin nickel finish brass or SS 304 brush finish Aldrop of EPPW or equivalent with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.**

10 "long Aldrop in \_\_\_ finish SS 316 as shown in the drawing as per manufacture's specification.

**5.25 Providing and fixing two-piece window adjuster \_\_\_ finish \_\_\_ mm long with necessary screws etc. complete as sample approved by Architect.**

two-piece window adjuster \_\_\_ finish \_\_\_ mm long as shown in the drawing as per manufacture's specification.

**5.26 Providing and fixing S.S 316 satin finish hinges with necessary screws etc. complete as sample approved by Architect.**

**5.26.1 Hinges with bearing**

**5.26.2 Hinges without bearing**

SS 316 satin finish hinges with necessary screws as shown in the drawing as per manufacture's specifications.

**5.27 Providing & fixing SS 316 satin (brush) finish Offset handles of Kitch or equivalent with necessary screws etc. complete as per drawing as sample approved by Architect**

SS 316 satin finish offset handles as shown in the drawing as per manufacture's specification.

## **WOOD WORK**

- 5.28 Providing and fixing in position composite door frame & shutter of teak wood complete including double grooves on both sides etc. made from the best quality wood (as per the drawing) including architectural mouldings, planning, sand papering, making the edges rounded, hold fast/catch bolts, screw, nails, gluing materials, concrete plugs and 3 coats of painting/polishing, all as per approved drawing, design and as directed by engineer-in-charge. sample to be got approved by the Architect & Engineer-in-charge, etc. complete.**

**Frame shall be fixed by using Hilti / fischer screws / fasteners with 6 to 10mm wooden / water proof ply, packing between wall and frame, gap between wall and frame shall be filled with polyethylene baker rod and neutral grade sealant of approved make and colour, at all sides / perimeter.**

**Rate shall be inclusive of all wastages of wood, glass, compact sheet, glazing clips, necessary EPDM rubber gasket between glazing clip and glass / compact sheet, screws, fastners, SS hinges, pivots, baker rod, neutral grade silicone sealant, structural sealant of approved make and colour, 3M tap, all hardwares like satin finish Nickle plated Brass Heavy quality Hinges and Heavy Quality Pivots, locks, hydraulic door closers and floor spring etc. cutting, fabrication, erection and fixing to the best workmanship manner as per the drawings and approved sample.**

### **1.0 Material**

- 1.1 Material Technical specification – M (Timber) is to be followed.
- 1.2 CPWD specifications clause no. 9.1 and 9.2 shall be followed.
- 1.3 The scantlings shall be accurately planed smooth. Rebates, rounding and mouldings shall be made as shown in the drawings. Patching or plugging of any kind shall not be allowed. Joints shall be coated with suitable adhesive like glue or synthetic resin before the frames are put together. All mortise and tennon joints shall fit in fully and accurately without wedging or filling. The joints shall be pinned with hard wood or bamboo pins of 10 mm. to 12-mm. dia., or rust resisting star shaped metal pins of 8-mm. dia., after the frames are put together and pressed in position by means of a press. The frames shall be protected during the progress of work by providing suitable boxing. All portions of timber abutting against or embedded in masonry or concrete shall be treated against termites by giving a coat of wood preservative as approved by architects.
- 1.3 All door/window frames shall be fixed to the concrete or masonry walls by approved brand of Anchor bolts as per supplier's specification.

- 1.4 All wood used shall be seasoned wood and termite treated. Contractor will have to submit the guarantee of 10 years for the termite treatment.
- 1.5 Wherever required, joints between the wall and frame shall be filled with neutral grade silicon sealant with filling rod if required.

## 2.0 Workmanship

### 2.1 Frames

- 2.1.1 All members of the frames shall be exactly at right angles. The right angle shall be checked from inside surface of the respective members. The size of the frame shall be as per the detailed drawings of the Architect. The work shall be carried out as per the sample approved by the Architect and Engineer-in-charge.
- 2.1.2 All members of the frames shall be straight without any warp or bow and shall have smooth surface well planned on the 3 sides, exposed at right angles to each other. The surface touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall size within the tolerances specified.
- 2.1.3 Frames shall have dovetail joints. When celestorey windows are included, it shall be provided by having full length one-piece post for door or windows and celestorey window extending the frame on top at the head to the required extent. Horns shall not be provided in the head of the frame. When no sills are provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm. and on upper floors, the vertical posts shall be fixed in the floor or masonry by forming notches 10 mm. deep. Slight adjustment of spacing as necessary shall be done to have the hold fasts in the joints of masonry course. The frame shall be erected in position and held plumb with strong supports from both sides and shall be built in masonry, as masonry work proceeds. The transom shall be tenoned into the mortises of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15 mm.
- 2.1.4 **Tolerance:** Unless specifically mentioned otherwise, tolerance of  $\pm 1.5$  mm. shall be allowed for each wrought face.
- 2.1.5 **Joints:** The tenons shall be closely fitting into the mortises and suitably pinned with wood dowels not less than 10 mm. diameter. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed. The contact surface of tenon and mortise shall be treated before putting together with an adhesive of approved make.
- 2.1.6 **Fixing of frames:**
  - a) In Brick/stone masonry wall : The rate shall include supplying and fixing of 3 nos., to each vertical member of a door frame and 2 nos., to each of window frame, MS hold-fasts of size 300 mm. x 40 mm. x 6 mm., with one end bent by 100 mm. at right angle with atleast 3 holes to receive 40 mm. screws, to fix it to the door and window frames and the other

end, fishtailed, to be embedded with 1:3:6 C.C. in cut-out or left-in grooves of 100 mm. x 225 mm. deep, in brick walls, including painting with 2 coats of boiled tar, all complete, as specified and directed, at all levels, including cutting chases in masonry walls.

b) In RCC Walls/Columns: The rates shall include supplying & fixing of 3 nos. each, to one vertical member of a door frame and 2 nos. each, to one vertical member of a window frame, 150 mm. long counter sunk catch bolts, to be driven through the frames and screwing into the drilled holes in RCC, filled with "Datofix" or equivalent anchor fasteners, all complete, as specified and shown, at all levels, including drilling holes in concrete work.

2.1.7 Mild steel hold fasts shall be protected with a coating of cold asphalt tar. The surface of frame abutting into the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

2.1.8 All teak wood faces shall be trench or wax or Touch wood polished, in desired tint or painted with 3 coats of approved synthetic enamel paint, over a coat of approved primer, as directed. The relevant specification of item no. 11.11, 11.12, and 11.13 shall be followed.

2.1.9 Necessary polysulphide filler should be provided all around the frame / wall / lintel / structure junctions to render it water tight.

**5.29 Providing and fixing wooden hand rail as per the details, over the verticals already installed, including painting/polishing of approved make, shade etc. as directed by engineer in charge. The teak wood shall be Ghana teak wood.**

## **1.0 Material**

### **1.1 Teak Wood**

1.1 Material Specification – M (Teak Wood) shall be followed.

### **2.0 Synthetic Enamel Paint**

2.1 Material Specification – M (Polyurethane Paint) shall be followed.

### **2.0 Workmanship**

2.1 The Hand rail shall be done as per the details given including sand papering, planning etc. complete as directed by engineer in charge.

2.2 The Hand rail shall be fixed with screws as per drawing and details given.

### **3.0 Mode of Measurement and Payment**

3.1 The Wood work shall be measured for finished sections in cum. No allowances shall be made for wastage and for dimensions supplied beyond those lengths specified.

3.2 The rate shall include painting all timber faces with 2 coats of approved wood primer and Polyurethane paint before fixing in position.

3.4 The rate shall be for an unit of one m<sup>3</sup>.

**5.30 Providing and fixing in position frames for aluminum door / composite door-window / window / casement window and aluminum door shutters ( sliding / side hung/ pivot) window shutters (sliding / fixed / open able casement ),louvers,handles, sections as per approved shop drawings and aluminum sections of approved make like Jindal or equivalent having 50 micron super durable powder coating for non exposed side of approved shade sections all floors / all levels / all heights / all shapes and for all sizes as per the drawing, specification or as directed by Architect or Engineer - in - Charge .**

Rate shall be inclusive of providing aluminum sections (conventional or Euro-profile), cutting, fabrication, erecting and fixing to the best workmanship manner, including

1) Sheet metal screws and aluminum angle corner cleat of minimum 3mm thickness and of full width etc for assembling the frame and shutter;

2) Glazing clips for receiving infill panel;

3) Best quality wool pile where ever shutter touches the frame and EPDM rubber;

4) Anchor fasteners of HILTI HRDUGT or equivalent for fixing the frame assembly to the RCC or masonry surfaces. Minimum 1 anchor fastener shall be used for every 750mm length of section for stability of frame.

5) 10mm GI tie rod for connecting vertical stile at top and bottom.

but excluding,

1) Rough ground to fix a frame with wall or any surface

Work shall have to be carried out as per the approved shop drawings and approved sample.

Actual weight of installed Aluminum sections which are visible shall only be measured and shall be considered for the payment. Infill panels shall be paid in relevant tender items.

**1.0 Material and Workmanship:** As per item description and general specifications.

**2.0 Mode of measurement and Payment:** Actual weight of installed Aluminum sections which are visible shall only be measured and shall be considered for the payment in kg. Infill panels shall be paid in relevant tender items in smt.

**5.31 Providing and fixing rough ground (packing) as per approved shop drawing in the gap between wall and aluminum door and window frame, The rate shall be inclusive of :**

1) providing and fixing average 6-8mm thick Ghana teak wood / BWP water proof ply (IS-710) of width approx. 32mm less than the width of the frame member.

2) Filling the gap between wall and frame on both sides (outside and inside) with polyethylene baker rod of avg. 10 mm thickness of approved make and color and then sealing the remaining gap with neutral grade G/M (Glazed & Metal) weather silicon sealant of approved make and color.

Work shall be carried out as per approved shop drawings and approved sample at all floors, all levels, all heights and in all shapes. Contractor shall provide guarantee for water tightness for 12 months after defects liability period. Installed measurements shall be considered for payment.

**1.0 Material and Workmanship:** As per item description and general specifications.

**2.0 Mode of measurement and Payment:** The item shall be measured for a unit of one Rmt. Inclusive filling with neutral cure silicon sealant (metal & glazed) of approved make & color.

**5.32 Providing and fixing clear float Toughened glass of specified thickness in frame work with necessary cutting of glass as per drawing & specifications including providing and fixing EPDM quality rubber / silicon rubber on the periphery of the glass as per the required thickness etc. complete at all floors, all levels, all heights and in all shapes as per the directions of Architect/Engineer-in-charge. Actual installed quantity shall be measured and paid.**

a) 6 mm thick

**1.0 Material and workmanship:** Material shall be as per item description and general specifications.

**2.0 Mode of measurement and Payment:** The rate shall be inclusive of all tools-tackles, EPDM rubber, silicon rubber etc. all complete. The item shall be measured for a unit of one sqm of actual area laid.

**5.33 Providing and fixing wired glass of approved make and specified thickness in frame work with necessary cutting of glass as per approved shop drawing & specifications including providing and fixing EPDM quality rubber on the periphery of the glass as per the required thickness etc. complete at all floors, all levels, all heights and in all shapes as per the directions of Architect/Engineer-in-charge. Actual installed quantity shall be measured and paid.**

(a) 6 mm. thick

**1.0 Material and workmanship:** Material shall be as per item description and general specifications.

**2.0 Mode of measurement and Payment:** The rate shall be inclusive of all tools-tackles,

EPDM rubber, silicon rubber etc. all complete. The item shall be measured for a unit of one sqm of actual area laid.

- 5.34 Providing and fixing compact sheet of approved make having specified thickness and shade of exterior grade quality in Aluminum frame work with necessary cutting of sheet as per drawing & specifications including providing and fixing EPDM quality rubber / silicon rubber on the periphery of the sheet as per the required thickness as per the directions of Architect/Engineer-in-charge. Actual installed quantity shall be measured and paid.**

**(a) 6mm. thick**

**1.0 Materials:**

- 1.1 Compact sheet shall be of approved make and texture.

**2.0 Workmanship:**

- 2.1 Compact sheet shall be fixed in best workman ship manner as a tight infill panel with EPDM rubber.

**3.0 Mode of Measurements and Payment:**

- 3.1 Non-decorative flush door shall be paid in relevant tender item  
3.2 The rate shall be for unit of one m<sup>2</sup> of the actual compact sheet fixed

- 5.35 Providing & fixing hydraulic floor spring with SS cover plate & adjustable concealed casted top pivot of approved make like Dorma or equivalent for wooden/aluminum doors of specified capacity with minimum one year guarantee. Rate shall be inclusive of cutting of floor neatly, grouting the floor spring & cleaning / polishing the floor & maintaining in good working condition up till defect liability period. In case of Aluminum shutter bottom arm of floor spring & top pivot shall be firmly fixed in the aluminum members using required size of teak wood by making rabbet in the wood.**

**a) Hold open for wooden door having weight up to 120 kg. - BTS 75 V WD**

**b) Hold open for Aluminum door having weight up to 120 kg. - BTS 75 V AD**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one no.

- 5.36.1 Providing & fixing hydraulic rack and pinion door closer with screws to pivoted/ hinged door of approved make like Dorma or equivalent for specified door width with minimum one year guarantee. Rate shall be inclusive of fixing with using the template as per supplier's specification & maintain in good working condition up till defect liability period.**



**a) With standard arm without mounting back plate up to 1100 mm door width - TS 68**

**b) With hold open arm without mounting back plate up to 1100 mm door width - TS 71 HO**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one no.

**5.37 Providing & fixing Narrow stile dead lock with 60/55 mm Europrofile Pin Cylinder of Kitch or equivalent with both side key /one side key -one side knob with one pair of rose for wooden /aluminum doors with necessary ss phillips head screws etc. complete as per drawing and sample approved by Architect /EIC. Rate shall be for all heights, all floors and all places.**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one no.

**5.38 Providing & fixing 19 mm diameter SS 316 satin (brush) finish push-pull handles square/rectangular shape in pair of DORMA or equivalent with necessary screws etc. complete, as per drawing as approved by Architect and Engineer-in-charge. Rate shall be for all heights, all floors and all places.**

**5.38.1 a) 150mm**

**5.38.2 b) 200mm**

**5.38.3 c) 300 mm**

**5.38.4 d) 450 mm**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one number.

**5.39 Providing & fixing 19 mm diameter SS 316 satin (brush) finish push-pull handles square/rectangular shape in pair of DORMA, Kich or equivalent with necessary screws etc. complete, as per drawing as approved by Architect and Engineer-in-charge. Rate shall be for all heights, all floors and all places.**

**b) 300 mm long**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one number of pair.

**5.40 Providing & fixing 10" long (minimum rod size shall be 15mm) "J" type satin nickel finish brass or SS 304 brush finish Aldrop of EPPW or equivalent with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one number

**5.41 Providing & fixing butt hinge of specific size of specified SS grade brush finish with necessary screws etc. complete of specified make and sample as approved by Architect and Engineer in Charge.**

**5.41.1 a) 102 x 76 x 3 mm - with ball Bearing SS 304 grade of Dorma or equivalent**

The item shall be applied as per drawings and manufacturer's specifications. The rate shall be for a unit of one number

**5.42 Providing and fixing 5mm thk mirror of specified size as per drawing & detail like Modifloat, Saint Gobain, I.A.G or equivalent silvered locally, with plain edge as required, with 12mm thick marine plywood backing, with CP brass caps, etc., complete. Teakwood beading of 20mm x 32mm size, with French polish or 3 coats of paint shall be done as directed.**

**1.0 Material**

1.1 The mirror shall be of Modifloat, Triveni, I.A.G. or equivalent as approved by the Consultants, with the edges rounded off as specified. The mirror shall be float glass, electroplated with silver. The mirror shall be free from waviness or distortion, from all angles of vision.

1.2 Its thickness shall not be less than 6mm the back of the mirror shall be free from any silvering defects. Silvering shall have a protective uniform covering of red-lead paint.

1.3 The 12mm thick marine plywood shall conform to relevant specification of civil materials and IS: 710. Teakwood shall conform to relevant specification of civil materials.

1.4 The mirror of a specified size shall be mounted on wooden frame comprising of 12mm thick marine plywood and teak beading, as per drawing and directed by the Architect or Engineer-in-charge.

**2.0 Workmanship**

2.1 The wooden frame shall be fixed in position by fixing wooden plugs in wall and the work shall be carried out in form of the best workmanship. For teakwood beading relevant civil work item specification shall be followed. The teakwood beading shall be of 20mm x 32mm size.

**3.0 Measurements**

3.1 The rate shall be for a unit of number and include cost of all labour and materials, tools and plant, etc., required for satisfactory completion of this item. The rate shall be for a unit of square meter.

**5.43 Providing & fixing 150 mm (minimum rod size shall be 12mm) satin nickel finish brass or SS 304 brush finish C shape rod handles with Tikadi of EPPW or equivalent with necessary screws etc. complete as approved by Architect and Engineer-in-charge.**

As per manufactures specification, shall be paid in numbers.

**5.44 Providing & fixing 22 mm diameter SS 304 satin (brush) finish Mortise handle in pair of KICH or equivalent with necessary SS phillips head screws etc. complete, as per drawing as approved by Architect and Engineer-in-charge. Rate shall be for all heights, all floors and all places.**

**a) 300 mm.**

As per manufactures specification, shall be paid in numbers of pair.

**5.45 Providing, making & fixing 2mm thk. SS 316 as approved sample on wooden /RCC / Brick Wall/Stone / Metal surface with philips head SS screws. The letters shall be fixed on satin finish plate as per sample approved. The rate shall be inclusive of scaffolding, drilling, adhesive material etc. at all heights & at all place.**

**S.S. 316 Grade Plate with black colour vinyl print / laser marking only. Up to 8 to 9 Characters or Numbers ( L X W X T)mm (200 X 400 X 2) [Finish : Satin]**

As per manufactures specification, shall be paid in numbers, shall be paid in no.

**5.46 Providing and fixing in position SS 304-15mesh x27gauge Mosquito net for aluminum sliding shutter / fixed shutter or in front of aluminum louvers as per approved shop drawing and sample as approved by Architect or Engineer-in-charge, at all floors, all levels, all heights. Only mosquito net shall be measured and paid in Sqm. All aluminum sections shall be paid under relevant tender item in kg.**

**5.46.1 Material and workmanship:** Material shall be as per item description and general specifications.

**5.46.2 Mode of measurement and Payment:** The item shall be measured for a unit of sqm. The aluminum frame shall be paid in relevant tender item in kg.

**CW 07.00****Plastering and Pointing Work**

**7.01.a Providing and laying average 10mm thick single coat cement finish cement plaster in CM 1:4 (1 Cement: 4 Coarse Sand) on ceilings and stair soffits at all floors, all shapes, all heights with necessary scaffolding, curing, making grooves, forming pattas, hacking properly to RCC surface (144 nos. of hacks per sqft) with floating coat of cement slurry etc. complete as directed by the Architect and Engineer-in-charge.**

**1.0 Material****1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**2.0 Workmanship****2.1 Scaffolding**

2.1.1 Nabhi's commentary on CPWD specifications clause no. 13.1.1 is to be followed.

2.1.2 Wooden ballies, bamboo, planks, trestles and other Steel scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster, which shall be independent of the walls. The sample shall be approved by engineer-in-charge before starting the work.

**2.2 Preparation of Surface**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 13.1.2 is to be followed.

2.2.2 All putlog holes in brickwork and junction between concrete and brickwork shall be properly filled in advance with concrete. Joints in brick work shall be raked about 10 mm if not raked during the masonry work and concrete surface shall be hacked to provide grip to the plaster. Projecting burrs of mortars formed due to gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brush/coir brush to remove dirt, dust etc., and the surface thoroughly washed with clean water to remove efflorescence, grease and oil etc., and shall be kept wet for a minimum of two hours before application of plaster.

2.2.3 For external plaster the plastering operation shall be started from the top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supporting

ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

### **2.3 Application of plaster and finish of plaster**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 13.1.4, 13.1.5 shall be followed.

2.3.2 Cement mortar shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed from the site.

2.3.3 Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging mats or gunny bags on the outside of the plaster and by keeping them wet.

2.3.4 Nabhi's commentary on CPWD specifications clause no. 13.6.1 is to be followed for floating coat of neat cement.

### **2.4 Thickness**

2.4.1 Nabhi's commentary on CPWD specifications clause no. 13.1.6 shall be followed except the thickness of the plaster shall be as per the item description. **Thickness of plaster shall be average thickness with minimum 10 mm, at any point on the surface.**

### **2.5 Curing**

2.5.1 Nabhi's commentary on CPWD specifications clause no. 13.5.5 shall be followed.

### **2.6 Precautions**

2.6.1 Nabhi's commentary on CPWD specifications clause no. 13.1.8 shall be followed.

### **3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 13.1.9.1, 13.1.9.3, 13.9.5, 13.1.9.7, 13.1.9.9 shall be followed.

3.2 Soffits of the stairs shall be measured as plastering on the ceilings. Folding soffits shall be measured separately and paid for.

3.3 The rates shall include for work at any height, position, and floor and for all necessary scaffolding, etc. as may be required. The rates shall also include for hacking and/or bush hammering to form key for plaster and for spatter dash treatment as specified as directed by engineer in charge.

The rates shall also include for all work in narrow width, rounded angles, chamfered external angles, drip moulds, grooves and for making good after all trades.

The rate shall also include for groove with cement finish upto 10 mm. x 10 mm to be formed in plaster at junction two different materials (skirting and plaster, dado and plaster, RCC and brickwork, around door window etc.) without any extra charge.

3.4 The rate shall be for an unit of one sqm.

**7.01.b 7.0 PLASTER WORKS.**

**Providing and applying average 10 mm. thick single coat Mala plaster using steel trowel in CM 1:3 (1 cement : 3 fine sand), on ceilings, stair soffits etc.as per instructions of EIC at all floors / all levels / all heights / all shapes including dense hacking to concrete surface, scaffolding, curing, making grooves (at junction of slab & beam, two different materials like brick & concrete surfaces, periphery of openings, below sills, above lintels, above skirting - horizontally or vertically), forming pattas including applying neat cement slurry on RCC Surface etc. complete as per drawing / specifications and / or as directed by the Engineer-in-charge. for all civil, plumbing, electrical & infrastructure works.**

The relevant specification of item no. 7.01.a is to be followed except mala finish plaster is carried out by aluminum Patti and steel trowel until cement slurry is seen on the surface evenly and smooth. Sample shall be got approved by the Engineer-in-charge before starting the work

**7.02.a Providing and laying average 15mm. thick single coat cement finish cement plaster in CM 1:4 (1 Cement : 4 Coarse Sand) on sides of masonry work / block wall / RCC wall etc., at all floors, all shapes and all heights with necessary scaffolding, curing, making grooves, forming pattas and drip moulds, hacking to the RCC surface, smooth flyash bricks and smooth Concrete blocks etc. complete, with floating coat of cement slurry as directed by the Architect and Engineer-in-charge.**

The relevant specifications of item no. 7.01.a are to be followed except the average thickness of plaster is 15 mm and it is applied on masonry wall / block wall / RCC wall.

**7.02.b Providing and laying average 15 mm thick single coat mala finish plaster in CM 1:3 (1 cement : 3 Coarse sand) on sides of brickwork/ blocks at all floors, all shapes and all heights with necessary scaffolding, curing, making grooves, forming pattas, hacking properly RCC surface etc. complete as directed by the Architect and Engineer-in-charge.**

The relevant specifications of item no. 7.01.a is to be followed except the thickness of the plaster is 15 mm and mala finish is carried out by aluminum patti and steel trowel until cement slurry is seen on the surface evenly. Sample shall be got approved by the Engineer-in-charge before starting the work.

**7.02.c Extra for providing lime neeru finish on walls and corner to be finished with cement slurry at all floors, all shapes and all heights, to the plastered surface @ 2.2 Kg/sqm**

**including cost of lime, scaffolding, rubbing with small trowel, watering, etc. complete as directed by directed by engineer in charge.**

The relevant specifications of item no. 7.02.a shall be followed except that the surface shall be finished smooth using lime @ 2.2 kg/m<sup>2</sup>. The plastered surface shall be rubbed with small trowel as specified.

**7.02.d Reduction in item no. 7.02a for providing wired finish instead of floating coat of cement slurry.**

The relevant specifications of item no. 7.02a shall be followed except that the surface shall not be finished smooth using cement @ 2.2 kg/m<sup>2</sup>. The rate shall be reduction in the rate for providing wired finish instead of floating coat of cement slurry.

**7.03.a Providing 20 mm thick double coat mala cement plaster on interior brick/concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 cement : 2 coarse sand) finished with trowel including scaffolding, curing etc. complete.**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**2.0 Workmanship**

2.1 Relevant specifications of item no. 7.01.a shall be followed except under coat shall be 12 mm of CM 1:4 (1 cement : 4 coarse sand), finishing coat shall be 8 mm in cement mortar 1:3 (1 Cement : 3 fine sand) and shall have an average total thickness of not less than 18 mm.

**2.2 12m under coat**

Plaster has been brought to a true surface a wooden straight edge and the surface shall be left rough and furrowed 2 mm deep with a scratching tool diagonally both ways, to form key for the finishing coat. The surface shall be kept wet till the finishing coat is applied. Before the first coat of surface hardens roughing shall be done to receive the second coat. Second coat shall be applied only after minimum curing of 72 hours

**2.3 8 mm Finishing Coat**

The finishing coat shall be applied after the under coat has sufficiently set but not dried and in any case within 48 hours.

### **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 7.01.a is to be followed.

**7.03.b Providing & laying average 15mm thick double coat mala finish cement plaster on sides of masonry work / block wall / RCC wall, first coat in CM 1:4 (1 cement : 4 coarse sand) by spraying , second coat upto 6 mm of CM 1:3 (1 cement : 3 fine sand) with mala finish plaster (finished with steel trowel) at all floors, all shapes and all height including hacking to RCC surface, scaffolding, curing, making grooves, forming pattas and drip mould, etc. complete as directed by engineer-in-charge.**

Relevant specification of item no. 7.01.a is to be followed. First coat in CM 1:4 (1 cement: 4 coarse sand) by spraying with cement mortar 1:4 (1 cement: 4 coarse sand). The second shall be applied after 3 days of curing. 6 mm thick finishing coat shall be applied with CM 1:3 (1 Cement: 3 fine sand).

**7.04.a Providing and laying average 18-20 mm. thick Sand faced cement plaster on masonry work / RCC wall upto any height above ground level and for all shapes consisting of first coat (backing coat) average 12-15 mm. thick with CM 1:4 (1 cement: 4 coarse sand) rough wired finish and second coat of average 6 mm. thick uniform grained textured by using wooden Gutka, in CM 1:2 (1 cement: 2 sand), including scaffolding, hacking to RCC surface, forming grooves, drip moulds, pattas, curing etc. complete as directed by engineer-in-charge.**

### **1.0 Material**

#### **1.1 Water**

1.1.1 Water shall conform to M-1.

#### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **2.0 Workmanship**

2.1 The work shall be carried out in two coats. The **backing coat (base coat) shall be average 12-15mm thick in CM 1:4** (1 cement: 4 coarse sand). The relevant specifications of item no. 7.01a shall be followed. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close-wired finish 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 the weather conditions. The surface shall not be allowed to dry during



this period. Before applying the second coat neat cement slurry shall be applied on the wall surface.

- 2.2 The second coat shall be completed to **average 6 mm. thickness in CM 1:2** as described above. The surface shall then be tapered to uniform grained texture by using Wooden **Gutka/ float** only, as specified. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per the sample approved.
- 2.3 Curing - The curing shall be started overnight after finishing of the plasterwork. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

### **3.0 Mode of Measurements and Payment**

- 3.1 The relevant specifications of item no. 7.01.a is to be followed. The rate shall be for all floors, all heights, all levels and all shapes.
- 3.2 The rate shall be for all operations as described above.
- 3.3 The rate shall be for an unit of one sqm.

**7.04.b Providing and laying average 18-20 mm. thick Sand faced cement plaster on masonry work / RCC wall upto any height above ground level and for all shapes consisting of first coat (backing coat) average 12-15 mm. thick with CM 1:3 (1 cement: 3 coarse sand) rough wired finish and second coat of average 6 mm. thick uniform grained textured by using sponge, in CM 1:1 (1 cement: 1 sand), including scaffolding, hacking to RCC surface, forming grooves, drip moulds, pattas, curing etc. complete as directed by engineer-in-charge.(Sample to be approved before mass production /construction /purchase)**

Relevant specifications of item no. 7.04.a shall be followed except top surface shall be tapered to uniform grain texture by using sponge instead of wooden gutka.

**7.04.c Providing and laying average 18-20 mm. thick Sand faced cement plaster on masonry work / RCC wall upto any height above ground level and for all shapes consisting of first coat (backing coat) average 12-15 mm. thick with CM 1:4 (1 cement: 4 coarse sand) rough wired finish and second coat of average 6 mm. thick uniform grained textured by using special tools and machines, in CM 1:2 (1 cement: 2 sand), including scaffolding, hacking to RCC surface, forming grooves, drip moulds, pattas, curing etc. complete as directed by engineer-in-charge.**

Relevant specifications of item no. 7.04.a shall be followed except the first coat is 15 mm thick with CM 1:4 (1cement: 4 coarse sand) and second coat is 3 mm thick with CM 1:2 (1 cement: 2 fine sand). Top surface shall be tapered to uniform grain texture by using special tools/ machine instead of wooden gutka.

**7.05 Providing and applying Rough Cast Plaster with a mixture of sand and gravel or crushed stone from 6mm to 10mm nominal size dashed over with hand scoop or trowel and including the fresh plaster in two layers, under layer 12mm cement plaster 1:4 (1 Cement: 4 coarse sand) and top layer 10mm cement plaster 1:3 (1 cement: 3 fine sand) mixed with 10% finely grounded hydrated lime by volume of cement as directed by engineer-in-charge.**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**1.3 Sand**

1.3.1 Sand shall conform to M-6.

**1.4 Stone Aggregate**

1.4.1 Stone Aggregate shall conform to M-12.

**2.0 Workmanship**

**2.1 Scaffolding**

2.1.1 Relevant specifications of item no. 7.01.a shall be followed.

**2.2 Preparation of Surface**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 13.11.2 shall be followed.

**2.3 Application**

2.3.1 12 mm under layer

Relevant specifications of item no. 7.01.a shall be followed except the thickness of the plaster will be 12 mm instead of 10 mm.

2.3.2 Top Layer

Nabhi's commentary on CPWD specifications clause no. 13.11.4.3 shall be followed.

2.3.3 Finish

Nabhi's commentary on CPWD specifications clause no. 13.11.5 shall be followed.

**3.0 Mode of Measurement and Payment**

3.1 Relevant Technical specifications of item no. 7.01.a shall be followed.

- 7.06 Providing and applying Pebble Dash Plaster with a mixture of washed pebble or crushed stone 6mm to 12.5mm nominal size dashed over and including the fresh plaster in two layers, under layer 12mm cement plaster 1:4 (1 Cement : 4 coarse sand) and top layer 10mm cement plaster 1:3 (1 cement : 3 fine sand) mixed with 10% finely grounded hydrated lime by volume of cement as directed by engineer-in-charge.**

Relevant specifications of item no. 7.05 shall be followed except that the washed pebbles or crushed stone graded from 12.5 mm to 6.3 mm or as specified shall be dashed over the plaster base and the vacant spaces if any shall be filled in by pressing pebbles or crushed stone as specified by hand, so that the finished surface represents a homogeneous surface.

- 7.07 Extra for providing and mixing waterproofing material in cement plaster work in proportion recommended by the manufacturers.**

Relevant specifications of item no. 7.01, 7.02, 7.03, 7.04, 7.05, 7.06 and manufacture's specifications shall be followed. The rate shall be for an unit of one kg.

- 7.08 Providing and laying average 25 mm. thick Stonecrete Plaster comprising of two coats first base coat of 15 mm. thick plaster in CM 1:4 (1 cement : 4 coarse sand) of wired finish and second coat of 10 mm thickness shall be with mixture of 1:1.25:1 (1 cement : 1.25 crushed stone chips : 1 dolomite powder with suitable pigment) as approved by Engineer-in-charge at all heights with necessary scaffolding including forming grooves, bands, drip moulds, patta, curing etc. complete as per the pattern in drawings as directed by engineer-in-charge. The stone chips shall be as following.**

- a) Jaiselmar Stone
- b) Kota Stone
- c) Red mandana Stone
- d) Black Kaddapa
- e) Marble

**1.0 Material**

**1.1 Water**

- 1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

- 1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

#### **1.4 Sand**

1.1.2 Sand shall conform to M-6.

**1.5** The crushed stone chips shall be of number 0, 1, 2 & 3 of approved colour and source as specified by Architect or engineer-in-charge

#### **2.0 Workmanship**

2.1 The relevant specification of item no. 7.01a shall be followed. The base surface shall have keys for receiving finishing coat. It shall be cured for 72 hours and then allowed to dry out, before being treated again with water as in the case of original surface.

2.2 The final (second) coat shall be of 10 mm with a mixture of 1:1.25:1 (1 cement : 1.25 crushed stone chips from approved quarry : 1 dolomite powder with suitable pigment) as approved by Engineer-in-charge. It shall be pressed, and finished with a steel trowel. Trowelling should be kept to a minimum as excessive trowelling may cause hair cracks and crazing. Floating shall be carried out only after the final rendering has slightly dried out. The impression of joints to the pattern shown in the drawings or as directed by the Architects shall then be marked on the face of the topping by pressing a light string with a trowel.

2.3 Grooves shall then be formed with the help of Aluminium channel of required size as per the Architectural drawings and they shall be finished neatly. The whole work shall be done as per the pattern of the sample approved by the Architect.

2.4 After the surface has been cured for about 72 hours and the surface hardened sufficiently, the face shall be dressed with fine chisel very carefully to give the appearance of chisel dressed stone of the pattern desired.

#### **3.0 Mode of Measurement and Payment**

3.1 Relevant Technical specifications of item no. 7.01.a shall be followed.

**7.09 Providing and laying average 15 mm. thick Silvercrete Plaster comprising of two coats, first coat of 12mm thick plaster in CM 1:4 (1 Cement : 4 coarse sand) and second coat of average 3 mm thick in of proportion 1:1:1 (1 cement : 1 marble chips no. 0 to 1 : with 1 part dolomite powder) as per pattern in the drawing at all heights with necessary scaffolding including forming grooves, bands, drip moulds, patta etc. complete as directed by the engineer-in-charge.**

Relevant specifications of item no. 7.07 shall be followed except marble chips of 0 to 1 no. from approved source is to be used instead of stone chips.

**7.10 Providing and fixing hexagonal chicken mesh of size 20 mm. x 20 mm. of 24 gauge at junction of concrete and brick work or between different materials etc. as directed by engineer in charge. (Sample to be approved before mass production / construction / purchase)**

**1.0 Material**

1.1 Chicken wire mesh having openings **20 mm. x 20 mm. of 22 gauge** shall be provided as directed.

**2.0 Workmanship**

2.1 The mesh is to be fixed with nails and cement paste at the junctions of different materials (column and brickwork, at beam bottom level on the face of beam and brickwork) to avoid cracks in the plaster

2.2 Chicken mesh shall be fixed in advance of the plasterwork. Chicken mesh shall be fixed in such a way that it is totally concealed in the plaster. Chicken mesh shall be fixed in such a way that minimum 75mm mesh is provided on either side of the joint. The mesh shall be fixed with both the elements with the help of nail/ screws. Drilling shall be carried out if required in RCC member.

**3.0 Mode of measurement and payment:**

3.1 The item will be measured and paid in sqm. Only clear visible area will be measured and paid. No extra payment shall be done for over lapping of mesh.

**7.11.a Flush pointing on the following work with Cement Mortar 1:2 (1 Cement : 2 Fine Sand) as per sample approved by Architect or engineer in charge.**

**7.11.a.1 Brick Work**

**7.11.a.2 Block Work**

**7.11.a.3 Stone Work**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**2.0 Workmanship**

**2.1 Scaffolding**

Nabhi's commentary on CPWD specifications clause no. 13.24.1 shall be followed.

**2.2 Preparation of surface**

Nabhi's commentary on CPWD specifications clause no. 13.24.2 shall be followed.

## **2.3 Application of Mortar & Finishing**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 13.24.4.1, 13.24.4.2 shall be followed. Marking of straight horizontal line shall be done at true level with the string as specified by the engineer-in-charge.

## **2.4 Curing**

2.4.1 Nabhi's commentary on CPWD specifications clause no.13.24.5 shall be followed.

## **3.0 Mode of measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 13.24.6, 13.24.7 shall be followed.

### **7.11.b Pointing on the Brick work with Cement Mortar 1:2 (1 Cement : 2 Fine Sand) as per sample approved by Architect or engineer in charge.**

#### **7.11.b.1 Flush Inclined type pointing**

Relevant specifications of item no. 7.11.a shall be referred except flush inclined type pointing is to be done instead of flush pointing.

#### **7.11.b.2 Grooved pointing**

Relevant specifications of item no. 7.11.a shall be referred except grooved pointing is to be done instead of flush pointing.

#### **7.11.b.3 Struk pointing**

Relevant specifications of item no. 7.11.a shall be referred except struk pointing is to be done instead of flush pointing.

#### **7.11.b.4 V-grooved pointing**

Relevant specifications of item no. 7.11.a shall be referred except V-grooved pointing is to be done instead of flush pointing.

#### **7.11.b.5 V pointing**

Relevant specifications of item no. 7.11.a shall be referred except V pointing is to be done instead of flush pointing.

**7.12.a Providing and laying average 10 mm thick single coat mala finish cement perlite plaster(finished smooth with steel trowel) plaster in CM 1:3 ( 1 cement : 3 perlite aggregate), on ceilings and stair soffits at all floors, all shapes and all heights with necessary scaffolding, curing, making grooves, forming pattas, hacking properly to RCC surface (144 nos. of hacks per sqft) etc. complete as directed by Engineer-in-charge.**

## **1.0 Material**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

## **1.2 Cement**

1.2.1 Cement Mortar shall conform to M-3.

## **1.3 Perlite aggregate**

1.3.1 Perlite Aggregate shall conform to M-30.

## **2.0 Workmanship**

### **2.1 Scaffolding**

2.1.1 Relevant specifications of item no. 7.01.a shall be followed.

### **2.2 Preparation of Surface**

2.2.1 Relevant specifications of item no. 7.01.a shall be followed.

### **2.3 Preparation of Mortar**

2.3.1 The proportion of perlite plaster shall be 1:3 (1 cement: 3 perlite based aggregate). The mortar shall be mixed on a dry platform. Perlite and cement is mixed in paddle type plaster mixer. Required amount of water and air entraining agent as per manufactures specification shall be mixed in the mixer followed by cement and mix until slurry is formed.

2.3.2 Perlite aggregate is added to the mix until required wet density is achieved. The thickness of perlite cement plaster for single coat shall be 10mm. The plaster shall be cured for a period of 48 hours.

## **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 7.01.a shall be followed. The rate shall be for an unit of one sqm.

**7.12.b Providing & laying average 18 mm thick mala finish cement perlite plaster in two coats at all heights, all shapes and all levels with 12 mm thick under coat in CM 1:4 (1 cement : 4 perlite aggregate) rough wired finish and 6 mm thick finishing coat in CM 1:3 (1 cement : 3 perlite aggregate) mala finish (finished with steel trowel) including scaffolding, curing, making grooves, forming pattas and drip mould, hacking RCC surface etc. complete, as directed by Engineer-In-charge.**

Relevant specifications of item no. 7.12.a shall be followed except thickness of the plaster will be 18 mm and it is to be applied in two coats.

**7.13 Providing cement vata, 10 cm. x 10 cm. size, quarter round concave/ triangular in cement concrete 1:2:4 including neat cement finishing, curing, hacking the RCC surface, etc. complete.**

## **1.0 Material**

1.1 Water

1.1.1 Water shall conform to M-1.

## 1.2 Cement Mortar

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

## 2.0 Workmanship

2.1 The work of cement vata of 10 cm. x 10 cm. size shall be carried out at junctions of parapets and terraces as directed. The vata shall be finished in quarter round shape. The work shall be carried out in the best workman-like manner. The internal portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

## 3.0 Mode of Measurement and Payment

3.1 The work shall be measured for finished item in rmt.

3.2 The rate shall be for an unit of one rmt. The rate shall include hacking the RCC surface, curing etc. complete.

**7.14 Extra for Providing and mixing Fibermesh Fibercast 500 (Formerly Harbourite) fine fibrillated 100% virgin polypropylene fibers of M/s. PROPEX CONCRETE SYSTEMS, U.S.A. represented in India by "M/s. NINA CONCRETE SYSTEMS PVT. LTD. or equivalent as approved by architect / EIC in proportion minimum @ 125gm per cement bags while doing the Cement Mortar for plaster, china mosaic, as per supplier's specification and approved by architect and engineer-in-charge. It shall be measured in Kg.**

## 1 Material

### 1.1 Polypropylene Fibers

1.1.1 Polypropylene Fibers shall conform to M-40 or shall be as per approved manufacture's specification.

### 2.0 Workmanship

2.1 Relevant specifications of item no. 7.02.b shall be followed. Non-metallic integral polypropylene fibers of approved make are to be used while mixing and placing the Cement Mortar as per manufacture's specification.

### 3.0 Mode of Measurement and Payment

3.1 The item shall be measured and paid in Kg per cum of concrete as directed by the engineer in charge. Actual consumption inclusive of wastage or theoretical consumption whichever is less shall be paid.



- 7.15 Providing and laying average 15mm. thick single coat smooth / wired finish cement plaster in CM 1:4 (1 Cement : 4 Coarse Sand) on sides of masonry work / block wall / RCC wall etc., at all floors, all shapes and all heights with necessary scaffolding, curing, making grooves, forming pattas and drip moulds, hacking to the RCC surface, smooth flyash bricks and smooth Concrete blocks etc. complete, with floating coat of cement slurry as directed by the Architect and Engineer-in-charge.**

The relevant specifications of item no. 7.01.a are to be followed except the average thickness of plaster is 15 mm and it is applied on masonry wall / block wall / RCC wall.

**CW 08.00**

**Water Proofing Work**

---

**8.01.a Providing and laying integral cement based brickbat coba water proofing treatment average 115mm thick and minimum thickness at khurra as 65 mm including preparation of surface as required for treatment on roofs, balconies, terraces etc. at all floors consisting of following operations and furnishing a guarantee bond of 10 years.**

- i) Cleaning and applying a cement slurry at the rate 2.75 Kg per sqm mixed with water proofing compound as manufacture's specification as directed by engineer-in-charge over the slab including adjoining walls upto 300 mm height including cleaning the surface before the treatment**
- ii) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand ) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.**
- iii) After three days of proper curing applying a second coat of cement slurry at the rate 2.75 Kg per sqm admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge**
- iv) Finishing the surface to make wired finish with average 12 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge.**
- v) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge. (Only plan area shall be measured, vata shall not be measured separately and paid for.)**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

### **1.3 Cement**

1.3.1 Cement shall conform to M-3.

### **1.4 Brickbats**

1.4.1 Brick Bat shall conform to M-15.

### **1.5 Water Proofing Compound**

1.5.1 Water proofing compound shall conform to M-31.

## **2.0 Workmanship**

2.2 **Unless otherwise specified proprietary waterproofing treatment shall be executed through approved specialized water proofing agency. Contractor shall furnish a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same which is also to be signed by the specialized agency. However, soul responsibility shall be of main contractor for any leakages.**

2.3 **Copy of work order mentioning the rate issued to the specialized agency shall be attached with guarantee bond.**

2.4

A guarantee bond on appropriately stamp paper shall be given by the contractor to the client in the manner form prescribed below:

#### **FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other form of humid condition, for a period of 10 years after completion of the work of water-proofing as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of humid conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

2.2 **This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.**

2.3 While tendering the contractors should clearly stipulate the type of treatment proposed to be provided by them and the name and particulars of firm through whom they propose to carry out the treatment.

2.4 The surface shall be cleaned of foreign matter such as fungus, moss, dirt and dust by wire brushing and dusting. Any cracks which may allow leakage of water shall be identified by ponding before starting the treatment.

- 2.5 The slab surface shall be washed with water and cement slurry mixed with water proofing compound as manufacture's specification as directed by engineer-in-charge shall be applied over the slab including adjoining walls upto 300 mm height including cleaning the surface before the treatment.
- 2.6 20 mm thick cement mortar 1:5 admixed with water proofing compound conforming to IS: 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.
- 2.7 The surface treated shall have a minimum slope of 1 in 120 or as specified in the drawing. Brickbats of varying size (25 mm to 115mm) as per requirement shall be arranged in proper gradient with cement mortar 1:5 according to desired slope.
- 2.8 After three days of proper curing applying a second coat of cement slurry admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge
- 2.9 Finally the surface is finished with to make wired finish with 12 mm thick joint less cement mortar of mix 1:4 (1cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by engineer-in-charge.
- 2.10 The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge.
- 2.11 At places of construction joints and well defined cracks other than hair cracks in the treated structure shall be cut to 'V' section, cleaned and then filled up flush with 1:1 cement sand mortar with polymer based waterproofing compound.
- 2.12 The surface under treatment, part of parapet (incase of balcony or terrace) and gutters, drain mouths etc. over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire brushing and dusting.
- 2.13 Drain outlet shall be suitably placed with respect to the surface gradient to ensure rapid drainage and prevention of local accumulation of water on the treated surface. Masonry drain mouth shall be widened sufficiently and rounded with cement mortar.
- 2.14 For cast iron drain outlets, a groove shall be cut all around to touch the treatment.
- 2.15 When a pipe passes through a roof on which water proofing treatment is to be laid, a cement concrete angle fillet shall be built round it and the water proofing treatment shall be taken over the fillet.
- 2.16 In case of masonry parapet wall over 450 mm. in height, for tucking in the water proofing treatment, a horizontal groove 75 mm. wide and 65 mm. deep at minimum height of 300 mm. above terrace level shall be left in the vertical face at the time of construction, the horizontal face of the groove shall be shaped with cement mortar 1:4.

- 2.17 In case of low parapet where the height does not exceed 450 mm, no groove shall be provided and the water proofing treatment shall be carried right over the top.
- 2.18 In case of existing R.C.C. and stone wall cutting the chase for tucking in the water proofing treatment is not recommended.
- 2.19 At the junction between the terrace slab and vertical face of the parapet wall, a fillet 75-100 mm. in radius shall be constructed.
- 2.20 At the drain mouths the fillet shall be suitably cut back and rounded off for each application of water proofing treatment for easy flow of water.
- 2.21 Outlet at every low dividing wall about less than 300 mm. in height shall be rounded smooth and corners rounded off or easy application of water proofing treatment.
- 2.22 The top surface shall be kept wired finish to receive the china mosaic. In case china mosaic is not to be provided, the surface shall be kept cement finished @ 2.75kg/m<sup>2</sup> and marked with 300x300mm false square (with string)

### **3.0 Mode of Measurement and Payment**

- 3.1 The rate shall include providing water proof cement concrete terracing of adequate thickness to give desired slope for drainage of rain water from terraces.
- 3.2 The measurements for this item shall be taken as under:
  - (a) Water proofing of roof shall be measured in m<sup>2</sup>, plan area of treated surface shall be measured correct to a centimeter.
  - (b) Measurement shall be taken for the plan area of roofing/terrace. Flashing / rounding off treatment including flashing / rounding over the parapet wall up to 300 mm from terrace. Low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing grooves shall not be measured extra and paid for.
  - (c) In measurements, no deduction shall be made for either openings or recess for chimney stacks, roof lights etc. having areas upto 0.4 m<sup>2</sup>. Deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.
- 3.3 The rate includes cost of all materials and labour required to carry the works as per the above specifications. The rate also includes cleaning and hacking the RCC parapet and inverted beam surface and treating the cracks shall not be paid separately. Cutting of horizontal grooves in parapet walls for tucking in water proofing treatment shall not be measured or paid separately.
- 3.4 Measurements shall be based on the drawings or as executed on site, the lesser of the two shall be given. No extra payment shall be made for rounding and vata at the junction

of slab & parapet. A deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of the work and 10% of the same or equivalent bank guarantee shall be retained for the balance of the guarantee period and shall be refunded only after the completion of the guarantee period.

- 3.5 The item shall be measured and paid in sqm.
- 3.6 The work is to be got done through approved specialized agency.

**8.01.b Providing and laying integral cement based brickbat coba water proofing treatment average 115mm thick and minimum thickness at khurra as 65 mm including preparation of surface as required for treatment on roofs, balconies, terraces etc. at all floors consisting of following operations and furnishing a guarantee bond of 10 years.**

- i) Cleaning and applying a cement slurry at the rate 2.75 Kg per sqm with mixed with water proofing compound as manufacture's specification as directed by engineer-in-charge over the slab including adjoining walls upto 300 mm height including cleaning the surface before the treatment**
- ii) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 115mm size with 50% of cement mortar 1:5 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :5 coarse sand ) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.**
- iii) After three days of proper curing applying a second coat of cement slurry at the rate 2.75 Kg per sqm admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge**
- iv) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement :4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge and finally finishing the surface with trowel with neat cement slurry @ 2.75 Kg / m2 admixed with water proofing compound conforming to IS : 2645 and making pattern of 300mm x 300 mm square 3 mm deep by string).**
- v) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge. Only plan area shall be measured, vata shall not be measured separately and paid for.)**

Relevant Technical specifications of item no. 8.01.a shall be followed except top surface shall be finished with trowel with neat cement slurry @ 2.75 Kg / m<sup>2</sup> admixed with water proofing compound conforming to IS : 2645 and making pattern of 300mm x 300 mm square 3 mm deep by string). Guarantee bond shall be for 10 years as specified in item no. 8.01.a.

**8.02.a Providing and laying integral cement based brickbat coba water proofing treatment average 75mm thick including preparation of surface as required for treatment on sunk slabs of toilets, depressed portions etc. at all floors consisting of following operations and furnishing a guarantee bond of 10 years.**

- i) Cleaning and applying a cement slurry at the rate 2.75 Kg per sqm mixed with water proofing compound as manufacture's specification as directed by engineer-in-charge over the slab including adjoining walls upto 300 mm height including cleaning the surface before the treatment**
- ii) Laying brick bats with mortar using broken bricks/brick bats 25 mm to 75mm size with 50% of cement mortar 1:4 (1 cement : 4 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:5 (1 cement :4 coarse sand ) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.**
- iii) After three days of proper curing applying a second coat of cement slurry at the rate 2.75 Kg per sqm admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge**
- iv) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:3 (1 cement :3 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge and finally finishing the surface with trowel with neat cement slurry @ 2.75 Kg / m<sup>2</sup> admixed with water proofing compound conforming to IS : 2645.**
- v) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge. Only plan area shall be measured, vata shall not be measured separately and paid for.)**

Relevant Technical specifications of item no. 8.01.a shall be followed except top surface shall be finished with trowel with neat cement slurry @ 2.75 Kg / m<sup>2</sup> admixed with water proofing compound conforming to IS : 2645. Thickness of water proofing shall be 75 mm instead of 115 mm. Guarantee bond shall be for 10 years as specified in item no. 8.01.a.

- 8.02.b Providing and laying integral cement based water proofing treatment average 50mm thick with black trap stone aggregate including preparation of surface as required for treatment on sunk slabs of toilets, depressed portions etc. at all floors consisting of following operations and furnishing a guarantee bond of 10 years**
- i) Cleaning and applying a cement slurry at the rate 2.75 Kg per sqm with mixed with water proofing compound as manufacture's specification as directed by engineer-in-charge over the slab including adjoining walls upto 300 mm height including cleaning the surface before the treatment**
  - ii) Laying black trap stone aggregate of 20mm to 40mm with cement mortar 1:4 (1 cement : 5 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge over 20 mm thick layer of cement mortar of mix 1:4 (1 cement :5 coarse sand ) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge to required slope and treating similarly the adjoining walls upto 300 mm height including rounding of junctions of walls and slabs.**
  - iii) After three days of proper curing applying a second coat of cement slurry at the rate 2.75 Kg per sqm admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge**
  - iv) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:3 (1 cement :3 coarse sand) admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-charge and finally finishing the surface with trowel with neat cement slurry @ 2.75 Kg / m<sup>2</sup> admixed with water proofing compound conforming to IS : 2645.**
  - v) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing and for final test. All above operations to be done in order and as directed and specified by the Engineer-in-Charge. Only plan area shall be measured, vata shall not be measured separately and paid for.)**

Relevant Technical specifications of item no. 8.01.a shall be followed except top surface shall be finished by trowel with cement slurry @ 2.75 Kg / m<sup>2</sup>; thickness of water proofing shall be 50 mm instead of 115 mm and black trap stone aggregate shall be used instead of brick bats. Guarantee bond shall be for 10 years same as specified in item no. 8.01.a.

- 8.02.c Providing and laying crystalline water proofing treatment of Penetron or Kryton or equivalent to vertical and horizontal surfaces of depressed portions of toilets, pantry and the like as per manufacture's specification or as directed by the engineer-in-charge and furnishing a guarantee bond of 10 years. Only plan area shall be measured, vata shall not be measured separately and paid for.)**



**1.0 Material**

**1.1 Water Proofing Compound**

1.1.1 Water proofing compound shall conform to M-31.

**2.0 Workmanship**

2.1 Item shall be executed as per manufacture's specification to RCC surfaces as directed by engineer in charge.

**3.0 Mode of Measurement and Payment.**

3.1 Relevant specifications of item no. 8.01.a shall be followed.

**8.02.d Crystalline water proofing system**

**Providing & Applying Integral Capillary concrete waterproofing systems of Penetron or equivalent, for basement Raft and RCC wall and water retaining structures. The work shall be carried out as per the manufacturer's specifications. It shall be carried out as per the approved method of waterproofing by Penetron, USA using PENETRON Products, having speed of penetration of 31 cms in 56 days and resistance to 16 bar hydrostratic water head, incl. treating joints / cracks with Pencrete mortar etc. including following tasks to be carried out etc. complete all as per detailed specification and instructions of Engineer in charge.**

**a) Providing and Sprinkling Penetron Plus (dryshake) for raft from positive side.**

**b) Providing and fixing Penebar (hydrophilic swelling) in joints, including application of primer [PN6], at all vertical and horizontal construction joints.**

**c) Providing and applying Penetron, as per supplier's specification on vertical walls of basement from positive side.**

**d) Providing and filling Penetron mortar for cracks, construction joints, tie rod holes, honeycombing/poor concrete etc. from positive side.**

**The rate shall be paid in sqmt area of RCC surface treated, for carrying out above system, and no individual task will be paid seperately.**

Relevant specifications of item no. 8.01.a shall be followed

**8.03.a Providing and applying chemical water proofing treatment with cement polymer modified based waterproof compound like Tapcrete P151 of CICO or equivalent, as per manufacture's specification in three coats over roofs, (last coat shall be applied using silica or quartz sand), including 300 mm rounding off/ vata on sides of parapet as specified / as per manufacturers specifications and direction of engineer-in-charge and**

**furnishing a guarantee bond of 10 years. Only plan area shall be measured rounding off vata shall not be measured separately and paid for.)**

## **1.0 Material**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

### **1.2 Cement**

1.2.1 Cement shall conform to M-3.

### **1.3 Sand**

1.3.1 Sand shall conform to M-6.

### **1.4 Water Proofing Compound**

1.4.1 Water proofing compound shall conform to M-31.

## **2.0 Workmanship**

### **2.1 Preparation of surface**

2.1.1 The surface shall be cleaned to remove all dust, foreign matters, loose materials or any deposits of contaminants etc. New flat surface like sub-base concrete shall be made reasonably smooth so as not to impede the application of the coating and to avoid sharp projections. All concrete shall be thoroughly pre-wetted for at least one hour prior to the application of water proofing compound by sprinkling of water on flat surface and by vigorously spraying water on vertical and horizontal surface. While placing the coating, water shall be removed so that surface is only damp or surface dry. In no case there shall be standing water or a shimmy wet surface. If any standing water, depressions are there it should be filled and leveled using Tapcrete fillers. For fillers, the mixing ratio is 1 kg cement: 1.5 by silica sand and 0.52kg Tapcrete P-151 or equivalent material.

### **2.2 Application**

2.2.1 Tapcrete P-151 polymer modified cementitious slurry or equivalent is to be applied over the prepared concrete surface. The slurry shall be spread out over an area which can be covered with fiber glass fabric before the slurry dries out.

2.2.2 Unroll the fiber glass fabric on to the wet slurry layer and impregnate with PMC slurry by pressing the fabric down so as to even out the all wrinkles.

2.2.3 Over the fiber glass fabric TAPCRETE P-151 slurry coating shall be applied.

2.2.4 Once the slurry coat dries for 24 hours, TAPCRETE P-151 – PMC brush topping is applied over the TAPCRETE P-151 slurry coating over the surface.

- 2.2.5 Minimum 25 mm thick cement mortar screed concrete (1:2:4 ) with 300 mm rounding off/ vata and making a pattern of 300mm x 300mm deep 3 mm admixed with water proofing compound CICO no. 1 in slope shall be applied over the cured PMC brush top coating.
- 2.2.6 The consumption per sqm for the first coat shall be 0.25 kg Tapcrete and 0.5 kg cement and for second coat 0.40 Tapcrete and 0.80 kg cement.
- 2.2.7 After first coat the surface shall be allowed to dry for 5 hours. During this no water is to be used for curing. In case of high temperature and low humidity combined with high wind condition, the surface shall be covered with polythene sheet. After the application, curing shall be done maximum 4 days starting one day after the application.
- 2.2.8 Third coat shall be Tapcrete brush topping 1.5mm thick with consumption 0.67 kg Tapcrete, 1.30 kg cement and 1.3 kg fine silica.
- 2.2.9 The applications shall be as per the manufacturer's specification.

### **2.3 Curing**

- 2.3.1 During the first 12 hours of coating, it must be protected from abrasion, rain and other adverse conditions.
- 2.3.2 No traffic shall be allowed on a standard TAPCRETE P-151 treated surface within 48 hours of installation.
- 2.3.3 After application of final coat of TAPCRETE P-151 composition, initial air drying shall be done for 2-6 hours. During this period no water is to be used for the curing.
- 2.3.4 Moist curing shall be done for the next 24 hours by spraying water on the treated surface.
- 2.3.5 Following moist curing, the TAPCRETE P-151 coating shall be allowed to air dry for 3 days before submersion of water.

### **4.0 Mode of Measurement and Payment**

Relevant specifications of item no. 8.01 shall be followed.

**8.03.b Providing and applying chemical water proofing treatment with cement polymer modified based waterproof compound like Tapcrete P151 of CICO or equivalent without net in three coats in sunk of toilets, kitchens, pantry , balconies and depressed portions including treatment up to 300 mm on side with (CC 1:2:4) 100X100 mm vata at corners as per manufacturers specifications and direction of engineer-in-charge and furnishing a guarantee bond of 10 years. (Only plan area shall be measured, vata & treatment on side up to 300 mm high shall not be measured separately and paid for.)**

The chemical shall be of approved make like- Tapcrete P151- Cico Technologies Limited. The surface shall be cleaned to remove all dust, foreign matters, loose materials etc. New flat surface like sub-base concrete shall be made reasonably smooth so as not to impede

the application of the coating and to avoid sharp projections. All concrete shall be thoroughly pre-wetted for at least one hour prior to the application of coating. When placing the coating, water shall be removed so that surface is only damp. In case there shall be standing water, depressions are filled and leveled using Tapcrete fillers. For fillers, the mixing ratio is 1 kg cement: 1.5 by silica sand and 0.52kg Tapcrete.

The consumption per sqm for the first coat shall be 0.25 kg Tapcrete and 0.5 kg cement and for second coat 0.40 Tapcrete and 0.80 kg cement.

After first coat the surface shall be allowed to dry for 5 hours. During this no water is to be used for curing. In case of high temperature and low humidity combined with high wind condition, the surface shall be covered with polythene sheet. After the application, curing shall be done maximum 4 days starting one day after the application.

Third coat shall be Tapcrete brush topping 1.5mm thick with consumption 0.67 kg Tapcrete, 1.30 kg cement and 1.3 kg fine silica. The applications shall be as per the manufacturer's specification.

The measurement shall be for a unit of a sqm.

**8.04.a Providing and laying Box type water proofing of average 90 mm thick (Kota stone in single layer) on horizontal surface from outside / inside at all depth below ground level for underground structures as directed by engineer-in-charge and consisting off following and including furnishing a guarantee bond for 10 years.**

- i) 1st layer of 22mm to 25mm thick approved and specified rough kota stone slab ( 2 ft X 1½ ft (undressed) over a 25 mm thick base of cement mortar 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound confirming to IS:2645 in the recommended proportion over the leveling course (leveling course is to paid separately.) Joints shall be sealed and grouted with 1:1 CM with approved water proofing compound in recommended proportions.
- ii) 2nd layer of 40 mm thick IPS (1 cement : 1.5 sand : 2 aggregate) mixed with water proofing compound in recommended proportions.
- iii) 3rd layer shall be RCC raft M20 as specified in the item (minimum 150 mm thick) with nominal reinforcement at top. It shall be paid in relevant item.

## **1.0 Material**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

### **1.3 Cement**

1.3.1 Cement shall conform to M-3.

### **1.4 Water Proofing Compound**

1.4.1 Water proofing compound shall conform to M-31.

### **1.5 Rough Kota Stone**

1.5.1 Rough Kota Stone shall conform to M-43.

## **2.0 Workmanship**

### **2.1 Preparation of surface**

2.1.1 The receiving surface of the concrete shall be roughened when the concrete is still green. In case the surface is not roughened while concrete is still green, the water proofing will not be permitted and surface is to be roughened by spatter dash key. The roughening of the surface is to be carried out by the contractor at his own cost. The surface is properly washed with water.

### **2.2 Application**

2.2.1 After cleaning the surface cement slurry is applied over the the surface to receive cement mortar. Just after that cement mortar (1:3) mixed with water proofing compound confirming to IS:2645 in the recommended proportion shall be applied over the treated surface.

2.2.2 Before the base course dries and gets hard the layer of kota stone shall be applied immediately. Rough kota stone shall be laid over the base course and pressed gently so that air gap can be removed. For laying the slabs in perfect level, two end stone slabs shall be fixed firmly to the required level and a string stretched over the two slab, intermediate slab shall be then set to the level of the string. Joints shall be filled with cement mortar 1:1.

2.2.3 After filling all joints area of stone slabs shall be cladded with 40 mm thick wired finish IPS (1 cement: 1.5 sand: 2 aggregate) mixed with water proofing compound. The surface of the stones shall be cleaned and slightly watered.

2.2.4 Immediately after finishing with IPS arrangements shall be made to lay the top RCC surface as quickly as possible and in the meantime water proofing treatment shall be kept wet continuously. In case the concreting slab gets delayed for more than 2 weeks, curing can be stopped after 14 days.

2.2.5 A guarantee bond on appropriate stamp paper shall be given by the contractor to the client in the manner form as described in item no. 8.01.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant Technical specifications of item no. 8.01 shall be followed except the payment of concrete and reinforcement shall be made in relevant items. Item shall be measured and paid in sqm.

3.2 Raft shall be measured and paid in relevant tender item.

**8.04.b Providing and laying Box type water proofing of average 125 mm thick (Kota stone in double layer) on horizontal surface from outside / inside at all depth below ground level for under ground structures as directed by engineer-in-charge and consisting of and including furnishing a guarantee bond for 10 years.**

- i) **1st layer of 22mm to 25mm thick approved and specified rough kota stone slab ( 2 ft X 1½ ft (undressed) over a 25 mm thick base of cement mortar 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound confirming to IS:2645 in the recommended proportion over the leveling course (leveling course is to paid separately.) Joints shall be sealed and grouted with 1:1 CM with approved water proofing compound in recommended proportions.**
- ii) **2nd layer of 25 mm thick approved rough kota stone slab (2 ft x 1½ ft) laid over a 25 mm thick cement mortar 1:3 ( 1 cement : 3 coarse sand) mixed with water proofing compound as per manufacture specifications. And the joints shall be filled with cement mortar (1:1) with water proofing compound in recommended proportions.**
- iii) **3rd layer of 40 mm thick IPS (1 cement: 1.5 sand: 2 aggregate) mixed with water proofing compound in recommended proportions.**
- iv) **4th layer shall be RCC raft M20 as specified in the item (minimum 150 mm thick) with nominal reinforcement at top.**

Relevant Technical specifications of item no. 8.05.a shall be followed except that 2<sup>nd</sup> layer will be of 25 mm thick approved rough kota stone slab (2 ft x 1½ ft) laid over a 25 mm thick cement mortar 1:3 ( 1 cement : 3 coarse sand)mixed with water proofing compound as per manufacture's specifications. And the joints shall be filled with cement mortar (1:1) with water proofing compound in recommended proportions. 3rd layer of 40 mm thick IPS (1 cement : 1.5 sand : 2 aggregate) mixed with water proofing compound in recommended proportions.

And 4<sup>th</sup> layer shall be RCC raft M20 as specified in the item (minimum 150 mm thick) with nominal reinforcement at top as specified in the item description.

**8.04.c Providing and laying Box type waterproofing on vertical surface through approved WP agency from outside by fixing stone slab 15 to 20 mm thick of (2 ft X 1½ ft (undressed)), keeping the gap of 20mm (minimum) between stone slabs and vertical surfaces and filling the gaps with neat cement sand mortar 1:1 (1 cement : 1 fine sieved sand) mixed with water proofing compound and finishing the exterior of stone slab with 12 mm thk cement sand plaster 1:3 (1 cement : 3 coarse sand) and finally finishing the surface with neat cement slurry at the rate of 2.75 Kg / sqm admixed with water proofing compound in recommended proportions etc. complete at all levels and as directed by engineer-in-charge including furnishing a guarantee bond for 10 years. Rate shall be inclusive of curing, scaffolding etc. complete**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

**1.3 Cement**

1.3.1 Cement shall conform to M-3.

**1.4 Water Proofing Compound**

1.4.1 Water proofing compound shall conform to M-31.

**1.5 Rough Kota Stone**

1.5.1 Rough Kota Stone shall conform to M-43.

**2.0 Workmanship**

**2.1 Preparation of Surface**

2.1.1 Relevant specifications of item no. 8.04.a shall be followed.

2.1.2 Box type water proofing shall be done only after the entire work is structurally complete.

2.1.3 Proper scaffolding shall be provided by contractor at his own cost.

**2.2 Application**

2.2.1 15 to 20 mm thick kota stone is applied on the walls with cement mortar (1:1) and water proofing compound conforming to IS 2645 in recommended proportions with a gap of 20mm (minimum) between stone slabs and receiving surfaces.

- 2.2.2 Only one layer of Kota stone shall be placed in a day. After the layer is placed, each stone shall be grouted individually with cement sand mortar 1:1.
- 2.2.3 Finally finishing the exterior of stone slab with 20 mm thick cement mortar 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound in recommended proportions and finally finishing the surface smooth with neat cement slurry mixed with water proofing compound at 2.75 KG / m<sup>2</sup> etc.complete at all levels.
- 2.2.4 A guarantee bond on appropriate stamp paper shall be given by the contractor to the client in the manner form as described in item no. 8.01.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant Technical specifications of item no. 8.01 shall be followed except the payment of concrete and reinforcement shall be made in relevant items.

**8.05.a Providing Lime plaster using ready mix lime mortar of proportion 1:1.5:1.5 (lime:surkhi:sand), by volume. The surkhi would be grounded to require size to get the necessary gradation. If desired we may supplywater based solvent prepared from molasses, methi and googal.**

**Lime : hydrated lime of at least 80% purity.**

**Surkhi: Prepared from well burnt brick bats to the required fineness minimum thickness of the lime plaster should be 18mm, done in two coats. This base plaster topped with 2-3 mm finishing coat of lime gives the minimum thickness required as per architect Extra thickness more than 18 mm improves all the advantages, only precaution needs to be taken is increase the thickness in subsequent coats of 6-10 mm thickness. Objective of above mix is to attend the mortar grade of MM3 at 45 days. (IS: 2250 – 1981**

### **1.0 Material**

- 1.1 Relevant Technical specifications of item no. 7.01.a shall be followed.
- 1.2 Water Proofing compound shall conform to M-31.
- 1.3 Supplying the ready mix lime mortar mix of proportion 1:1.5:1.5 (lime: surkhi: sand), by volume. The surkhi would be grounded to require size to get the necessary gradation. If desired, we may supplywater based solvent prepared from molasses, methi and googal.

Lime: hydrated lime of at least 80% purity.

Surkhi: Prepared from well burnt brick bats to the required fineness.

### **1.0 Workmanship**

- 2.1 Relevant technical specifications of item no. 7.01.a shall be followed except thickness of the plaster will be 15 mm and water proofing material such as Hydroshield liquid of



ConTech Chemicals or CICO no.1 or equivalent shall be added to the cement at the rate specified by the manufacture specification or as approved by the engineer-in-charge.

2.2 The guarantee bond shall be furnished as per item no. 8.01.a.

2.3 Recommended minimum thickness of the lime plaster should be 18mm, done in two coats.

This base plaster topped with 2-3 mm finishing coat of lime gives the minimum thickness required to take advantage of breathability, humidity control and insulating properties of lime based mortars.

Extra thickness more than 18 mm improves all the advantages, only precaution needs to be taken is increase the thickness in subsequent coats of 6-10 mm thickness.

2.4 PLASTER ON BRICKWORK:

1. Remove all loose particles from the wall and sufficiently wet the surface (not drenched).
2. Take the lime mortar in medium thick **slurry** form and apply with trowel in layer of about 6 mm thick. The layer should be kept as it is to get rough uneven surface. It should be not leveled with wooden float. The process is known as "Chaant".
3. "Chaant" should get some initial setting, this period depends up on the season. In summer it would be around 1-2 day and in winter it would be 3-4 days. During this period, it should be cured regularly (by no means it should dry out and become pink colored). If time permits allow longer curing period up to 8-10 days.
4. The second layer of 8-10 mm should be applied after initial setting of Chaant. This should be finish in line, plumb and level as per requirement. Here pressure application is necessary. Give sufficient drying/setting time so that this coat can take sufficient pressure. If necessary, leveling/finishing can be done on the next day also with application of water. Use wooden floats, guthkha, muster, plaster patti etc. Do not finish with metal float (pataru).
5. Allow this coat to set and dry for a few days. In case of cracks development on surface repair the cracks by wetting the plaster and compacting with the stroke of edge of wooden float/gutka.
6. The final level layer is finished with wooden float.
7. In case of other finishing coat; this coat is left rough by applying edge strokes by wooden float.

PLASTER ON CONCRETE (VERTICAL SURFACE):

1. For preparation concrete surface should be made rough with dents (tancha) and should be clean from all loose particles, the concrete surface should be moist not drenched.
2. A concoction made by mixing 1 part slaked lime + 1-part Molasses ('rasio gaud') should be brush applied to the surface. First coat of plaster (chant) should be applied when this coat is tacky (sticky dry).

3. All other process would be same as described in brick work. If thick plaster is needed it should be achieved in second course onwards.

**PLASTER ON CONCRETE (CEILING):**

The process of plaster on ceiling would same as described in plastering vertical concrete surface, however total thickness of plaster would be around 8-10 mm only.

**2.0 Mode of Measurement and Payment**

- 3.1 The payment shall be made for 15 mm. thick water proof plaster work as per the relevant specifications of item no. 7.01a. The rate shall include the waterproofing material as per manufacture's specification.
- 3.2 The rate shall be for a unit of one sqm for plaster work using water proofing materials such as Hydroshield liquid of ConTech Chemicals or CICO no.1 or equivalent in recommended proportions by manufacture.

**8.05.b Providing 18 to 20 mm. thick Water proof cement plaster in double coat on sides of masonry / RCC wall at all heights, first coat of 12 to 15 mm thk under coat in cement mortar 1:3 (1 cement : 3 sand) and second coat of 5 to 6 mm thk with cement mortar 1:3 (1 cement : 3 sand) including providing and mixing water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions in both coats as approved by the Architect and Engineer-in-charge and finishing the surface smooth finish with neat cement slurry at 2.75 Kg per sqm etc complete including furnishing a guarantee bond for 10 years, hacking to RCC surface. Cement slurry admixed with Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions is to be applied before each coat and final finishing coat.**

**1.0 Material**

- 1.1 Relevant Technical specifications of item no. 7.01.a shall be followed.
- 1.2 Water Proofing compound shall conform to M-31.

**2.0 Workmanship**

- 2.1 Relevant technical specifications of item no. 7.01.a shall be followed except thickness of the plaster will be 18 to 20 mm in two coats comprising of , first coat of 12 to 15 mm thk under coat in cement mortar 1:3 (1 cement : 3 sand) and second coat of 5 to 6 mm thk with cement mortar 1:3 (1 cement : 3 sand) including providing and mixing water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions in both coats as approved by the Architect and Engineer-in-charge and finishing the surface smooth finish with neat cement slurry at 2.75 Kg per sqm etc complete including furnishing a guarantee bond for 10 years, hacking to RCC surface. Cement slurry admixed with Hydroshield powder & liquid of ConTech

Chemicals, Fosroc, CICO or equivalent in recommended proportions is to be applied before each coat and final finishing coat.

2.2 The guarantee bond shall be furnished as per item no. 8.01.a.

### **3.0 Mode of Measurement and Payment**

3.1 The payment shall be made for 18 to 20 mm. thick water proof plaster work as per the relevant specifications of item no. 7.01a. The rate shall include the waterproofing material as per manufacture's specification.

3.2 The rate shall be for a unit of one sqm for plaster work using Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions.

**8.05.c Providing & laying average 18mm thick double coat smooth / wired finish cement plaster on sides of masonry work / block wall / RCC wall, 12 mm thk first coat in CM 1:3 (1 cement : 3 coarse sand) by spraying , second coat of 6 mm of CM 1:3 (1 cement : 3 fine sand) and mixing water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions in both coats, finishing the surface wired finish to receive the tiles / smooth finish with a floating coat of neat cement slurry at 2.75 Kg / sqm at all floors, all shapes and all height including hacking to RCC surface, scaffolding, curing etc. complete as directed by engineer-in-charge including furnishing a guarantee bond for 10 years. Cement slurry admixed with Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions is to be applied before each coat and final finishing coat.**

*(Item shall be operated for water retaining structures and basement walls).*

Relevant specification of item no. 7.01.a is to be followed. 12 mm thk first coat in CM 1:3 (1 cement : 3 coarse sand) by spraying, second coat of 6 mm of CM 1:3 (1 cement : 3 fine sand) and mixing water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions in both coats, finishing the surface wired finish to receive the tiles / smooth finish with a floating coat of neat cement slurry at 2.75 Kg / sqm at all floors, all shapes and all height including hacking to RCC surface, scaffolding, curing etc. complete

**8.06 Providing and laying average 60 mm thick water proof cement concrete flooring in 1:2:2 (1 Cement : 2 Sand : 2 Graded Aggregate 10mm nominal size) to RCC swimming pool floor, under ground tanks at all heights in line, level and gradient including mixing water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent in recommended proportions as approved by the Architect and Engineer-in-charge and leaving the surface rough wired finish to receive any type of flooring / smooth finish etc complete including furnishing a guarantee bond for 10 years. Rate shall be inclusive of curing, scaffolding etc. as directed.**

**1.0 Material**

- 1.1 Relevant Technical specifications of item no. 9.04.a shall be followed.
- 1.2 Water Proofing compound shall conform to M-31 or as per manufacture's specification.

**2.0 Workmanship**

- 2.1 Relevant technical specifications of item no. 9.04.a shall be followed except the thickness of the concrete floor will be average 60 mm instead of 40 mm, proportion will be 1:2:2 (1 cement: 2 sand: 2 graded aggregate of 10 mm nominal size) and water proofing compound such as Hydroshield powder & liquid of ConTech Chemicals, Fosroc, CICO or equivalent shall be added to the cement as per manufacture's specification or as directed by the engineer-in-charge. The water proofing material shall be mixed with 50 Kg as recommended by manufacture's specification. RCC surface shall be properly hacked before applying the concrete.
- 2.2 The guarantee bond shall be furnished for a period of 10 years as per item no. 8.01a.

**3.0 Mode of measurement and Payment**

- 3.1 Relevant specifications of item no. 9.04.a.1 shall be followed. Item shall be measured and paid in sqm.

**8.07.a Providing and laying four courses water proofing treatment with bitumen felt over roofs consisting of first and third courses of blown bitumen 85/25 or 90/15 conforming to IS : 702 applied hot @ 1.45 Kg per square meter of area for each course, second course of roofing felt type 3 grade-I (hessian based self finished bitumen felt) and fourth and final course of stone grit 6mm and down size or pea-sized gravel spread at 6 cubic diameter per square meter including preparation of surface, grading complete with Bitumen felt (Hessian base) type 3 grade I conforming to IS : 1322 as directed by the engineer-in-charge and including furnishing a guarantee bond for 10 years**

**1.0 Material**

**1.1 Roofing felt type 3 Grade-I (Hessian based self finished bitumen felt)**

- 1.1.1 Tar felt shall be of STP or equivalent. Specifications shall be as per manufacture's specification.

**1.2 Bitumen**

- 1.2.1 Bitumen shall conform to IS: 702 and IS: 73.

**2.0 Workmanship**

- 2.1 In first and third course hot bitumen is applied at the rate of 85/25 or 90/15 at the rate of 1.2 Kg per square meter or as directed by engineer-in-charge.

- 2.2 In second course roofing felt type 3 Grade-I (hessian based self finished bitumen felt) laid over the hot bitumen and pressed properly to avoid airgaps.
- 2.3 In fourth and final course stone grit 6mm and down size or pea-sized gravels are spread at 6 cubic diameters per square meter.
- 2.4 The guarantee bond shall be furnished for a period of 10 years as per item no. 8.01a.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 8.01.a shall be followed.

**8.07.b Providing and laying six courses water proofing treatment with bitumen felt over roofs consisting of first, third and fifth course of blown bitumen 85/25 or 90/15 conforming to IS : 702 applied hot @ 1.45, 1.20 and 1.45 Kg per square meter of area respectively, second and fourth courses of roofing felt type 3 grade I conforming to IS :1322 (Hessian based self finished bitumen felt) conforming to IS :1322 and sixth and final course of stone grit 6 mm and down size or pea sized gravel spread at 6 cubic dm per sqm including preparation of surface, grading, complete as directed by the engineer-in-charge and including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in six courses consisting of first, third, fifth course of bitumen 85/25 or 90/15 conforming to IS : 702 applied hot @ 1.45, 1.20 and 1.45 Kg per square meter of area respectively, second and fourth courses of roofing felt type 3 grade I conforming to IS :1322 (Hessian based self finished bitumen felt) conforming to IS :1322 and sixth and final course of stone grit 6 mm and down size or pea sized gravel spread at 6 cubic dm per sqm.

**8.07.c Providing and laying six courses water proofing treatment with bitumen felt over roofs consisting of first, third and fifth courses of blown or / and residual bitumen applied hot at 1.45, 1.20 and 1.70 kg per square meter of area respectively, second and fourth courses of roofing felt type 2 grade I (fiber base self finished bitumen felt) six and final courses of stone grit 6mm and down size or pea sized gravel spread at 6cu.dm per sqm including preparation of surface, grading compete as directed by the engineer-in-charge and including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in six courses consisting of first, third and fifth courses of blown or / and residual bitumen applied hot at 1.45, 1.20 and 1.70 kg per square meter of area respectively, second and fourth courses of roofing felt type 2 grade I (fiber base self finished bitumen felt) six and final courses of stone grit 6mm and down size or pea sized gravel spread at 6cu.dm per sqm including preparation of surface.

**8.07.d Providing and laying six courses water proofing treatment with bitumen felt over roofs consisting of first, third and fifth courses of blow or/ and residual bitumen applied hot at 1.45, 1.20 and 1.70 kg per square meter of area respectively, second and fourth courses of roofing felt type 2 grade II (glass fiber base self finished bitumen felt) and sixth and final course of stone grit 6mm and down size or pea sized gravel spread at 6 cubic dm per sqm including preparation of surface, grading complete as directed by the engineer-in-charge and including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in six courses consisting of first, third and fifth courses of blow or/ and residual bitumen applied hot at 1.45, 1.20 and 1.70 kg per square metre of area respectively, second and fourth courses of roofing felt type 2 grade II (glass fibre base self finished bitumen felt) and sixth and final course of stone grit 6mm and down size or pea sized gravel spread at 6 cubic dm per sqm including preparation of surface.

**8.07.e Deduct for omitting in water proofing treatment final course of spreading stone grit 6mm down size or pea sized gravel.**

**8.07.e.1 At 6 cudm per sqm**

**8.07.e.2 At 8 cudm per sqm**

Relevant specifications of item no. 8.07.a shall be followed.

**8.08.a Providing and laying in situ seven course water proofing treatment with APP (Atactic poly-propylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd, 4th & 6th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd and 5th layers of roofing membrane APP modified Polymeric membrane 1.5mm thick of 2.25 Kg/sqm weight consisting of five layers prefabricated with centre core as 20micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 7th, the top most layer shall be finished with brick tiles of class designation 100 grouted with cement mortar 1:3 (1cement:3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in seven course water proofing treatment with APP (Atactic poly-propylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd, 4th & 6th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd and 5th layers of roofing membrane APP modified Polymeric membrane 1.5mm thick

of 2.25 Kg/sqm weight consisting of five layers prefabricated with centre core as 20micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 7th, the top most layer shall be finished with brick tiles of class designation 100 grouted with cement mortar 1:3 (1cement:3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat.

- 8.08.b Providing and laying in situ five course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd & 4th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd layer of roofing membrane APP modified Polymeric membrane 2.0mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 5th, the top most layer shall be finished with brick tiles of class designation 100 grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in five course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric memberane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd & 4th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd layer of roofing membrane APP modified Polymeric membrane 2.0mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 5th, the top most layer shall be finished with brick tiles of class designation 100 grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat.

- 8.08.c Providing and laying in situ seven course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd, 4th & 6th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd and 5th layers of roofing membrane APP modified Polymeric membrane 2.0mm thick of 3.00 Kg/sqm weight consisting of fivelayers prefabricated with centre**



core as 100micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 7th, the topmost layer shall be finished with brick tiles of class designation 100grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in seven course water proofing treatment with APP (Atactic Polypropylene) modified Polymeric membrane over roof consisting of first coat of bitumen primer @ 0.40Kg per sqm, 2nd, 4th & 6th courses of bonding material @ 1.20 Kg/sqm, which shall consist of blown type bitumen of grade 85/25 conforming to IS : 702, 3rd and 5th layers of roofing membrane APP modified Polymeric membrane 2.0mm thick of 3.00 Kg/sqm weight consisting of five layers prefabricated with centre core as 100micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. 7th, the topmost layer shall be finished with brick tiles of class designation 100grouted with cement mortar 1:3 (1 cement: 3 fine sand) mixed with 2% integral water proofing compound by weight of cement over a 12mm layer of cement mortar 1:3 (1 cement: 3 fine sand) and finished neat.

**8.09.a Providing and fixing APP (Atactic Polypropylene Polymer) modified prefabricated five layer 2mm thick water proofing membrane, black finished reinforced with glass fibre matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sq. mtr. by the same membrane manufacture of density at 25°C, 0.87 - 0.89 kg/ ltr and viscosity 70 - 160 cps. Over the primer coat the layer of membrane shall be laid using Butane torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 350/300 N/ 5cm. Tear strength in longitudinal and transverse direction as 60/80N. Softening point of membrane not less than 150°C. Cold flexibilities shall be upto -2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacture of membrane. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in five layer 2mm thick water proofing membrane, black finished reinforced with glass fibre matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sq. mtr. by the same membrane manufacture of density at 25°C, 0.87 - 0.89 kg/ ltr and viscosity 70 - 160 cps. Over the primer coat the layer of membrane shall be laid using Butane torch and sealing all joints etc., and preparing the



surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 350/300 N/5cm. Tear strength in longitudinal and transverse direction as 60/80N. Softening point of membrane not less than 150°C. Cold flexibilities shall be upto -2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacture of membrane.

- 8.09.b Providing and laying APP (Atactic Polypropylene Polymer) modified prefabricated five layer, 3mm thick water proofing membrane, black finished reinforced with glass fibre matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sqm. by the same membrane manufactured of density at 25°C, 0.87 - 0.89 kg/ltr and viscosity 70 - 160 cps. Over the primer coat the layer of membrane shall be laid using butane torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 350/300 N/5cm. Tear strength in longitudinal and transverse direction as 60/80N. Softening point of membrane not less than 150°C. Cold flexibilities shall be upto - 2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in five layer, 3mm thick water proofing membrane, black finished reinforced with glass fibre matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sqm. by the same membrane manufactured of density at 25°C, 0.87 - 0.89 kg/ltr and viscosity 70 - 160 cps. Over the primer coat the layer of membrane shall be laid using butane torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 350/300 N/5cm. Tear strength in longitudinal and transverse direction as 60/80N. Softening point of membrane not less than 150°C. Cold flexibility shall be upto - 2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane.

- 8.09.c Providing and laying APP (Atactic Polypropylene Polymer) modified prefabricated five layer 3mm thick water proofing membrane, black finished reinforced with non-woven polyester matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sqm. by the same membrane manufacture of density at 25°C, 0.87-0.89 kg/ltr and viscosity 70-160 cps. Over the primer coat the layer of membrane shall be laid using Butane Torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 650/450N/5cm. Tear strength in**

**longitudinal and transverse direction as 300/250N. Softening point of membrane not less than 150°C. Cold flexibility shall be upto -2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07.a shall be followed except the water proofing treatment is to be carried out in d five layer 3mm thick water proofing membrane, black finished reinforced with non-woven polyester matt consisting of a coat of bitumen primer for bitumen membrane @ 0.40 ltr/sqm. by the same membrane manufacture of density at 25°C, 0.87-0.89 kg/ltr and viscosity 70-160 cps. Over the primer coat the layer of membrane shall be laid using Butane Torch and sealing all joints etc., and preparing the surface complete. The vital physical and chemical parameters of the membrane shall be as under: Joint strength in longitudinal and transverse direction at 23°C as 650/450N/5cm. Tear strength in longitudinal and transverse direction as 300/250N. Softening point of membrane not less than 150°C. Cold flexibility shall be upto -2°C when tested in accordance with ASTM, D - 5147. The laying of membrane shall be got done through the authorised applicator of the manufacturer of membrane

- 8.10 Extra for covering top of membrane with Geotextile, 120gsm non woven, 100% polyester of thickness 1 to 1.25mm bonded to the membrane with intermittent touch by heating the membrane by Butane Torch as per manufactures recommendation. The work shall be carried out as directed by engineer-in-charge and rate should be including furnishing a guarantee bond for 10 years.**

Relevant specifications of item no. 8.07 shall be followed.

- 8.11 Grading roof for water proofing treatment with Cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size)**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement**

1.2.1 Cement shall conform to M-3.

**1.3 Sand**

1.3.1 Sand shall conform to M-6.

**1.3 Coarse Aggregate**

1.3.1 Coarse Aggregate shall conform to M-12.

## **2.0 Workmanship**

2.1 Before laying cement concrete of grading, the level markings to the required slope and shall be made only with cement concrete on the surface on the slab at suitable spacing with the help of string.

2.2 On getting the approval of level markings the surface should be sprinkled with cement slurry and concrete should be laid carefully, without throwing from height.

2.3 Vibrator can not be used for hammering and concrete should be consolidated by wooden tamping beams operated by two labors on two ends. After tamping is done the surface should be finished with to required slope with wooden trowels without leaving any spots of aggregate.

2.4 The cement concrete that is mixed must be laid in position within half an hour of its mixing with water, every time small batches shall be mixed. In any case concrete remains for half an hour after mixing, such concrete shall be rejected.

2.5 The concrete surface shall present a smooth surface with correct slopes and uniform roundings. The concrete should be free from cracks. Excess trowelling shall be avoided.

2.6 Curing shall be done at least for 10 days.

## **3.0 Mode of Measurement and Payment**

3.1 Length and Breadth shall be measured correct to a cm. Area shall be worked out to nearest to 0.01sqm and the cubical content shall be measured nearest to 0.001 cum.

3.2 Concrete laid in excess of the dimension not shown in drawing shall not be measured and paid for.

3.3 Average thickness of concrete laid exceeds the thickness as shown in drawing will not be measured and paid for.

3.4 Relevant specifications of item no. 8.01a shall be followed.

**8.12 Providing and placing in position suitable size (width, thickness based on water head and pressure) PVC water stops conforming to IS: 12200 as approved by consultant for construction / expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete etc. complete as directed by engineer in charge.**

**8.12.1 Serrated with central bulb (225 mm wide, 8-11 mm thick)**

**8.12.2 Dumb Bell with central bulb (180 mm wide, 8 mm thick)**

**8.12.3 Kickers (320 mm wide, 5 mm thick)**

## **1.0 Material**

- 1.1 The PVC water stops shall be fabricated by an extrusion process from the elastomeric plastic compound, the basic resin of which shall be virgin Polyvinyl chloride. No reclaimed Polyvinyl Chloride shall be used.
- 1.2 The compound shall contain any additional resin, plasticizers inhibitors or other materials, needed to ensure that the finished product shall have the following physical characteristics as per the CWC specification for PVC seal.
1. Tensile strength Kg/cm<sup>2</sup> 116 minimum
  2. Ultimate elongation % 300 minimum
  3. Tear Resistance Kg/cm<sup>2</sup> 49 minimum
  4. Stiffness in flexure Kg/cm<sup>2</sup> 24.6 minimum
  5. Accelerated extraction
    - (a) Tensile strength minimum 105 kg/cm<sup>2</sup>
    - (b) Ultimate elongation minimum 250%
  6. When tested in accordance with the effect of alkali test as described in the following paragraphs, the material shall not show an increase in weight of more than 0.25 percent or a loss in weight of more than 0.1 percent or loss in weight of more than 0.10 after 7 days, or more than 0.40 percent increase in weight or more than 0.30 percent loss in weight after 28 days. After 28 days' immersion the dimensions of the sample shall not differ from those of the original sample by more than 1.0 percent. After 7 days' immersion, the Durometer hardness reading of sample shall not differ by more than plus or minus 5 from the reading on the original sample.
  7. When tested in accordance with the cold bend test described in the following paragraph, the material shall show no signs of cracking or chipping.
  8. PVC water stop confirming to IS –12200 of approved make is only acceptable and testing shall be in accordance with IS 8543.

#### 1.4 Inspection and Tests

- 1.4.1 All water stops shall be subject to laboratory tests before transport. Samples of the finished water stops and material for tests shall be furnished to the Engineer -in-charge. All tests shall be made by and at the expense of the contractor.
- 1.4.2 Samples for laboratory tests to determine physical properties of the compound shall be taken in accordance with the random process to obtain following number of tests units from each lot received.

Size of lot received Number of tests

45 Meters	1
45 to 90 Meters	2
90 to 450 Meters	4
450 to 900 Meters	8
Over 900 Meters	Additional one test for every 100 m

1.4.3 Laboratory tests to determine physical properties of the water stops required to be furnished under this specification shall be performed on test specimens cut from test units taken from the finished products. The contractor shall furnish the specimens at his cost for test at places as directed.

1.4.4 Test shall be made in accordance with the following methods.

- i) Tensile strength                      ASTM designation D 638
- ii) Elongation                              ASTM Designation D 638
- iii) Durometer hardness    ASTM Designation D 2240 (Type A)
- iv) Accelerated extraction.
- v) Effect of alkali
- vi) Cold bend test
- vii) Impact resistance.

## 2.0 Installation

2.1 Location and embedment of the PVC water stops shall be as shown on the drawings, with approximately one half of the width of the water stops embedded in the concrete on each side of the joint. In order to eliminate faulty installation that may result in leakage, care shall be taken that the water stops are correctly positioned and secured during installation. All water stops shall be installed so as to form a continuous watertight diaphragm in the joint, unless otherwise shown. Adequate provision shall be made to completely protect the water stops during the progress of the work.

2.2 Additional vibration, over and above that used for adjacent concrete placement, shall be carried out to ensure complete embedment of the water stop in the concrete. Larger pieces of aggregate near the water stop shall be removed by hand during embedment to assure complete contact between the water stop and the surrounding concrete. Splices in the continuity or at the intersections of junctions of PVC water stops shall be performed by **heat-sealing** the adjacent surface in accordance with the manufacturer's recommendations. A thermostatically controlled electric heat source shall be used to make all splices. The correct temperature at which splices should be made will differ with the material compounds but should be sufficient to melt. All splices shall be neat

with the ends of the joined water stops in true alignment. A meter box guide and portable saw shall be provided and used to cut the ends to be joined to ensure good alignment and contact between joined surfaces. After splicing, a remoulding iron with ribs and corrugations to match the pattern of the water stop shall be used to reform the ribs at the splices. The continuity of the characteristics members of the cross sections of the water stop design (ribs, tubular centre axis, protrusions, and the like) shall be maintained across the splices.

- 2.3 Prior to embedment, the edges of the water stops shall be secured to looped wire in the end bulbs to improve the Concrete bond as shown on the drawings. The manner in which the water stop is secured to the reinforcing bars shall be subject to approval.
- 2.4 Where splices are required between water stops of different size, the splices shall be made as recommended by the manufacturer of the water stops and drawings showing the details of the splices or as directed by engineer in charge.
- 2.5 To provide an even surface these joints must be filled and at the same time the materials used for fillings should permit expansion and contraction of the Concrete. The joint filler is a strip of compressible material used to form and fill the expansion joints structures. The joints in structures joint fillers are produced from a variety of materials such as bitumen impregnated fibre, cork strips sponge or synthetic rubber, expanded plastics, epoxy, coconut pith and CMSL resin, or as directed by Engineer -in-charge. The materials are confirmed with IS: 1838-1983/94. Sealing compounds shall be employed above expansion joint fillers. Suitable primers may be first applied to the vertical faces of concrete joint before the pouring of sealing compounds in order to improve the adhesive qualities of the latter sealing compounds are confirmed to IS:1834-1984.
- 2.6 Care shall be taken for perfectly watertight shutting and compaction of concrete so as cement slurry shall not escape. Water bars shall be placed at centre of the wall and if it is to be provided away from the centre, its distance from either face of the wall shall not be less than half the width of the water bar.

### **3.0 Mode of Measurement and Payment**

- 3.1 Measurement for payment, for furnishing and placing PVC water stops shall be made on the basis of **linear meter** measured along the centre line of the water stop with no allowance for lap at splices and intersection. The contractor unit rate includes complete item of PVC water stop, joint filler sill flex (supreme industries), polysulphide sealant. The payment shall be made at the rate quoted for the item with no allowance for lap at splices and intersection. The unit price shall include the cost of filling the sealing materials making splices and intersections and of furnishing all labor, equipment, and materials, required for installing the water stops and protecting the water stops from damage during the progress of the work. The unit rate shall also include the cost of preparing and submitting the drawings, producing samples for approval of the Engineer-

in-charge and costs of all incidental work needed to complete the work as per the specifications.

**8.13.a Providing and laying over deck insulation over terrace by ex-foliated vermiculite or Porosil or equivalent in the ratio of 1 :6 (1 cement : 6 Ex foliated vermiculite (by volume)) as per manufacturer's specifications. Bulk density of Ex foliated vermiculite shall be 212 kg/cum. The cement shall be mixed with the ex foliated vermiculate in dry stage & then minimum qty of water shall be added. After screeding the ready mixed material in specified thickness, curing shall be carried out at least for for 7 days by sprinkling of required quantity of water so that surface remains damp and not to be done by ponding or flooding. The work includes cleaning of the surface with wire brush thoroughly necessary scaffolding finishing the top surface as best workmanship like manner as per the manufacturers specifications and as directed by Engineer in charge.**

**a) Thickness 100mm**

**b) Thickness 75 mm**

**1.0 Material**

**1.1 Cement**

1.1.1 Cement shall conform to M-3.

**1.2 Exfoliated Vermiculite**

1.2.1 Exfoliated Vermiculite shall conform to M-32.

**2.0 Workmanship**

**2.1 Surface Preparation**

After water proofing work, thorough cleaning of surface is to be completed. Before commencement of insulation work the work is to be inspected and approved by the engineer-in-charge.

**2.2 Application of EFV (Ex foliated Vermiculite)**

2.2.1 Application of EFV (Ex foliated Vermiculite) is to be done as per manufacture's specification. Mix (1 cement: 6 Exfoliated Vermiculite) is to be thoroughly mixed with water and mix is to be uniformly screeded on the surface / slab. Screeding of the mix should be done in uniform thickness as per drawing and as directed by engineer-in-charge.

**2.3 Curing**

2.3.1 After application of mix (cement and ex-foliated vermiculilite) curing for minimum 7 days is required.

3.0 Mode of measurement

3.1 The item shall be measured and paid in sqm.

**8.13.b Providing and laying over deck insulation over terrace water proofing of Perlite of Amol Dicalite or equivalent for roof insulation in the ratio of 1 :6 (1 cement : 6 Ex foliated vermiculite (by volume)). The cement shall be mixed with the ex foliated vermiculate in dry stage & then minimum qty of water shall be added. After screeding the ready mixed material in specified thickness, curing shall be carried out at least for for 7 days by sprinkling of required quantity of water so that surface remains damp and not to be done by ponding or flooding. The work includes cleaning of the surface with wire brush thoroughly necessary scaffolding finishing the top surface as best workmanship like manner as per the manufacturers specifications and as directed by Engineer in charge.**

**8.13.b.1 Thickness 115mm**

**8.13.b.2 Thickness 75 mm**

**1.0 Material**

**1.1 Cement**

1.1.1 Cement shall conform to M-3.

**1.2 Perlite**

1.2.1 Perlite shall conform to M-30.

**2.0 Workmanship**

**2.1 Surface Preparation**

2.1.1 After water proofing work, thorough cleaning of surface is to be completed. Before commencement of insulation work the work is to be inspected and approved by the engineer-in-charge.

**2.2 Application of Perlite**

2.2.1 Application of Perlite is to be done as per manufacture's specification. Mix (1 cement: 6 Exfoliated Vermiculite) is to be thoroughly mixed with water and mix is to be uniformly screeded on the surface / slab. Screeding of the mix should be done in uniform thickness as per drawing and as directed by engineer-in-charge.

**2.3 Curing**

2.3.1 After application of mix (cement and Perlite) curing for minimum 7 days is required.



3.0 Mode of measurement

3.1 The item shall be measured and paid in sqm.

**8.14 Providing and laying cushioning layer of 1:4:8 BBCC (1 cement: 4 sand: 8 Brick Bat coba) as per the required slope with water proofing compound, using 20mm nominal size brick bat on RCC slab after cleaning the slab top properly and applying neat cement slurry @2.75 kg/sqm with water proofing compound like Cico No.1 or equivalent as per supplier's specification. The BBCC shall be machine mix, well compacted with wooden rammer cured etc complete at all places and all heights including rounding off upto 300mm height using 1:1 cement mortar and brickbats. Rate shall be inclusive of curing, scaffolding etc. complete.**

a) Average thickness of BBCC- 75mm

b) Average thickness of BBCC- 90mm

**1.0 Materials**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement**

1.2.1 Cement shall conform to M-3.

**1.3 Brickbats**

1.3.1 Brick Bat shall conform to M-15.

**1.4 Sand**

1.4.1 Sand shall conform to M-6.

**1.5 Cement Mortar**

1.5.1 Cement Mortar shall conform to M-11

**1.5 Water Proofing Compound**

1.6.1 Water proofing compound shall conform to M-31.

**2.0 Workmanship:**

2.01 Relevant specification of item no. 8.01 shall be followed. The surface under treatment, part of parapet (incase of balcony or terrace) and gutters, drain mouths etc. over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire brushing and dusting.

- 2.02 Well defined cracks other than hair cracks in the treated structure shall be cut to 'V' section, cleaned and then filled up flush with cement sand mortar 1:1 with polymer based waterproofing compound.
- 2.03 The surface to be treated shall have a minimum slope of 1 in 120. The grading shall be carried out prior to the application of water proofing treatment by cement mortar. Before starting BBCC, cement slurry, @ 2.75 kg/sqm with polymer based water proofing compound like Tapcrete 151 of Cico Industries Ltd. or equivalent as per supplier's specification shall be thoroughly applied on the surface.
- 2.04 Machine mixed BBCC of 1:4:8 with water proofing compound Cico no.1 or equivalent as per supplier's specification and 20mm nominal size brick bats shall be laid on the surface as per the desired slope.
- 2.05 The compaction shall be done by wooden templet (patti) till the cement slurry comes on the top. No ramming shall be allowed.
- 2.06 Vatta shall be provided at the junction of wall and terrace slab. The fillet of the vatta shall be 75mm in radius or as per the drawing and in concave shape upto 300mm height in proportion 1:1 (cement: coarse sand) mortar with water proofing compound Cico no.1 or equivalent as per supplier's specifications. Brickbats shall be embedded in the junction as per brick bat coba indian waterproofing treatment.
- 2.07 The testing shall be done by ponding for atleast 48 hours to check the leakage of water. The area where leakage is observed, the BBCC above the same shall be removed as per direction of Engineer in-charge and leakage shall be stopped by appropriate method like injection grouting etc. BBCC shall be re-laid after testing. (No extra payment shall be paid for this)
- 2.08 Drain outlet shall be suitably placed with respect to the surface gradient to ensure rapid drainage and prevention of local accumulation of water on the treated surface. Masonry drain mouth, shall be widened sufficiently and rounded with cement mortar.
- 2.09 When a pipe passes through a roof on which water proofing treatment is to be laid, a cement concrete angle fillet shall be built round it and the water proofing treatment shall be taken over the fillet.
- 2.10 At the drain mouths, the fillet shall be suitably cut back and rounded off at each outlet for easy flow of water. Outlet at every low dividing wall less than 300 mm. in height, shall be rounded smooth and corners rounded off for easy application of water proofing treatment.
- 3.0 Mode of Measurement and Payment**
- 3.1 The item shall be measured and paid in sqm.

**8.15 Providing and laying permashield aluminum water proofing, using bitumen primer and hot bitumen, 6 mm. thick stone grit and cement mortar concrete screed 25-75mm thickness laying Permaguard/ permashield, finishing the top with 40 mm. screed cement concrete or any other material as per the choice of the Architect, etc. complete, including furnishing of a guarantee for 10 years. The work should be carried out as per the instructions of the manufacturer of Permaguard, M/s. India foils Ltd., The treatment shall be for the following:**

- a) terraces and under roof gardens.
- b) Sunk floor of toilets, swimming pools and basement
- c) Behind wardrobes and cupboards
- d) Lining to canals, tanks, ponds etc.

**1.0 Materials**

1.1 Permaguard is an aluminium foil/strip laminated with polythene film on both sides. The edges of the strips are overlapped and sealed by a heat-sealer or hot molten bitumen to make it a continuous sheet. At present Permaguard is marketed by M/s. India Foils Ltd. and Permashield is marketed by Hindalco Industries Ltd. (Aditya Birla Group) It shall conform to M-86.

**1.2 Water**

1.2.1 Water shall conform to M-1.

**1.3 Cement**

1.3.1 Cement shall conform to M-3.

**1.4 Sand**

1.4.1 Sand shall conform to M-6.

**1.5 Stone Grit**

1.5.1 Stone grit shall conform to M-8.

**1.6 Cement Mortar**

1.6.1 Cement mortar shall conform to M-11.

1.7 Bitumen of grade 85/25 or 95/15 shall conform to IS : 73.

**2.0 Workmanship:**

2.1 The relevant specification of item no. 8.01 shall be followed.

2.2 The work of waterproofing shall be carried at the location as mentioned in the item description:

1) The surface to be waterproofed must be thoroughly swept cleaned with wire brush and be clear of all dust and dirt particles and washed with water. Make a niche on the parapet wall about 225mm (9") high from the bottom of the surface to be waterproofed, on all sides of the surrounding walls. The niche shall be atleast 50mm deep inside the wall. A layer of cement plaster in CM 1:4 or screed concrete 1:2:4. This layer shall be applied after cleaning the base surface of all debris with water. The thickness of the layer must be maintained between 25 mm. to 75 mm. depending on the length of the terrace and the desired gradient. Uniform gradient slope of 1:60 to 1:100 shall be maintained. The concrete shall be cured before starting the subsequent treatment.

This layer may however be omitted if necessary gradient is already provided in the RCC slab and the slab is smooth and evenly finished.

2) One day before laying the Permagaard, a coat of molten bitumen of desired temperature or bitumen primer- Bitukote Nift is then applied on the area equal to the width of the Permagaard strip to be laid subsequently. Apply adhesive/ hot bitumen grade 85/25 conforming to IS 702-1988 @ 2.4 kg/m<sup>2</sup> all along the parapet wall/ side wall, including inside the niche

If the Permagaard strips are to be heat-sealed, then the overlaps are kept free of bitumen. Otherwise, molten bitumen is also applied over the overlaps before pressing the strips together.

3)Permagaard strips are laid so that the first strip of Permagaard is laid along the bottom of the slope. The subsequent strips are laid in the same manner, ensuring that the lower edge of the second strip overlaps on the upper edge of the first strip, overlap width being min. 50 mm. wide. These overlaps are sealed with Teflon coated heat-sealer or molten bitumen to make a continuous sheet of Permagaard. The process is repeated till the entire surface is covered with the foil.

4) At the end of the corners, corner piece shall be formed. The details shall be as per the manufacturers specification.

5) When there is a parapet wall, a groove/niche shall be made (50 mm. in depth & 125mm above roof level) all along the parapet. While laying Permagaard, leave an extra 175 mm. (both lengthwise and widthwise) after the end of the roof. Apply molten bitumen all along the parapet wall covering the area upto the groove and the groove itself. Insert the 50 mm. (of 175 mm.) of Permagaard into the groove and press the remaining 125 mm. onto the wall. Seal the groove with cement concrete 1:2:4.

5) For laying Permagaard near/around drain pipes, make a circular tube of Permagaard/ Permashield overlapping one end over the other. The tube should approximately be of the same dia. as that of the pipe. Insert this tube into the pipe leaving 100 mm. projection out, keeping the lap joint minimum 50mm of the tube on top. Cut this 100 mm. at right

angles to each other to make 4 strips. 3 of these are flushed on the parapet wall and the 4th into the roof with hot molten bitumen. The 125 mm. Permaguard pressed onto the parapet wall shall have a hole cut slightly smaller than the opening of the drain pipe so that the pipe is not blocked and the material is flushed into the pipe over the already laid Permaguard tube with hot molten bitumen or portable heat sealer machine. Lastly brush the mouth of the pipe liberally with hot molten bitumen.

6) Over the Permaguard apply molten bitumen using sprinkler and brush. Sprinkle coarse sand evenly on top of the bitumen layer. This will help to bond the Permaguard to the top finishing layer of either screed concrete or any other desired finish.

7) A top protective layer/ wearing coat of IPS, cement mortar of required thickness shall be laid over the bonding film and a vata of minimum 150mm shall be formed on all sides along the parapet wall base.

Following precautions shall be taken during the treatment process:

- a) Foil shall be applied on the dry surface. It shall not be applied during rainy season.
- b) It shall be ensured that the foil is not damaged during storage, transportation etc.
- c) Proper care shall be taken while working of sloping roof. Safety belts or ladders shall be used while laying the sheets.
- d) The foil used shall be free of cracks, holes or any other damage.

2.3 A guarantee bond on appropriately stamped paper shall be given by the contractor to the client in the manner form described in item no. 8.01.

### **3.0 Mode of Measurements and Payment**

3.1 The relevant specifications of item no. 8.01a shall be followed. Water proofing of roof shall be measured in m<sup>2</sup> plan area of treated surface shall be measured correct to a centimeter.

### **8.16 Methodology for Hydrothem Thermal Insulation treatment for Roof Terraces**

**a) Clearing the terrace surface as per the requirements, and ponding the terrace slab with water for 48 hours to identify existing leaking spots. The spots so identified shall be marked and grouting of this leaking spots such as, construction joints, honeycombs location, cracks etc. shall be done with "Hydrogrout" crystalline based non shrink cementitious grout to full saturation, and also to make small fillets (wattas) around the periphery junction etc. all complete as per detailed specification and instructions of Engineer in charge.**

**b) Providing and applying "Hydrocem" flexible polymer modified cementitious coating system on terrace slab, in 2 coats by brush at a rate of 1.5 kg/sqmt, on the horizontal as**

well as vertical surface upto, 300 mm above F.F.L, including ponding the slab with water for 3 days to test water tightness etc. all complete as per detailed specification and instructions of Engineer in charge.

c) Providing and applying "Hydroshield LW" thermal insulating "High Albido" liquid applied, elastometric membrane, of total 0.8mm DFT and 400% elongation capacity, with thermal conductivity value of 0.77W/M.K. applied in 2 coats over one coat of primer etc. all complete as per detailed specifications and instructions of Engineer in charge.

The relevant specifications of item no. 8.01a shall be followed. Water proofing of roof shall be measured in m<sup>2</sup>.

**8.17 Providing and applying protective treatment for internal surface of RCC manholes, including cleaning the surface and thereafter providing and applying one coat of epoxy primer, followed by 2 coats of solvent free water based non- toxic epoxy coating system consisting of araldite and hardner of M/s. Huntsman or sikagard 67 or equivalent as per manufacturer's recommendations on the floor and walls and on the soffit etc. at all heights, places and all shapes complete**

The relevant specifications of item no. 8.01a shall be followed. Water proofing of roof shall be measured in m<sup>2</sup>.

## CW 09

### Flooring Work

**9.01.a Precast terrazzo /mosaic tiles laid in flooring and skirting, riser of steps, stairs of 20 to 25 mm thickness as per required size with graded marble chips of approved colors (single or more than one) from approved quarry of size 1 mm to 12mm, jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and special polishing with different grades of emery like 60, 120, 320 and 400 no and cleaning with oxalic acid complete on 35 to 40 mm thick bedding of cement mortar 1:6 ( 1 cement : 6 coarse sand). The work should be done as per the drawing and shall be truly maintained until handing over to client and directed by the Architect and Engineer-in-charge. [NO WAXING SHALL BE PERMITTED].**

**9.01.a.1 Ordinary cement with Dolomite Powder and Chhota Udaipur white chips of grading 4 & 5 nos without any pigment**

**9.01.a.2 White cement with Dolomite powder and approved shade and make nonfading pigment**

#### **1.0 Material**

##### **1.1 Precast Terrazzo Tile**

1.1.1 Precast Terrazzo Tile shall conform to M-33.

##### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

##### **1.3 Water**

1.3.1 Water shall conform to M-1.

#### **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 11.11.2, 11.11.3 to be followed except 35 to 40 mm thick bedding for the tiles shall be with cement mortar 1:6.

2.2 Nabhi's commentary on CPWD specifications clause no. 11.12.3, 11.12.4 to be followed for risers of steps, stairs, skirting etc.

#### **3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 11.11.4, 11.11.5 to be followed except the no extra will be paid for treads of stairs, steps etc.

**9.01.b Providing and laying chequerred terrazzo tiles in flooring with 25 mm. thick with marble chips of sizes up to 6 mm. over 35 to 40 mm. thick bedding of CM 1:6, jointed with neat cement slurry mixed with pigment to match the shade of the tiles, including rubbing, polishing and cleaning etc. complete as approved by Architects & Engineer-in-charge.**

## **1.0 Material**

### **1.1 Chequered Terrazzo Tile**

1.1.1 Chequered Tile shall conform to M-34.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Water**

1.3.1 Water shall conform to M-1.

## **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.01.a shall be followed except the chequered terrazzo tile is to be used instead of precast terrazzo tile.

2.2 Polishing of the tiles and chequer groove may be done by hand. Special care shall be taken to polish the grooves in such a manner as to get a uniform section and their finish will match with the finish of flat portion of the tile.

## **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.01.a shall be followed.

**9.02.a Providing and laying ceramic tiles of required surface finish (Matt, Satin, Glossy, Non skid, Rustic) in floor with residue and skirting of approved make and shade as per design laid over 20 mm thick cement mortar 1:3 ( 1 cement : 3 coarse sand) bedding on 40 mm wired finish screed 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size ), laid to proper slope and level. Finishing shall be done with pointing the joints with white cement and matching pigment, including curing, cleaning with mild oxalic acid, maintaining till handing over to the client etc. complete as directed by Engineer-in-charge.**

## **1.0 Material**

### **1.1 Ceramic Tile**

1.1.1 Ceramic Tile shall conform to M-35.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Water**

1.3.1 Water shall conform to M-1.



## **2.0 Workmanship**

- 2.1 Nabhi's commentary on CPWD specifications clause no. 11.15.4, 11.15.5 to be followed except bedding for the tiles shall be with 20 mm thick Cement Mortar 1:3 (1 cement: 3 coarse sand) over 40 mm thick wired finish screed 1:2:4 laid to proper slope and level.
- 2.2 The thickness of cement mortar under the tile shall not be less than 15 mm under any portion.
- 2.3 The tiles before laying shall be soaked in water for at least two hours.
- 2.4 The tiles shall not have staggered joints. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. The outlets for drainage shall be marked as per drawing and tile fixing shall be carried out accordingly after laying and testing the drainage lines. After the tiles are laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5 mm. and then grouted with white cement with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill up pinholes that may exist on the surface. White cement with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to cure undisturbed for 7 days.
- 2.5 While laying, any chiseling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm. between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.
- 2.6 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

## **3.0 Mode of Measurement and Payment**

- 3.1 Nabhi's commentary on CPWD specifications clause no. 11.15.6, 11.15.7 to be followed except rate shall be for all colors, all patterns.
- 3.2 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good up to & around pipes, fittings and fixtures etc.
- 3.3 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

**9.02.b Providing and laying rectified ceramic tiles of required surface finish (Matt, Satin, Glossy, Non skid, Rustic) in floor with residue and skirting of approved make and shade as per design laid over 20 mm thick cement mortar 1:3 ( 1 cement : 3 coarse sand) bedding on 40 mm wired finish screed 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size ), laid to proper slope and level. Finishing should be done with pointing the joints with white cement and matching pigment, including curing, cleaning with mild oxalic acid, maintaining till handing over to the client etc. complete as directed by Engineer-in-charge.**

**1.0 Material**

**1.1 Ceramic Tile**

1.1.1 Ceramic Tile shall conform to M-35.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Water**

1.3.1 Water shall conform to M-1.

**2.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.a shall be followed except rectified ceramic tile is to be used instead of ceramic tile.

**3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.02.a shall be followed except rectified ceramic tile is to be used instead of plain ceramic tile.

**9.02.c Providing and laying in position Ceramic\Glazed wall tiles of required surface finish (Matt, Satin, Glossy, Nonskid, Rustic) for skirting, dado, risers of steps etc. of approved make and shade as per design and drawing. Tile is to be fixed over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand). Tile shall be fixed with 1:1 cement sand mortar of average 6 mm thickness behind the tiles including pointing in white cement mixed with pigment of matching shade etc. complete as approved by architect and directed by engineer-in-charge. Rate is inclusive of back coat of 12 to 15 mm thick plaster, curing etc. complete.**

**1.0 Material**

**1.1 Ceramic Tile**

1.1.1 Ceramic Tile shall conform to M-35.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Water**

1.3.1 Water shall conform to M-1

**2.0 Workmanship**

2.1 The sub-base/wall shall be cleaned, wetted. The plaster in the proportion of 1:4 cement sand mortar as per the relevant specification of wired plaster shall be applied. The plaster shall be cured for 7 days. After curing, the string marking of the glazed tiles with blue or white lime shall be done on the wall after wired plaster is completed as per drawing in such a way that opposite walls shall be mirror image. The outlets for plumbing shall be marked as per drawing and plumbing work shall be carried out accordingly and tested for pressure as instructed by engineer –in-charge. The tiles shall be fixed after testing the water supply lines and laying the electrical conduits and boxes.

2.2 The tiles before laying shall be soaked in water for at least two hours. Neat grey cement slurry at 3.3 Kg. Cement per sqm of honey-like consistency shall be spread over the 12 to 15 mm thick wired plaster of cement mortar 1:4 ( 1 cement : 4 coarse sand) as directed by engineer in charge. Average 6 mm thick Cement sand mortar of 1:1(1 cement: 1 fine sand) shall be evenly spread behind the tiles and thereafter tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. The edges of the tiles shall be smeared with neat cement slurry. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.3 The tiles shall not have staggered joints. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. After the tiles are laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5 mm. and then grouted with white cement with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill up pin holes that may exist on the surface. White cement with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the dado shall be kept wet and allowed to cure undisturbed for 7 days.

2.4 While laying any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size between plaster and /or other finishes, dado or skirting (if required) shall be provided.

Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.

- 2.6 The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.
- 2.7 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished and maintained till handing over to client.
- 2.8 For curing and finishing CPWD specification clause no. 11.16.4 shall be followed.

### **3.0 Mode of Measurement and Payment**

- 3.1 Nabhi's commentary on CPWD specifications clause no. 11.16.5, 11.16.6 to be followed except no extra will be paid for any type of decorative tiles. Rate is inclusive of 12 to 15 mm thick wired finish plaster on the walls.
- 3.2 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.
- 3.4 The rate shall include for fixing the dado in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

**9.02.d Providing and fixing ceramic tiles in dado of required surface finish (Matt, Satin, Glossy, Non skid, Rustic) with cement based polymer adhesive like BAL or equivalent with minimum 3 mm thickness or as manufacture's specification. The material, workmanship, coverage area shall be carried out as per the supplier's specifications and approved by architect and engineer-in-charge. In dado adhesive is to be applied over smooth finish mala plaster (1:3) instead of wired plaster. Rate is inclusive of mala finish plaster on the masonry wall.**

#### **1.1 Ceramic Tile**

- 1.1.1 Ceramic Tile shall conform to M-35.

#### **1.2 Cement Mortar**

- 1.2.1 Cement Mortar shall conform to M-11.

#### **1.3 Water**

- 1.3.1 Water shall conform to M-1

#### **1.4 Tile Adhesive**

- 1.4.1 Tile Adhesive shall conform to M-37.

## **2.0 Workmanship**

2.1 The relevant specifications of item no. 9.02c is to be followed except polymer adhesive is to be used instead of cement mortar for fixing the tile.

## **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 9.02.c shall be followed. Rate is inclusive of 12 to 15 mm thick mala finish plaster on the walls.

**9.03.a Providing and laying 600 x 600 mm vitrified tiles of reqied surface (Matt, Satin, glossy, Non-skid, rustic) and shade as per design in floor with residue and skirting of desired colors and size of first quality over a minimum 20 mm. thick cement mortar 1:3 bedding on 40 mm wired finish screed 1:2:4 and laid to proper slope and level. Finishing to be done with flush pointing in white cement and approved pigment including curing and cleaning with mild oxalic acid etc. complete as directed by Architects and Engineer-in-charge. Rate shall be inclusive of protection of flooring until the handling of the project by covering the joints with abrotaps, platic sheet and plaster of paris.**

## **1.0 Material**

### **1.1 Vitrified Tile**

1.1.1 Vitrified Tile shall conform to M-36.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Water**

1.3.1 Water shall conform to M-1.

## **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.a shall be followed except vitrified tile is to be used instead of ceramic tile.

2.2 Once the laying of flooring gets completed, it shall be covered with LDPE sheet and above it POP of 12 to 15 mm thickness OR other alternative of protecting the floor by using readymade available sheet as approved. Flooring shall be open only when area is ready for occupation. Newspaper below POP should not be used to avoid stains of printing ink of the newspaper on the tile.

## **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.02.a shall be followed. Rate shall be inclusive of material and labour required for protecting the flooring by any means until handling over to client.

**9.03.b Providing and laying vitrified tiles of approved make and color as per design in floor with residue and skirting of desired colors and size of first quality, over a minimum 20 mm. thick cement mortar 1:3 bedding on 40 mm wired finish screed and laid to proper slope and level. Groove of (3mm to 5mm width) using PVC spacer of approved make, finishing to be done with below specified grout including curing and cleaning with mild oxalic acid etc. complete as directed by Architects and Engineer-in-charge. Rate shall be inclusive of filling in grooves with cementitious grout and protection of flooring until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of paris etc. complete.**

**9.03.b.1 Grouting in joints of 3mm to 5mm with readymix matching polymer based cementitious grout of BAL or equivalent of approved shade**

**1.0 Material**

**1.1 Vitrified Tile**

1.1.1 Vitrified Tile shall conform to M-36.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Water**

1.3.1 Water shall conform to M-1

**1.4 Cementitious Grout**

1.4.1 Cementitious Grout shall conform to M-38A.

**2.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.a shall be followed except vitrified tile is to be used instead of ceramic tile.

2.2 Once the laying of flooring gets completed, it shall be covered with LDPE sheet and above it POP of 12 to 15 mm thickness OR other alternative of protecting the floor by using readymade available sheet as approved. Flooring shall be open only when area is ready for occupation. Newspaper below POP should not be used to avoid stains of printing ink of the newspaper on the tile.

2.3 Groove of (3mm to 5mm wide) using PVC spacer of approved make and filling in groove is to be done with cementitious grout of BAL or equivalent matching shade as per manufacture's specification. On completion of the work the cleaning shall be done properly to have a neat finished surface.

- 2.4 The grouting material shall be filled when the grooves are completely dry and only after proper cleaning of grooves which are to be grouted. On completion of the work the cleaning shall be done properly to have a neat finished surface

**3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 9.02.a shall be followed except vitrified tile is to be used instead of ceramic tile and item shall be measured and paid in sqm.
- 3.2 Rate is inclusive of finishing and filling the groove as per sample approved with PVC spacer, grouting with polymer based cementitious grout as per manufacture's specification.

**9.03.b.2 Grouting in joints of 3mm to 5mm with epoxy grout of BAL or equivalent of approved shade**

**1.0 Material**

**1.1 Epoxy Grout**

- 1.1.1 Epoxy Grout shall conform to M-38B.

**2.0 Workmanship**

Relevant specifications of item no. 9.03.b.1 shall be followed except grooves are to be filled with epoxy grout.

**3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm.

**9.03.c Providing and laying in position vitrified wall tiles of required surface finish (Matt, Satin, Glossy, Non skid, Rustic) for dado, risers of steps etc. of approved make and shade as per design and drawing. Tile is to be fixed over 12 to 15 mm thick wired finish plaster in cement mortar 1:3 (1 cement: 3 coarse sand) with keeping a groove of (3mm width). Tile shall be fixed with 1:1 cement sand mortar of average 6 mm thickness behind the tiles including filling the grooves with white cement and approved shade etc. complete as approved by architect and directed by engineer-in-charge. Rate shall be inclusive of 12 to 15 mm thick wired finish plaster in cement mortar 1:3 and protection of flooring until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of Paris etc. complete.**

**1.1 Vitrified Tile**

- 1.1.1 Vitrified Tile shall conform to M-36

**1.2 Cement Mortar**

- 1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Water**

1.3.1 Water shall conform to M-1.

### **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.c shall be followed except the vitrified tile shall be used instead of ceramic tile.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.02.c shall be followed except the vitrified tile shall be used instead of ceramic tile.

3.2 Rate shall be inclusive of 12 to 15 mm thick wired finish plaster in cement mortar 1:4, filling in grooves with white cement and matching pigment, protection of flooring, until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of paris etc. complete.

**9.03.d Providing and laying in position vitrified wall tiles of required surface finish (Matt, Satin, Glossy, Non skid, Rustic) for dado, risers of steps etc. of approved make and shade as per design and drawing. Tile is to be fixed over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand) with keeping a groove of (3mm width). Tile shall be fixed with 1:1 cement sand mortar of average 6 mm thickness behind the tiles including filling the grooves with below specified grout etc. complete as approved by architect and directed by engineer-in-charge. Rate shall be inclusive of 12 to 15 mm thick wired finish plaster in cement mortar 1:4 and filling in grooves with cementitious grout protection of flooring until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of Paris etc. complete.**

**9.03.d.1 Grouting in joints of 2mm to 3mm with readymix matching polymer based cementitious grout of BAL or equivalent of approved shade**

### **1.0 Material**

#### **1.1 Vitrified Tile**

1.1.1 Vitrified Tile shall conform to M-36

#### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Water**

1.3.1 Water shall conform to M-1.

### **1.4 Cementitious Grout**



1.4.1 Cementitious Grout shall conform to M-38A

**3.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.c shall be followed except the vitrified tile shall be used instead of ceramic tile.

2.2 Grooves (3mm width) shall be filled with cementitious grout of matching shade.

**3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.02.c shall be followed except the vitrified tile shall be used instead of ceramic tile.

3.2 Rate shall be inclusive of 12 to 15 mm thick wired finish plaster in cement mortar 1:4, filling in grooves with polymer based approved color ready mix cementitious grout, protection of flooring until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of paris etc. complete.

**9.03.d.2 Grouting in joints of 2mm to 3mm with epoxy grout of BAL or equivalent of approved shade**

**1.0 Material**

**1.1 Epoxy Grout**

1.1.1 Epoxy Grout shall conform to M-38B.

**2.0 Workmanship**

Relevant specifications of item no. 9.03.c.1 shall be followed except grooves are to be filled with epoxy grout.

**3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in sqm.

**9.03.e Providing and fixing vitrified tiles in dado with cement based polymer adhesive like BAL or equivalent with minimum 3 mm thickness or as manufacture's specification. The material, workmanship, coverage area shall be carried out as per the supplier's specifications and approved by architect and engineer-in-charge. In dado adhesive is to be applied over smooth finish mala plaster instead of wired plaster. Rate is inclusive of smooth finish mala plaster (finished with steel trowel) (1:3).**

The relevant specifications of item no. 9.02.d are to be followed except vitrified tile is to be used instead of ceramic tile.

**9.04.a Cement concrete flooring (IPS) 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate) laid in one layer finished with trowel using 1:1 cement sand mortar for filling the minor**

**holes etc. or alternate panels using 5 mm thk glass strips including curing etc. complete as per design or as directed by engineer-in-charge.**

**9.04.a.1 40 mm thick with 6 to 10 mm nominal size stone aggregate**

**1.0 Material :**

**1.1 Cement Concrete**

1.1.1 Nabhi's commentary on CPWD specifications clause no. 11.2.1 shall be followed.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 11.2.2, 11.2.3, 11.2.4, 11.2.5, 11.2.6, 11.2.7 shall be followed except rate is inclusive of providing and fixing glass strip or any type strip.

2.2 The cement concrete flooring of 40mm thickness is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixed may however be allowed for smaller quantities of work and in case of failure of machines or as permitted by the Architect. It shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in color and consistency. However, in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for a period of 1.5 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over a period of one to six hours depending upon the temperature and atmospheric conditions. The surface shall be left for some time till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once when the slurry is applied and the second time when cement starts setting and is to be finished smooth. The surface shall be marked with string of 300x300 mm or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required upto 25 mm. radius.

2.3 The form work shall be provided if necessary as directed by Architect. Concreting shall be done as per alternate bay method with necessary centering.

2.4 After the concrete has been fully compacted it shall be finished by trowelling or floating with neat cement rendering. Finishing operations shall start shortly after the compaction of concrete and the surface shall be trowelled three times at intervals so as to produce a

uniform and hard surface. The satisfactory resistance of floor to wear and tear, depends largely upon the care with which trowelling is carried out. The time interval allowed between successive trowelling is very important. Immediately after placing cement rendering, only just sufficient trowelling shall be done to give a level surface. Excessive trowelling in the earlier stages shall be avoided as this tends to bring a layer in cement to the surface. Sometime, after the first trowelling, the duration depends upon the temperature and atmospheric conditions and the rate of setting of the cement used. The surface shall be retrowelled to close any pores in the surface and to bring to surface and to scrape off any excess water in concrete or any laitance. **No dry cement shall be used directly on the surface to absorb moisture or to stiffen the mix.** The final trowelling shall be done well before the concrete has become too hard but at such a time that considerable pressure is required to make any impression on the surface. The topping shall be rendered with 1:1 (1-part cement with a suitable mineral pigment (if directed): 1-part sand), instead of cement only to fill up the pin-holes etc.

### **3.0 Mode of measurement and Payment**

Nabhi's commentary on CPWD specifications clause no. 11.2.8, 11.2.9 shall be followed. Rate shall be inclusive of glass strips or any type of strips.

#### **9.04.a.2 50 mm thick with 6 to10 mm nominal size stone aggregate**

Relevant specifications of item no. 9.04.a.1 shall be followed except the thickness of flooring will be 50 mm.

#### **9.04.a.3 40 mm thick colored flooring with non fading matching pigment and 6 to10mm nominal size stone aggregate**

Relevant specifications of item no. 9.04.a.1 shall be followed and matching pigment is to used for making coloured flooring.

#### **9.04.a.4 50 mm thick colored flooring with non fading matching pigment and 6 to10 mm nominal size stone aggregate**

Relevant specifications of item no. 9.04.a.1 shall be followed except the the thickness of flooring will be 50 mm and matching pigment is to be used for making colored flooring.

#### **9.04. b Extra over and above for supplying and sprinkling nonmetallic floor hardener ready to use cement based of Ironite or equivalent make approximately @ 4 Kg per sqm or as per supplier's specification over green concrete surface / IPS.**

##### **9.04.b.1 coloured nonmetallic floor hardener**

##### **9.04.b.2 Noncoloured nonmetallic floor hardener**

### **1.0 Material**

### **1.1 Floor Hardener**

1.1.1 Floor Hardener shall conform to M-39 or as approved by consultant or engineer in charge.

### **2.0 Workmanship**

2.1 The material shall be used as per manufacture's specification and checking the shelf life and manufacture date.

2.2 Floor Hardener shall be broadcast / sprinkled at uniform rate over green concrete surface / IPS by mechanical means.

2.3 The men engaged on finishing operations shall be provided with raised platform to sit on, so as to prevent damage to new work.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in Kg per sqm of area of concrete done at the site. Actual consumption inclusive of wastage or theoretical consumption whichever is less shall be paid.

**9.04. c Extra for providing and mixing Fiber mesh 150 e3 (Formerly Stealth e3) multi-dimensional graded multifilament 100% virgin polypropylene fibers** manufactured by M/s. PROPEX CONCRETE SYSTEMS, U.S.A. and represented by "M/s. NINA CONCRETE SYSTEMS PVT. LTD.@ 0.9 Kg per cum or as per manufacture's specification of approved make while doing the cement concrete in cement concrete pavement / IPS as per supplier's specification and approved by architect and engineer-in-charge. It shall be measured in Kg.

## **2 Material**

### **1.1 Polypropylene Fibers**

1.1.1 Polypropylene Fibers shall conform to M-40 or as per manufacture's specification.

### **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.04.a.1 shall be followed. Polypropylene fibers of approved make are to be used while mixing and placing the concrete as per manufacture's specification.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in Kg as directed by the engineer in charge. Actual consumption inclusive of wastage or theoretical consumption whichever is less shall be paid.

**9.05 Cement concrete pavement of 75 to 100 mm thickness with 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) in line level and gradient including**

**smooth / broom finish without glass strips in alternate panels as per drawing in uniform size not exceeding 1.25 m in any direction with or without weld mesh / reinforcement / polypropylene fibers etc. complete as directed by engineer in charge. Rate shall be exclusive of weld mesh / reinforcement / polypropylene fibers.**

CPWD specification clause no. 11.7 shall be followed except broom finish or chequering will be paid in this item in accordance with relevant specifications of item no. 9.04. a.1.

**9.06.a 50 mm thick marble chips flooring and skirting rubbed and polished with different grade emery stones to achieve semi mirror finish, under layer 38 mm thick cement concrete 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 12.5 mm nominal size) and top layer 12mm thick with marble chips of colour and sizes from 7mm to 10mm nominal size laid in white cement marble powder mix 3:1 (3 white Cement : 1 marble powder) by weight in proportion of 2:3 (2 cement marble powder mix : 3 marble chips) admixed with approved shade and make nonfading pigment by volume including cement slurry, placing the homogenous mix in alternate panels and panels being formed with glass strips and finishing the panels with approved color pigments and Polishing the panels up to mirror finish with different emery stones including cleaning with oxalic acid or as directed by engineer in charge. (In situ Terrazzo flooring) (NO WAXING SHALL BE PERMITTED)**

## **1.0 Material**

### **1.1 Marble Chips**

1.1.1 Marble Chips shall conform to M-41.

### **1.2 Cement Concrete**

1.2.1 Nabhi's commentary on CPWD specifications clause no. 11.2.1 shall be followed.

## **3 Workmanship**

2.1 Nabhi's commentary on CPWD Specification clause no. 11.8.1, 11.8.2, 11.8.3, 11.8.4 shall be followed.

## **4 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD Specification clause no. 11.8.5.1 shall be followed. The rate also includes the cost of borders, margins and similar bends up to 30 cm width and on staircase treads & risers, skirting, coving, flooring in narrow bands etc. complete.

3.2 The rate shall include the cost of base concrete (under layer) and cost of providing and fixing strips of 5 mm thk glass used for making panels.

3.3 Relevant specifications of item no. 9.04.a shall be followed for under layer and for polishing relevant specifications of 9.10 shall be followed.

**9.07.a Providing and fixing 4 mm thick and 30 mm height aluminum strips in joints of terrazzo / Kota stone**

Relevant specifications of item no. 9.04.a.1 to be followed. It shall be measured in running meter.

**9.07.b Providing and fixing 12 mm thick and 20 mm height aluminum strips in joints of terrazzo / Kota stone**

Relevant specifications of item no. 9.04.a.1 to be followed. It shall be measured in running meter.

**9.08 Crazy marble stone flooring including filling the gaps with approved shade and make nonfading pigment with white cement marble powder mixture (3 parts of white cement: 1 part of marble powder) by weight in proportion of 4:7(4 cement marble powder mix: 7 chips of sizes from 1mm to 4mm nominal size by volume) and under layer**

**thick cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 12.5 mm nominal size) with 18 mm thick crazy marble stone including rubbing, polishing upto semimirror finish with different grade of emery and cement slurry etc. complete**

**1.0 Workmanship**

1.1 Nabhi's commentary on CPWD specification clause no. 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6 shall be followed.

1.2 Relevant specifications of item no. 9.04.a shall be followed for under layer and for polishing relevant specifications of 9.10 shall be followed.

**2.0 Mode of Measurement and Payment**

2.1 Nabhi's commentary on CPWD specification clause no. 11.10.7, 11.10.8 shall be followed except the rate shall include the cost of base concrete

**9.09.a Providing & laying broken china mosaic flooring for terrace using 12 mm to 20 mm broken pieces of glazed tiles to be laid over cement mortar 1: 3 to plain or slope and to be tempered to bring mortar crè me out up to surface using white cement including rounding off junctions and extending them up to 15 cms along the wall, cleaning with water and oxalic etc. as directed by Engineer-in-charge.**

**1.0 Material**

**1.1 Cement Mortar**

1.1.1 Cement Mortar shall conform to M-11.

**1.2 China Mosaic**

1.2.1 China Mosaic shall conform to M-42.

### 1.3 White Cement

1.3.1 White cement shall conform to IS: 8042.

### 2.0 Workmanship

2.1 The sub-grade shall be cleaned, wetted and mopped. The cement slurry @2.75kg/sqm (with polymer based waterproofing & bonding compound) shall be applied on the sub-grade evenly. The bedding (average 25mm) shall then be laid evenly over the surface in CM 1:6 in the desired slope as mentioned in the drawing. The bedding shall be tamped and corrected to desired level with wooden patti. The bedding shall be allowed to harden enough to offer a rigid cushion to the tile pieces and to enable the mason to place wooden planks across and squat on it.

2.2 Broken pieces of white china mosaic shall be soaked for 24 hours before laying. The broken china pieces are laid manually as close as possible over the specified bedding (before it sets/ gets hard), which shall be laid to the required slope and gradient. While laying the broken glazed tiles, neat cement paste shall be applied over the bedding.

2.3 After china mosaic is arranged, the entire surface shall be tampered by wooden piece with a wooden mallet so that tile piece are properly embedded and leveled in the mortar and slurry starts oozing from the joints.

2.4 Vatta shall be done along with the floor keeping machine cut edges at the top end of the vatta.

2.5 At the end of day's work, the entire work shall be cleaned with the minimum quantity of water and moped with the cotton cloth. The joints shall be grouted firmly with white cement paste with the help of steel trowel.

2.6 The surface shall be cured for 7 days by ponding. After curing period is over, china mosaic shall be cleaned with water & rubbing by plastic brush to remove the dirt, excess cement etc. **The surface shall then be cleaned with water and mild oxalic acid (NO ACID OTHER THAN OXALIC ACID SHALL BE USED)**

### 3.0 Mode of measurement and Payment

3.1 The rate shall be for a unit of one sqm and shall be measured wall to wall in plan. Length and breadth shall be measured correct to a cm and area shall be measured in sqm correct to two places of decimal. No extra measurement shall be given for rounding off up to 15cm. The rate of white cement is included in the item even if grey cement is supplied by the client.

**9.09.b Providing and laying in position china mosaic on dado comprising of 20 to 25 mm size broken pieces of ceramic / glazed tiles laid over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 ( 1 cement : 4 coarse sand) including applying a cement slurry at 2.75 Kg per sqm on plastered surface. China mosaic shall be fixed with 1:2 cement**

sand mortar of average 6 mm thickness including filling the joints with white cement. The dado shall be tampered with wooden rammer not exceeding 2 Kg in weight to bring the mortar up to the surface. The rate shall be inclusive of bands, if different color is used, any pattern or design as per drawing and direction, curing, scaffolding, cleaning with water and oxalic acid etc. complete as directed by the engineer in charge. Rate is inclusive of 12 to 15 mm thk wired finish plaster in cement mortar 1:4.

#### **4.0 Material**

##### **1.1 Cement Mortar**

1.1.1 Cement Mortar shall conform to M-11.

##### **1.2 China Mosaic**

1.2.1 China Mosaic shall conform to M-42.

##### **1.3 White Cement**

1.3.1 White cement shall conform to IS: 8042.

#### **2.0 Workmanship**

2.1 The relevant specifications of item no. 9.09.a shall be followed except the china mosaic is to be fixed on walls with 1:2 cement sand mortar of average 6 mm thickness over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand) including applying a cement slurry at 2.75 Kg per sqm on the plastered surface. The dado shall be tampered to bring the mortar on the surface.

2.2 Relevant specification of 7.02.b shall be followed for wired finish plaster.

#### **4.0 Mode of measurement and Payment**

3.1 The rate shall be for a unit of one sqm. Length and height shall be measured correct to a cm and its area shall be calculated in sqm correct to two places of decimals. The rate of white cement is included in the item even if grey cement is supplied by the client. The rate is inclusive of bands if different color is used in any pattern or design as per drawing and direction, curing, scaffolding, cleaning with water etc. complete as directed by the engineer-in-charge.

**9.10.1 Providing and laying average 40mm (25 to 40 mm) thick hand dressed / machine cut green polished kotah stone of approved quality, selected and sorted for uniform colour, in floor, otta and skirting etc. of required sizes upto 600 mm as per design in normal pattern (straight or staggered joint with square or rectangular shaped stone) and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 to 50mm thickness, jointed with grey cement and colour pigment in proportion to match the shade of kota stone. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be**



done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing etc. complete upto the satisfaction of the Architect or Engineer-in-charge. (NO WAXING WILL BE PERMITTED.) (Sample to be approved before mass production / construction / purchase)

a) Size upto 600 mm (L) x 600 mm (B)

b) size upto 1200mm x 300 mm

**1.0 Material**

**1.1 Kota Stone**

1.1.1 Kota Stone shall conform to M-44.

**1.2 Cement Mortar**

1.2.1 Cement mortar shall conform to M-11.

**2.0 Workmanship**

2.1 For dressing Nabhi's commentary on CPWD specifications clause no. 11.20.2 shall be followed

2.1 For laying and preparation of surface Nabhi's commentary on CPWD specifications clause no. 11.20.3 shall be followed except average thickness of CM shall be 35mm to 50 mm, cement mortar shall be 1:6 (1 cement: 6 sand) used.

2.2 While laying any chiseling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm. between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required, shall be provided as per the drawing and design.

2.3 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothed at edge to give straight and true joints.

2.4 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

2.5 The floor shall be kept wet for a minimum period of 7 days, so that bedding and joints set properly.

2.6 **Polishing** shall be normally commenced after 14 days of laying the slab. For special polish polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka. For semi mirror polish polishing to be done with 220, 320, 400, 600 grades of emery. Water shall be properly used during polishing. The flooring shall then be washed clean with oxalic acid. Daily moping for 15 days shall be done after polishing or up to the satisfaction

of client and engineer-in-charge. All works shall be carried out as directed by the Architect and as specified in the item, no waxing will be permitted.

2.7 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

2.8 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

### **3.0 Mode of Measurement and Payment**

3.1 Kota slab flooring shall be measured in m<sup>2</sup> for visible area of work done. Length and breadth shall be measured correct to a cm before laying skirting, dado or plaster.

3.2 No deductions shall be made or extra paid for any opening in the floor area upto 0.1 m<sup>2</sup>. Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or courtyard. Kota slabs laid in floor borders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bands formed of half or multiples of half size standard tiles/or other uncut tiles.

3.3 The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.

3.4 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.

3.5 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.

3.6 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.7 The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.8 The risers of steps, skirting or dado shall be measured in m<sup>2</sup>. Length shall be measured along the finished faces of risers, skirting or dado. Height shall be measured from finished level of treads or floor to top. Lining of pillars shall be measured under this item.

3.9 The rate shall be for a unit of one m<sup>2</sup>

**9.10.b Providing and laying average 25mm (20 to 30 mm) thick hand dressed / machine cut green polished kotah stone of approved quality, selected and sorted for uniform color, in floor, otta and skirting etc. of required sizes upto 600 mm as per design in diagonal pattern and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 to 50mm thickness, jointed with grey cement and colour pigment**

as specified. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing or upto the satisfaction of the Architect or Engineer-in-charge etc. complete. (NO WAXING WILL BE PERMITTED)

The relevant specifications of item no. 9.10.a shall be followed except flooring shall be carried out in diagonal pattern.

- 9.10.c Providing and laying average 25mm (20 to 30 mm) thick hand dressed / machine cut green polished kotah stone of approved quality selected and sorted for uniform colour, in floor, otta and skirting etc. of required sizes above 600 mm and upto 1000 mm as per design in normal pattern (straight or staggered joint with square or rectangular shaped stone) and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 mm thickness, jointed with grey cement and color pigment as specified. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing or upto the satisfaction of the Architect or Engineer-in-charge etc. complete. (NO WAXING WILL BE PERMITTED).**

The relevant specifications of item no. 9.10.a shall be followed except size of the kota stone shall be above 600 mm and upto 1000mm.

- 9.10.d Providing and laying average 25mm (20 to 30 mm) thick hand dressed / machine cut green polished kotah stone of approved quality, selected and sorted for uniform colour, in floor, otta and skirting etc. of required sizes above 600 mm and upto 1000 mm as per design in diagonal pattern and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 mm thickness, jointed with grey cement and color pigment as specified. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing or upto the satisfaction of the Architect or Engineer-in-charge etc. complete, (NO WAXING WILL BE PERMITTED).**

The relevant specifications of item no. 9.10.a shall be followed except size of the kota stone shall be above 600 mm and upto 1000mm. Flooring shall be carried out in diagonal pattern.

- 9.10.e Providing and laying in position average 10 mm thick green kota stone of approved quality, selected and sorted for uniform color in skirting of required size as per design and drawing. Kota stone is to be fixed over 8 mm thk cement mortar (1:1) jointed with grey cement and color pigment. Polishing to be done with 2 coats of 60, 120 grades of**

emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing or upto the satisfaction of the Architect or Engineer-in-charge etc. complete, (NO WAXING WILL BE PERMITTED).

Relevant specifications of item no. 9.10.d shall be followed except that 10mm thk kota stone shall be used in skirting and fixed with 8 mm thk cement mortar 1:1 jointed with grey cement and matching pigment. Item shall be measured and paid in sqm.

- 9.11.a Providing and laying average 25mm (20 to 30 mm) thick hand dressed / machine cut brown polished kotah stone of approved quality, selected and sorted for uniform colour, in floor, otta and skirting etc. of required sizes upto 600 mm as per design in normal pattern (straight or staggered joint with square or rectangular shaped stone) and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 mm thickness, jointed with grey cement and colour pigment as specified. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. curing, daily moping with water & kerosene as directed for at least 15 days after final polishing etc. complete upto the satisfaction of the Architect or Engineer-in-charge etc. complete, (NO WAXING WILL BE PERMITTED)**

The relevant specifications of item no. 9.10.a shall be followed except kota stone shall be brown in color.

- 9.11.b Providing and laying average 25mm (20 to 30 mm) thick hand dressed / machine cut brown polished kota stone of approved quality, selected and sorted for uniform colour, in floor, otta and skirting etc. of required sizes above 600 mm and upto 1000 mm as per design in normal (straight or staggered joint with square or rectangular shaped stone) and residue as per drawing, including 1:6 (1 cement : 6 sand) cement mortar bedding of average 35 mm thickness, jointed with grey cement and colour pigment as specified. Polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka for special polish, after it polishing to be done with 220, 320, 400, 600 grades of emery till semimirror finish is achieved. Curing, daily moping with water & kerosene as directed for at least 15 days after final polishing or upto the satisfaction of the Architect or Engineer-in-charge etc. complete, (NO WAXING WILL BE PERMITTED)**

The relevant specifications of item no. 9.10.a shall be followed except Kota stone shall be brown in color and size of the kota stone shall be above 600 mm and upto 1000 mm.

#### **9.12.1 Rough kota Stone**

**Providing & laying average 40 mm (30 to 40 mm) thick machined cut Green Rough Kotah stone of approved quality, selected and sorted for uniform color & texture, in**

floor, otta, sill, skirting, tread, riser etc., in required sizes up to 600 mm. as per design normal pattern (straight or staggered joint with square or rectangular shaped stone) and drawings (with grooves of 10mm wide or without grooves). Kota stone is to be laid over cement mortar 1:6 bedding of average 40 mm thickness with joints, pointing and finishing and filling the grooves with CM 1:2 as sample approved, including curing and cleaning with wire brush to remove excess cement on the sides of stone up to the satisfaction of the Architect & Engineer-in-charges etc. complete. (NO WAXING WILL BE PERMITTED). (Sample to be approved before mass production/construction/purchase)

a)40mm th. - Upto 600 mm X 600 mm (River Wash)

b)40mm th. - Upto 1200 mm X 300 mm (River Wash)

### **1.0 Material**

#### **1.1 Rough Kota Stone**

1.1.1 Rough Kota Stone shall conform to M-43.

### **2.0 Workmanship**

2.1 The relevant specifications of item no. 9.10.1 shall be followed except rough kota stone shall be used instead of polished kota stone.

### **3.0 Mode of Measurement and Payment**

3.1 The relevant specifications of item no. 9.10.1 shall be followed except rough kota stone shall be used instead of polished kota stone.

**9.12.b Providing & laying average 25 mm (20 to 25 mm) thick- size up to 1200 mm X 300 mm (Riverwash finish) machined cut Green Rough Kotah stone of approved quality, selected and sorted for uniform color & texture, in floor, otta, sill, skirting, tread, riser etc., in required sizes up to 1200 mm. as per design normal pattern (straight or staggered joint with square or rectangular shaped stone) and drawings (with grooves of 10mm wide or without grooves). Kota stone is to be laid over cement mortar 1:6 bedding of average 40 mm thickness with joints, pointing and finishing and filling the grooves with CM 1:2 as sample approved, including curing and cleaning with wire brush to remove excess cement on the sides of stone up to the satisfaction of the Architect & Engineer-in-charges etc. complete. (NO WAXING WILL BE PERMITTED).**

Relevant specifications of item no. 9.12.b shall be followed except that the thickness of green rough kotah stone shall be 25 mm insted of 40mm.

**9.12.c Providing & laying average 25 mm (20 to 30 mm) thick machined cut green rough kota of approved quality, selected and sorted for uniform color & texture, in floor, otta, sill, skirting, tread, riser etc., in required sizes from 1.0m to 1.5m as per design (normal pattern straight or staggered joint with square or rectangular shaped stone) and**

drawings (with grooves of 10mm wide without grooves). Kota stone is to be laid over cement mortar 1:6 bedding of average 35 mm thickness with joints, pointing and finishing and filling the grooves with CM 1:2 as sample approved, including curing and cleaning with wire brush to remove excess cement on the sides of stone upto the satisfaction of the Architect & Engineer-in-charges etc. complete.

Relevant specifications of item no. 9.12.a shall be followed except the size of Kota stone is above 1000mm and upto 1500mm.

- 9.13.a Providing & fixing average 25 mm (20 to 30 mm) thick single side prepolished (upto semimirror finish) green kota of uniform size and color for platforms, staircases, sinks, shelves, morry etc. upto 1.0 m. long, including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar bedding in CM 1:4 of average 35 mm thickness. Cement joints and pointing as specified with polishing, curing, daily mopping with water and kerosene as directed for at least 15 days or upto the satisfaction of the Architect & Engineer-in-charge etc. complete.**

The relevant specifications of item no. 9.10.a shall be followed except kota stone shall be upto 1.0 m long and 25 mm thick single side prepolished (upto semimirror finish). Bedding shall be in Cement mortar 1:3 (1 Cement: 3 Coarse Sand) of average 20 mm thickness.

- 9.13.b Providing & fixing average 25 mm thick both side prepolished (upto semimirror finish) green kotah of uniform size and colour for shelves and vertical partitions etc. upto 1.0m long including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar 1:3 for filling the jaris. Cement joints and pointing as specified with polishing, curing, daily mopping with water and kerosene as directed for atleast 15 days or upto the satisfaction of the Architect & Engineer-in-charge etc. complete.**

The relevant specifications of item no. 9.10.a shall be followed except kota stone shall be upto 1.0 m long and 25 mm thick both side prepolished (upto semimirror finish). Bedding shall be in Cement mortar 1:3 (1 Cement: 3 Coarse Sand) of average 20 mm thickness.

- 9.13.c Providing & fixing average 25 mm thick single side prepolished (upto semimirror finish) green kotah of uniform size and color for platforms, staircases, sinks, shelves, morry etc. from 1.0 m. to 1.5 m long, including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar bedding in CM 1:4 of average 35 mm thickness. Cement joints and pointing as specified with polishing, curing, daily mopping with water and kerosene as directed for atleast 15 days or upto the satisfaction of the Architect & Engineer-in-charge etc. complete.**

The relevant specifications of item no. 9.10.a shall be followed except Kota stone shall be from 1.0m to 1.5m long and 25 mm thick single side prepolished (upto semimirror finish).

Bedding shall be in Cement mortar 1:3 (1Cement:3 Coarse Sand) of average 20 mm thickness.

- 9.13.d Providing & fixing average 25 mm thick both side prepolished (upto semimirror finish) green kota of uniform size and color for shelves and vertical partitions etc. from 1.0 to 1.5m long, including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar CM 1:3 for filling the jaris. Cement joints and pointing as specified with polishing, curing, daily mopping with water and kerosene as directed for atleast 15 days or upto the satisfaction of the Architect & Engineer-in-charge.**

The relevant specifications of item no. 9.10.a shall be followed except kota stone shall be from 1.0 m to 1.5m long and 25 mm thick both side prepolished (upto semimirror finish). Bedding shall be in Cement mortar 1:3 (1 Cement: 3 Coarse Sand) of average 20 mm thickness.

- 9.14 Providing & fixing green polished kota of average 50 mm. thick of uniform size and colour for sills, floor etc. in required sizes from 1.0 m. to 1.5 m. long, including necessary machine-cut edges (uniform thickness), rounded edges, necessary cement mortar bedding in CM 1:3 of required thickness, average 20 mm. Cement joints and pointing as specified with polishing, curing, daily mopping with water and kerosene as directed for atleast 15 days or upto the satisfaction of the Architect & Engineer-in-charge.**

The relevant specifications of item no. 9.10.a shall be followed except kota stone shall be average 50 mm thick and shall be 1.0 m to 1.5 m long. Bedding shall be in Cement mortar 1:3 (1 Cement: 3 Coarse Sand) of average 20 mm thickness.

- 9.15 Providing roughened strip 2.5 cm. wide to form antiskid surface on floors & treads as per design, including forming straight deep curved gishi (groove), 6 mm. Wide & 4 mm deep on two sides of the roughened area, chiseling, polishing the edges, sides and bottom of gishis etc. complete as per sample approved.**

#### **1.0 Workmanship**

The roughened strip 2.5 cm wide shall be provided as and where directed. The roughing strip shall be carried out by providing two curved grooves on either side of roughed strip provided with machine and polishing the same and as per sample approved.

#### **2.0 Mode of measurement and Payment**

The length of the groove and roughened strip clearly visible shall be measured. The rate shall be for a unit of one meter. Two gishis and roughened strip including polishing the gishis shall be considered as one single unit.

- 9.16 Extra for providing special mirror finish polish on kota flooring over semi mirror polish with different grades of emery like 800, 1200, 5x and buffing with tin oxide. All work to be carried out with polishing machine.**



The relevant specification of polishing of item no. 9.10.a shall be followed except that the special mirror polish finish is achieved with 800, 1200, 5x emery grades and buffing with tin oxide. Item shall be measured and paid in sqm.

**9.17 Providing and laying 18 mm thick marble stone of approved quality (sample of marble stone shall be approved by architect) as per design in required sizes and shapes over 35 to 40 mm (average) thick bedding of cement mortar 1:3 (1 cement: 3 coarse sand) laid and jointed with white cement and matching pigment including rubbing, semi mirror polishing with different grades of Emery, curing etc. complete. (Only finished marble work will be measured.)**

**1.0 Material**

**1.1 Marble stone**

1.1.1 Marble Stone shall conform to M-45.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 11.18.3 is to be followed except that 35 to 40 mm thick bedding of cement mortar 1:3 to be laid.

2.2 **Polishing** shall be normally commenced after 14 days of laying the slab. For special polish polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka. For semi mirror polish polishing to be done with 220, 320, 400, 600 grades of emery. Water shall be properly used during polishing. The flooring shall then be washed clean with oxalic acid. Daily moping for 15 days shall be done after polishing or up to the satisfaction of client and engineer-in-charge. All works shall be carried out as directed by the Architect and as specified in the item, no waxing will be permitted.

2.3 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

2.4 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

**3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.10.1 shall be followed.

**9.18 Extra for providing special mirror finish polish on marble flooring over semimirror polish with different grades of emery like 800, 1200, 5x. All work to be carried out with polishing machine**



The relevant specification of polishing of item no. 9.10.a shall be followed except that the special mirror finish polish is achieved with 800, 1200, 5x emery grades on marble flooring over semi mirror polish.

**9.19.a Providing & laying machine cut single polished red "Dholpur" 25 to 30 mm. thick upto 600 mm in flooring or as per design and drawing in in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves) in cement mortar 1:6 bedding of average 35 to 50mm thickness, pointing with matching pigment and white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emeries) with different grade of emery etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge.**

**1.0 Material**

**1.1 Dholpur stone**

1.1.1 Dholpur Stone shall conform to M-46.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specification clause no. 11.22.2, 11.22.3, 11.22.4 shall be followed except bedding of red dholpur stone shall be laid on cement mortar 1:6 (1 cement: 6 coarse sand) of 35 mm thickness and filling the grooves with 1:1 cement sand mortar.

**3.0 Mode of measurement and Payment**

3.1 Relevant specifications of item no. 9.10.a shall be followed.

**9.19.b Providing & laying machine cut single polished white "Dholpur" 25 to 30 mm. thick upto 600 mm in flooring or as per design and drawing in in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves) in cement mortar 1:6 bedding of average 35 to 50mm thickness, pointing with matching pigment and white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emeries) with different grade of emery etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge.**

Relevant specifications of item no. 9.19.a shall be followed except white Dholpur stone shall be used instead of red Dholpur stone. Sample shall be approved by Architect before procurement and sample for laying of the stones shall be approved before executing the work.

- 9.20 Providing & laying machine cut single polished pinkish "Bansipahadpur" minimum 25 mm. thick slab upto 600 mm in flooring or as per design and drawing in in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves) in cement mortar 1:6 bedding of average 35 to 50mm thickness, pointing with matching pigment and white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emeries) with different grade of emery etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge.**

Relevant specifications of item no. 9.19.a shall be followed except Bansipahadpur stone shall be used instead of red Dholpur stone. Sample shall be approved by Architect before procurement and sample for laying of the stones shall be approved before executing the work.

- 9.21 Providing & laying machine cut single polished "Agra Red" minimum 25 mm. thick slab upto 600 mm in flooring or as per design and drawing in in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves) in cement mortar 1:6 bedding of average 35 to 50mm thickness, pointing with matching pigment and white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emeries) with different grade of emery etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge.**

Relevant specifications of item no. 9.19.a shall be followed except Agra Red stone shall be used instead of red Dholpur stone. Sample shall got approved by Architect before procurement and sample for laying of the stones shall be approved before executing the work.

- 9.22.a Providing and fixing in position, 25 to 38 mm. thick acid and alkali resisting Red Mandana stone of approved size and shape, for flooring, skirting and dado, fixing on average 37 mm. thick cement mortar bedding 1:3 (1cement : 3 coarse sand) , keeping the joints 6 mm wide all around and filling the same with epoxy resin and hardner, including special machine polishing with different grades of Emery, etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge. (size upto 600mm x 600mm)**

## **1.0 Material**

## **1.1 Red Mandana Stone**

1.1.1 Red Mandana stone shall conform to M-48.

## **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

## **2.0 Workmanship**

2.1 The relevant specifications of item no. 9.19.a shall be followed except "Red Mandana" stone shall be used instead of Dholpur Stone as specified in item description. Stone shall be laid on 37 mm thick bedding of cement mortar 1:3. Sample shall be approved by Architect and engineer-in-charge.

Acid-alkali proof powder shall be mixed with cement as per the manufacturer's specifications to prepare the cement mortar 1:3 for bedding. The stones of desired size shall be laid on the mortar bed of average thickness 37 mm. for flooring and 15-20 mm for dado/skirting, in proper line and level with joints of even thickness of 6 to 8 mm. all around. The joints shall be raked to 10 to 12 mm deep and filled with epoxy-basin resin.

## **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.10.a shall be followed.

### **9.22.b Reduction in item no. 9.22.a for not providing and filling in position epoxy resin all around the joints.**

Relevant specification for 9.22.a shall be followed except that the flooring shall be laid without groove. The rate shall be as per item no 9.22.a but after deducting the cost of providing and filling epoxy resin and hardener in the groove.

### **9.23 Providing & laying machine cut single polished Jesalmer yellow, 18 mm. thick in flooring as per design and drawing over 35 to 40 mm thick mortar 1:3 bedding and pointing in joints in white cement with pigment, curing etc. complete. The rate should also include for special polishing with different grades of emery, daily moping with water etc. complete. The work shall be carried out as directed by engineer-in-charge.**

## **1.0 Material**

### **1.1 Jesalmer Yellow Stone**

1.1.1 Jesalmer Yellow stone shall conform to M-49.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

## **2.0 Workmanship**

- 2.1 Relevant specifications of item no. 9.17 shall be followed except that 18 mm thick Jesalmer yellow stone shall be used instead of marble stone.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 9.10.a shall be followed.

**9.24.a Providing & laying approved quality machine cut mirror finished granite of approved shade, thickness 18-20 mm., in Basin top , floor, otta, sill, skirting, dado etc. in required sizes (not exceeding 2100mm(L) m. x 750 mm(B).) and shapes, including average 45 mm thick cement mortar bedding in 1:6 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the EIC (Only finished work will be measured.) etc. all complete as per approved sample by Architect, drawings and instruction of EIC. at all floors / all levels / all heights and all shapes. The rate includes machine cut edges of uniform thickness, rounding of edges, champhering and mirror polishing of edges. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets.**

**(Sample to be approved before mass production/construction/purchase)**

### **1.0 Material**

#### **1.1 Granite Stone**

- 1.1.1 Granite stone shall conform to M-47.

### **2.0 Workmanship**

- 2.1 Relevant specifications of item no. 9.17 to be followed except that 18 mm thick mirror finish granite shall be used instead of marble stone.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 9.10.1 shall be followed.

**9.24.b Providing & laying approved quality machine cut flame finished granite of approved shade, thickness 18-20 mm., in flooring , otta, sill, skirting, dado etc. in required sizes (not exceeding 2100mm(L) m. x 750 mm(B).) and shapes, including average 45 mm thick cement mortar bedding in 1:6 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the EIC (Only finished work will be measured.) etc. all complete as per approved sample by Architect, drawings and instruction of EIC. at all floors / all levels / all heights and all shapes. The rate includes machine cut edges of uniform thickness, rounding of edges,**

**champhering and mirror polishing of edges. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets.**

Relevant specifications of item no. 9.24.a shall be followed except that 18 mm to 20 mm thick flame finish granite shall be used instead of mirror finished granite

**9.24.c Providing & laying 18 to 20 mm thick both side polished granite of approved shade and quality, selected and sorted for uniform color for urinal, platform as per design and in required sizes and shapes over required size of cement mortar bedding in 1:3. (Only finished granite work shall be measured). The rate includes rounding, champhering and mirror polishing of edges. The work shall be carried out as per the approval of architect and engineer-in-charge.**

Relevant specifications of item no. 9.24.a shall be followed except that 18 to 20 mm thick both side polished granite shall be used instead of mirror finished granite.

**9.25.a Providing and fixing cobbles of approved make as per design and drawing with 50 mm thick top layer of coarse sand bedding (cushioning layer), under layer of compacted sub-base(in required slope and of specified thickness). Sample to be approved by the Architect before procurement of the material. The work shall be carried out as per the approval of architect and engineer-in-charge. The rate shall be inclusive of layer of coarse sand but exclusive of preparing layer of subbase.**

**1.0 Material:**

**1.1 Cobbler stone**

1.1.1 Cobbler Stone shall conform to M-50.

**2.0 Workmanship**

2.1 50 mm thick coarse sand shall be laid as cushioning layer for arranging the cobbler stone. Joints of the cobbler stone shall be filled with the sand.

2.2 The cobbler stone shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Engineer-in-charge's instruction.

2.3 The relevant specifications of roadwork shall be used for preparing the sub grade.

**3.0 Mode of Measurement and Payment**

3.1 The mode of measurement and rate shall be for one sqm.

**9.25.b Fixing granite cobbles made from granite available at site as per design and drawing with 50 mm thick top layer of coarse sand bedding (cushioning layer), under layer of compacted sub-base(in required slope and of specified thickness as per drawing). Sample to be approved by the Architect before laying of the material. The work shall be carried out as per the approval of architect and engineer-in-charge. The rate shall be inclusive of layer of coarse sand and labour charges for fixing cobbles but exclusive of preparing layer of subbase.**

**1.0 Material:**

**1.1 Cobbles**

1.1.1 Cobbles as per drawing are to be made from granite available at site with machines.

**2.0 Workmanship**

2.1 50 mm thick coarse sand shall be laid as cushioning layer for arranging the cobbler stone. Joints of the cobbler stone shall be filled with the sand.

2.2 The cobbles shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Engineer-in-charge's instruction.

2.3 The relevant specifications of roadwork shall be used for preparing the sub grade.

**3.0 Mode of Measurement and Payment**

3.1 The mode of measurement and rate shall be for one sqm.

**9.26 Providing and laying in position grill having thickness upto 50 mm and smooth finish made out of sandstone like Bansipahadpur, Hindon or Karoli of specified colour, having size not more than 1.5 m. x 0.6 m., of any pattern and design as per drawing. The same shall be fixed with white cement, Araldite and coloured pigment in required proportion with necessary scaffolding and finishing at all heights with necessary scaffolding and curing etc. complete as directed by engineer in charge.**

**1.0 Material**

**1.1 Sandstone Grill**

1.1.1 Sample shall be approved by the Architect and Engineer-in-charge.

1.1.2 It shall be made from best quality either Bansipahadpur or as specified in item having uniform colour (no other colour spot shall be allowed) and texture. The sand stone shall be even, sound, durable and free from any veins, cracks and flaws. The thickness of the stone used shall be as specified in item of work with the permissible tolerance of  $\pm 2$  mm.

1.1.3 The sandstone grills shall be produced by fine chiselling. All edges, faces and angles of fine hand chiselled grills, columns, baluster shall be smooth finished.

1.1.4 The carving shall be done as per detailed design, drawing and direction of the Architect and Engineer-in-charge.

**2.0 Workmanship**

2.1 The grill shall be fixed in position by using white cement, coloured pigment and araldite in required proportion.

2.2 The engraving shall be done on approved in design of approved pattern. The work shall be done in best workmanship manner and very neatly.

2.3 This includes necessary scaffolding, finishing at all heights required for satisfactory completion of work.

### **3.0 Mode of measurement and Payment**

3.1 The rate shall be for an unit area of one sqm of actual area of grill provided without any tolerance.

**9.27 Providing and laying chequerred 22 mm thick precast cement concrete tiles of approved make in for external pavings such as pavements, garages, pathways, swimming pool, deck etc. over CM (1:6) of 35 mm thickness including pointing of joints with white cement mixed with pigment to match the shade of the tiles including rubbing and cleaning etc. complete.**

#### **1.0 Material**

##### **1.1 Precast Cement Concrete Tile**

1.1.1 Precast cement concrete tile shall conform to M-51.

#### **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.01 shall be followed except tiles will be precast cement concrete tile.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.01 shall be followed except tiles will be precast cement concrete tile is to be used instead of precast terrazzo tile.

**9.28 Providing and fixing 60 mm M 30 grade thick abrasion resistant shot blasted interlocking / non interlocking or Brick type paver blocks of approved make and colour as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base.**

#### **1.0 Material**

##### **1.1 Interlocking Paver Block**

1.1.1 Interlocking Paver Block shall conform to M-52.

Relevant specifications of item no. 9.25 shall be followed except abrasion resistant shot blasted interlocking/non interlocking or brick type paver blocks shall be used instead of cobbler stone.

**9.29.a Brick on edge flooring with bricks of class designation 75 including cement slurry, finishing the joints, flush pointing, curing etc. complete as per drawing in cement mortar 1:6 with F.P.S. bricks. Sample shall be approved by architect and engineer-in-charge.**

Nabhi's commentary on CPWD specifications clause no. 11.1.1 to 11.1.9 shall be followed.

**9.29. b Dry brick on edge flooring in required pattern with bricks of class designation 75 on a bed of 12 mm mud mortar including filling joints with river sand (with F.P.S. bricks) complete**

Nabhi's commentary on CPWD specifications clause no. 11.1.10 shall be followed.

**9.30 Providing and laying PVC (Poly vinyl chloride) floor tile / sheet of approved make, shade as per design, with proper rubber based adhesive solution of approved make. Adhesive to be used shall be as per manufacturer's specification. Sheets are to be fusion welded and should not appear visually. The rate includes making seamless joints and cleaning the flooring, taking precautionary measures till handing over to client etc. complete as directed by engineer in charge and as per manufacture's specification.**

**1.0 Material**

**1.1 PVC Floor tile / Roll**

1.1.1 Poly Vinyl Chloride Floor tile / Roll shall conform to M-53.

**1.2 Adhesive**

1.2.1 Adhesive shall be of approved make and meet the requirement as per manufacture's specification.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 11.25.2, 11.25.3, 11.25.4 shall be followed for preparation of sub-floors, laying and fixing and precautions for maintenance in accordance with manufacture's specification. In PVC (Poly Vinyl Chloride) floor tile / roll joints shall be treated with hot and fusion welding or cold liquid welding as per manufacture's specification and should not appear visually.

**3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specification clause no. 11.25.5 shall be followed.

3.2 The rate shall include the cost of material and labor required for all operations involved in laying of floor tile and precautions taken for maintaining the floor until handing over to client as directed by engineer in charge. The rate does not include the cost for sub floor.

**9.31 Providing and fixing 2.5mm thk. 2m wide in roll form Linoleum monolithic floor of TARKETT or equivalent to be laid & fixed over the leveled surface strictly as per manufacturers specification. Method & materials for joining the Linoleum sheets are to be fusion welded and should not appear visually. Requisite levelling course for fine leveling is to be provided as per manufacturer specification. Adhesive to be used shall be as per subjected to manufacturers recommendation. Before procurement sample of the product is to be approved by Architect or Engineer-in-charge.**



**1.0 Material**

**1.1 Linoleum**

1.1.1 Linoleum shall conform to M-54.

**1.2 Adhesive**

1.2.1 Adhesive shall be of approved make and meet the requirement as per manufacture's specification.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 11.26.2, 11.26.3, 11.26.4 shall be followed in accordance with manufacture's specification. In Linoleum roll joints shall be treated with hot and fusion welding as per manufacture's specification and should not appear visually

**3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specification clause no. 11.26.5 shall be followed.

3.2 The rate shall include the cost of material and labor required for all operations involved in laying of linoleum floor and precautions taken for maintaining the floor until handing over to client as directed by engineer in charge. The rate does not include the cost for sub floor.

**9.32 Providing and laying sintered unglazed acid resistant tiles of approved make, shade and size in desired pattern including bedding of CM 1:3 as per the manufacture's specification including pointing, jointing, cleaning etc. complete as directed by the engineer-in-charge.**

**1.0 Material**

**1.1 Acid and Alkali Resistant Tile**

Acid resistant tile shall conform to M-55.

**2.0 Workmanship**

2.1 The surface should be clean, dry and leveled where mortar bed is to be applied. The tiles are to be fixed on bedding of cement Mortar 1:3 (1cement: 3 coarse sand). The tiles are to be laid with a closed joint or a groove of 1 to 2 mm as per the design.

2.2 If the tiles are to be laid in the battery rooms, water and effluent treatment plants, chemical storage tanks, acid pits etc. than 2 coats of bitumen primer shall be provided as a bedding over which 6 mm thick bitumen mastic mortar shall be provided as a bedding. Over the bitumen mastic mortar 6 mm thick acid resistant silicate mortar bedding is provided.

2.3 Joints to be filled with cement mortar 1:3 if not specified in the item. At some places joints are to be filled with epoxy grout of approved make.

### **3.0 Mode of measurement and Payment**

3.1 The rate shall be for a unit of one sqm.

**9.33 Providing and fixing glass mosaic of approved make and colour as per design in floor, dado in line, level and gradient at all levels and heights in any shape. Chemicals or bonding material for fixing the tiles of size 25mm x 25mm shall be as per manufacturer's specification. Grouting of the joints to be done with cement grout of matching colour or as directed by manufacturers specification including necessary cleaning with oxalic acid. Sample of material and pattern is approved by engineer-in-charge.**

### **1.0 Material**

#### **1.1 Glass Mosaic**

1.1.1 Glass Mosaic shall conform to M-57.

### **2.0 Workmanship**

2.1 Fixing of mosaic tile shall be as per manufacture's specification. Sample of the tiles for shade and finish is to be approved by the Architect prior to procurement and after one sample is to be laid over the wall, it is to be approved by the Architect.

2.2 Tile Adhesive or glue is to be applied on the plastered surface and paper with glass mosaic is stucked on the glued surface. After some time the paper is removed from the surface of the glass mosaic.

### **3.0 Mode of measurement and Payment**

3.1 The item shall be measured and paid in sqm.

**9.34.a Providing and laying cement concrete for roads, pavements & floors 100 –150 mm. thick with machine mixed, machine vibrated M25 concrete with minimum cement content 360 kg/cum etc. in required slope and camber as per drawing including giving a floating coat of 1:1 cement mortar, with nominal temperature steel / weld mesh / fibers / dowel bars / tie bars at joints as specified by the Architect/Engineer-in-charge. The rate shall be exclusive of reinforcement steel, weld mesh, fibers, dowel bars etc. and the same shall be paid in relevant tender items. Rate shall be inclusive of concrete (to be laid in alternate panels of 3.75 m X 5.5m) with steel channel formwork. Sieved sand shall be used.**

Relevant specifications of item no. 9.04.a shall be followed in accordance with relevant specifications of RCC and PCC works as per sample approved by architect and as directed by engineer in charge. The rate shall be for a unit of one cum.

- .34.b Extra for carrying out vacuum dewatering & Power floater treatment in roads, pavements, floors well compacted, mechanically vibrated with screed vibrator, finished to required levels, floated with neat cement and power trowelled to get desired smooth finish / broom finish, over a leveling course, including MS channel or box shuttering, curing for 10 days with gunny bags etc complete. The size of panel should be approximately 3.75 x 5.5 m or as directed by Engineer. The Contraction joints to be formed at every 5m distance by grooving with mechanical saw within 48 hrs. Groove/sawed joints/ longitudinal joints shall be made of 6mm width and 25 mm depth min (1/3 rd depth of the pavement) as shown in the drawing. The rate shall be inclusive of labour, making the grooves and machinery cost.**

## **1.0 Material**

### **1.1 Equipment for compacting, placing, vacuum processing and finishing of slab**

All process equipment to be used shall be of a design representative of the state of the art, and shall be subject to the approved of the engineer. Equipment shall be trimix or approved equal. System shall have a demonstrated five years' history of performing such work. The vacuum pumps shall be able to generate a minimum vacuum of 609mm (24 inches) of mercury (0.80 atmospheres) in actual operation using the maximum number and size of suction mats required for this work.

The Contractor shall have at the job site sufficient equipment (vacuum pumps, mats, fitter pads and accessories) to ensure that the vacuum dewatering process continues uninterrupted to completion. Stand by equipment is sometimes required.

### **1.2 Planning of Placing**

The Contractors shall submit for review shop drawings for floor slabs detailing the location of all construction joints and the sequence of the slab placement and manufacturer's literature describing the equipment to be used. In addition to the shop drawings, the Contractor shall indicate the quantity of each piece of dewatering equipment that will be located at the construction site and shall include the dimensions of all suction mats.

Before concreting is started the work should be planned with a view to determine areas to be placed daily, the required amount of equipment, size of vacuum mats, length of vacuum hoses, arrangement of rails, if any, or screeds etc. Crew required for the vacuum process is two men to handle the mats and the pump. Note that placing, vibration with vibratory needle and screed vibrator for vacuum treatment and floating follow immediately behind each other.

Check position of vacuum pump in relation to vacuum mat location to find whether extra vacuum hoses are required.

### **1.3 Equipment Specification Trimix System**

Poker vibrator with high frequency preferably 335 hz (20 000 vibr/min) dia. 1 to 1 1/2".

Surface vibrator type double beam with beam spacing 12".

Preferably one-piece beam in full length exceeding bay width 8" to 24". Beam should easily be adjusted to absolute straightness and controlled every morning before placing of concrete starts.

Suction mat type RM 60. 100% tight plastic material weight 650 gram/m<sup>2</sup>. Width same as bay size and length 20' for capacity and flexibility.

Filter Pad type RD 12 weight 600 g/m<sup>2</sup>, width 4' length-bay width-minus 8".

Vacuum Pump P 4001 8 with 10 HP engine and specially designed pump unit with heavy duty chrome housing and sealing. Adjustable vacuum by valve on top of tank for ease of operation with different mix designs.

Skim floater type G 900/G 700 with disc which allows direct floating of dewatered concrete. Weight maximum 90kg (200 pounds) for 40"(W.disc.)

Finishing is done with G 900, using blades only and is normally done with 30 minutes' intervals between passes.

The above equipment specified should be used for the production of quality concrete floors according to the Trimix System. Inter-changeability of equipment is not recommended.

## **2.0 Workmanship**

### **2.1 General**

The work shall be planned and executed so that there is no delay between the placement, screeding, dewatering and floating of the concrete. Concrete to be vacuum dewatered shall be handled and placed so as to prevent segregation. The concrete shall be internally vibrated prior to screeding.

### **2.2 Levelling**

Immediately following placement, the concrete shall be levelled with a vibrating screeding running on a true surface, set at the proper elevation required to provide the specified finished elevation. The concrete surface shall be screeded high by 2% of the slab's thickness to compensation for the compaction caused by the vacuum dewatering process. (Slabs to have an aggregate hardener shall have compensation made to maintain elevation). The vibrating screed shall be moved forward as rapidly as proper consolidation allows. The proper surcharge of concrete must be maintained in front of the leading edge of the screed.

### **2.3 Vacuum**

Immediately after levelling, the concrete shall be covered with filter pads and suction mats in strict accordance with the recommendation of the manufacturer to have the slab fully dewatered. The suction mat shall extend 4

inches beyond the edge of the filter pad on all sides. The pads shall extend to within 4" of the edge of concrete slab, and the mats shall cover entire slab. Before connecting the hose on the suction mat to the vacuum pump, the edges of the mat shall be smoothed to enable an airtight seal to be created. A vacuum shall then be applied to the mat. After a minute the gauge on the vacuum pump should indicate a minimum vacuum of 0.70 atmospheres (24.0 in. Hg) and if not, the mat must be checked for leakage. For concrete that dewater readily the vacuum should then be maintained at 0.70-0.80 atmospheres (24.0-25.5 in. Hg.) For concrete which dewater less efficiently (e.g. air-entrained concrete) the vacuum shall then be reduced to 0.50-0.60 atmospheres (15.0-18.0 in. Hg). After approximately 10 minutes the vacuum can then be increased to 0.80 atmospheres.

The vacuum shall be maintained for at least 3 minutes per inch of concrete thickness at 0.80 atmospheres. (Where aggregate hardeners are specified, sufficient moisture shall be maintained to meet manufacturer's requirements). The suction mats and filter pads shall then be removed and moved to the next section in leapfrog manner.

Stop the vacuum dewatering when light footprints only are left in the concrete when stepped upon. A suitable suction time can also be checked with a Proctor-apparatus, which should show 1.5-2 kp/cm<sup>2</sup>.

#### **2.4 Floating**

Upon removal of the suction mats and filter pads the concrete surface shall be power-floated without delay until all imprints from the vacuum process are removed. If crusting occurs, the floating operation must be delayed till the concrete carries the machine.

The higher speed is recommended for the floating operation. Two passes with the floating disc should be made in the junction of two mats in order to avoid risk for cracking.

#### **2.5 Finishing**

The waiting time after the floating operation depends on concrete temperature and humidity and varies from 10 minutes to 2 hours.

The trowelling operation cannot take place before the concrete has hardened enough to carry the machine, i.e. the trowelling blades will not leave any marks on the concrete. Repeated trowelling. With intervals between the

passes, which are adapted to the setting of the concrete, greatly improves the surface characteristics. The surface will be more wear resistant and less dusty. At least two passes are recommended for floors, which are not to be covered.

## 2.6 Curing

Vacuum dewatered concrete should be cured like any other quality concrete in order to achieve a good final result with ponding.

## 3.0 Mode of measurement:

The item shall be measured and paid in sqm excluding cost of concrete & steel. The cost of steel & concrete shall be measured & paid separately under relevant items. Rate of shuttering with MS channels & cutting of grooves is inclusive.

**9.35.a Providing and laying Non Cushion Synthetic Floor system of Sports Master or equivalent in 4 layers, consisting of two layer of leveling course of level master make or equivalent and two layers of approved shade Acrylic paint and marking of lines with white paint of colour plus make or equivalent as per the manufacturer's guideline in line, level and gradient to the satisfaction of Engineer-In-Charge including the cost of base course specified under section a to c below. The work shall be executed by specialized agency with five years of guarantee bond.**

1. **Providing and Laying WBM of 75 mm thick with aggregate size 63 mm well graded down to 12 mm with quarry dust in appropriate proportion to fill up the voids and consolidating with water and rolling with 8-10 tone power driven roller to achieve strong and stable base to receive the 50 mm thick bituminous macadam including anti termite treatment in line, level & gradient. Cost of anti termite treatment shall be paid separately as per relevant tender item.**
2. **Providing and laying 50 mm thick fair finish Bituminous Macadam with aggregate size 12mm down to 6 mm well graded and mixed with bitumen at 5% by weight, adding necessary binder material in appropriate proportion as per the manufacturer's recommendation including rolling in both directions by power driven roller for compaction and applying tack coat @ 1kg/sqm on WBM etc. complete.**
3. **Providing and laying average 20 mm thick Asphalt Concrete with well graded aggregate size 6mm down to 2mm and mixing it with bitumen at 6% by wt of the mix and 10% stone dust (quarry dust) and adding necessary binder in appropriate proportion and rolling it with 8-10 tone power driven roller taking care of undulations and wheel marks etc, including laying of tack coat of hot bitumen @ 0.5 kg/sqm on Bituminous macadam to receive the Asphalt Concrete etc. complete.**

## 1.0 Material

1.1 Material shall be from Sports Master or equivalent. Sample for shade and finish to be approved by Architect or Engineer in charge before procurement of material. Materials like stone aggregate, bitumen, water, quarry dust etc. shall confirm to relevant material specification.

## **2.0 Workmanship**

2.1 The work shall be carried out with the best construction practice with true line, level and gradient.

2.2 The work shall be carried out as per manufacturer's specification.

## **3.0 Mode of Measurement and Payment**

3.1 The work shall be measured and paid on sqm.

**9.35.b EXTRA for Synthetic floor with 6 layer cushion system, consisting of one layer of leveling course of level master make or equivalent, three cushion layer of cushion master make or equivalent, two layers of approved shade Acrylic paint and marking of lines with white paint of colour plus make or equivalent as per the manufacturer's guideline in line, level and gradient to the satisfaction of Engineer-In-Charge.**

The relevant specifications of item no. 9.44.a to be followed except the work shall be carried out in six layers of cushion system.

**9.35.c EXTRA for Synthetic floor with 8-layer cushion system, consisting of one layer of leveling course of level master make or equivalent, five cushion layer of cushion master make or equivalent, two layers of approved shade Acrylic paint and marking of lines with white paint of colour plus make or equivalent as per the manufacturer's guideline in line, level and gradient to the satisfaction of Engineer-In-Charge.**

The relevant specifications of item no. 9.44.a to be followed except the work shall be carried out in eight layers of cushion system.

**9.36 Providing, fixing & laying rubber tile of approved make in exterior / interior flooring, with desired colour, size & thickness of as approved by engineer in charge. Rubber tiles procured should be fixed with the help of adhesive suggested by the manufacture over firm concrete base OR strictly according to manufacturers instruction guidelines. Before laying the tiles, surface should be neat, clean from dirt or other inert material. Requisite levelling course for fine leveling is to be provided as per manufacturers specification. All the characteristic of product should match with manufacturer's specification. Sample is to be approved with Architect before procurement and after laying of the one tile, sample needs to be approved by the Architect.**

## **1.0 Material**

1.1 Rubber Tile shall conform to M-58.

**2.0 Workmanship**

2.1 The work shall be carried out with the best construction practice with true line, level and gradient as per the latest IS code.

2.2 The work shall be carried out as per relevant manufacturer's specification.

**.0 Mode of Measurement and Payment**

3.1 The work shall be measured and paid on sqm.

**9.37.a Providing and fixing homogenous solid wood floor of \_\_mm thk. of approved make as per manufacture's specification. Rate shall be inclusive of all the accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design. Floor is to be laid over the sound levelled, dry and clean surface of marine plywood as directed by engineer in charge.**

**1.0 Material**

1.1 Solid Wood shall conform to M-59A.

**2.0 Workmanship**

2.1 The work shall be carried out as per relevant manufacturer's specification.

2.2 The work shall be carried out in true line, level and gradient as per best construction practice.

**3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in sqm.

3.2 The rate shall be inclusive of all accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design.

3.3 The rate shall be inclusive of material and skilled labour required for carrying out the work as per manufacture's specification as directed by engineer in charge.

**9.37.b Providing and fixing engineered wood floor of \_\_mm thk. of approved make as per manufacture's specification. Rate shall be inclusive of all the accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design. Floor is to be laid over the sound levelled, dry and clean surface as directed by engineer in charge.**

**1.0 Material**

1.1 Engineered Wood shall conform to M-59B.

**2.0 Workmanship**



- 2.1 The work shall be carried out as per relevant manufacturer's specification.
- 2.2 The work shall be carried out in true line, level and gradient as per best construction practice.

**3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm.
- 3.2 The rate shall be inclusive of all accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design.
- 3.3 The rate shall be inclusive of material and skilled labour required for carrying out the work as per manufacture's specification as directed by engineer in charge.

**9.37.c Providing and fixing laminated wood floor of \_\_mm thk. of approved make as per manufacture's specification. Rate shall be inclusive of all the accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design. Floor is to be laid over the sound leveled, dry and clean surface as directed by engineer in charge.**

**1.0 Material**

- 1.1 Laminated Wood shall conform to M-59C.

**2.0 Workmanship**

- 2.1 The work shall be carried out as per relevant manufacturer's specification.
- 2.2 The work shall be carried out in true line, level and gradient as per best construction practice.

**3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm.
- 3.2 The rate shall be inclusive of all accessories like edge strip, joining strip, quarter strip, moulding strip etc. required as per design.
- 3.3 The rate shall be inclusive of material and skilled labour required for carrying out the work as per manufacture's specification as directed by engineer in charge.

**9.38 Providing and fixing outdoor wood floor of \_\_mm thk. of approved make Takettt or equivalent as per manufacture's specification. Floor is to be laid over the polypropylene patenet grid as per manufacture's specification and as directed by engineer in charge.**

**1.0 Material**

### **1.1 Wood Planks**

1.1.1 Wood planks shall be as per manufacture's specification

### **2.0 Workmanship**

2.1 The work shall be carried out as per relevant manufacturer's specification.

2.2 The work shall be carried out in true line, level and gradient as per best construction practice.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in sqm.

3.2 The rate shall be inclusive of accessories required as per manufacture's specification.

3.3 The rate shall be inclusive of material and skilled labour required for carrying out the work as per manufacture's specification as directed by engineer in charge.

**9.39 Providing and laying in position clay tiles of size 200 mm X 80 mm as per approved sample, as per design and drawing on exterior wall as cladding. Tile is to be fixed over 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand). Tile shall be fixed with 1:1 cement sand mortar of average 6 mm thickness with bonding agent / integral tile adhesive of approved make of behind the tiles including keeping the groove of (5mm x 5mm) with PVC spacer of approved make and grouting in grooves (5mm width x 3mm deep) with cementitious grout of matching shade etc. complete as directed by engineer-in-charge. Rate is inclusive of back coat of 12 to 15 mm thick plaster, grouting with cementitious grout.**

### **1.0 Material**

#### **1.1 Clay Tile**

1.1.1 Clay tile shall be as per approved sample by Architect.

#### **1.2 Cement Mortar**

1.2.1 Nabhi's commentary on CPWD specifications clause no. 3.2.2 to followed.

#### **1.3 Water**

1.3.1 Nabhi's commentary on CPWD specifications clause no. 3.1.1 to be followed.

### **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.02.c shall be followed except the clay tile of approved sample is to be followed instead of ceramic tile. Tile is to be fixed with 1:1 cement sand

mortar of average 6 mm thickness with bonding agent / integral tile adhesive of approved make.

- 2.2 The grouting material shall be filled when the grooves are completely dry and only after proper cleaning of the grooves, which are to be grouted. The grouting of the grooves with cementitious grout shall be carried out as per manufacturer's specifications. On completion of the work the cleaning shall be done properly to have a neat finished surface.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 9.02.c shall be followed except clay tile is to be used instead of ceramic tile.
- 3.2 Rate is inclusive of making the groove with PVC spacer, grouting with cementitious grout as per manufacture's specification.

### **9.40 Providing & laying sandwich platform comprising of**

1. **Sandwich of 18 mm thk Granite of approved shade and sample on top and 25 mm thk polished kota in bottom with 30 mm thk screed of (1:2:4) in between**
2. **At centre vertical sandwich supports of 25 mm thk two kota stone on sides, screed (1:2:4) in between and at both end walls vertical supports of 18 mm thk granite.**
3. **75 mm raised platform at bottom with kota on top and screed (1:2:4) at bottom, kota stone skirting as per design and approved sample.**

The rate includes rounding, champhering and mirror polishing of edges, facias of granite, including necessary bonding adhesive (if required) of approved make or equivalent. Rate shall be also inclusive of making holes & cutouts for SS sink, Oval wash basin, Piller tap / Bib tap etc. as directed by engineer in charge. (Only finished single side granite work shall be measured & paid for).

Relevant specifications of item no. 9.10 shall be followed and work shall be carried out as per drawing and direction of engineer in charge. Item shall be measured and paid in Rmt.

- 9.41 **Providing & fixing stone cladding on wall for all heights with natural finish "AGRA RED" stone, 30 mm thick having maximum size of 1200x600 mm with grooves (10mm x 10mm) in both direction, filling the grooves with epoxy grout (10mm x 5mm) of matching shade as per detail design and drawing. The stone shall be fixed with stainless steel clamps (304 grade) of approximate size 100x20x4mm (LxWxthick) inserted in the wall, curing etc. complete. The rate shall also include backing coat wired finish plaster of average 15 mm thick in cement mortar 1:4 (1 cement: 4 coarse sand) with polypropylene fibers (----gms per 1 cement bag) of approved make, grouting the clamps in brick wall**

**with non shrink cement mortar and anchor fasteners for RCC surfaces, etc. complete. The work shall be carried out as per the cladding sample approved by Architect and engineer in charge**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Sand Stone Slab**

1.3.1 Sand stone slabs of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. The exposed face shall have no veins or unsightly stains and defects. They shall have uniform colours as approved by the Architect. Samples shall be got approved by the Architect before procurement of the slabs. The surface shall be fine polished and sides machine cut, true to line and level.

**1.4 Epoxy Grout**

1.4.1 Epoxy Grout shall conform to M-38B.

**2.0 Workmanship**

2.1 Red Agra stone slab is fixed with 15 to 20 mm CM (1:2) on to the wall and the sand stone slabs with machine cut edges shall be pressed on to them firmly. By gently tapping of the slab if sound is coming, it shows there are any hollows. When the hollow cannot be filled with grout and the finished slab continues to give a hollow sound on tapping the slab shall be removed and reset.

**3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in sqm. The relevant specifications of item no. 7.01 shall be followed and only clear visible area will be measured and paid. These shall include clamps, fixing with cement mortar, grouting with epoxy grout, cleaning, polishing etc. as directed by engineer in charge.

**9.42 Providing & laying machine cut single polished pinkish "Bansipahadpur" minimum 25 mm. thick slab up to 800 mm in flooring,skirting,dado,sill,parapet top, chajja top etc. or as per design and drawing in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves) in cement mortar 1:6 bedding of average 35mm thickness, pointing with matching pigment and**

**white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emery's) with different grade of emery etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge. The rate shall also include cutting in stone for electrical points/boxes etc. complete.**

Relevant specifications of item no. 9.19.a shall be followed except Bansipahadpur stone shall be used instead of red Dholpur stone. Sample shall be approved by Architect before procurement and sample for laying of the stones shall be approved before executing the work.

**9.43 Providing & laying machine cut average 30mm. thick acid and alkali resisting Red Mandana stone slab in flooring,skirting,dado,sill,parapet top, chajja top etc. or as per design and drawing in in normal pattern straight or staggered joint with square or rectangular shaped stone (with grooves (10mm wide or without grooves and filling the same with epoxy resin and hardener) in cement mortar 1:6 bedding of average 35mm thickness, pointing with matching pigment and white cement in joints or filling the grooves with CM 1:2 and matching pigment, curing etc. complete. The rate shall also include for rubbing and polishing (without scratches and marks of emery's) with different grade of emery, cutting in stone for electrical points/boxes etc. complete. The work shall be carried out as per the approval of architect and engineer-in-charge.**

**9.43.1 a) up to 600(L) x 600(B)**

**9.43.2 b) up to 300(L) x 600(B)**

**2.0 Material**

**1.1 Red Mandana Stone**

1.1.1 Red Mandana stone shall conform to M-48.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**2.0 Workmanship**

2.1 The relevant specifications of item no. 9.19.a shall be followed except "Red Mandana" stone shall be used instead of Dholpur Stone as specified in item description. Stone shall be laid on 35 mm thick bedding of cement mortar 1:6. Sample shall be approved by Architect and engineer-in-charge.

Acid-alkali proof powder shall be mixed with cement as per the manufacturer's specifications to prepare the cement mortar 1:6 for bedding. The stones of desired size shall be laid on the mortar bed of average thickness 35 mm. for flooring and 15-20 mm for

dado/skirting, in proper line and level with joints of even thickness of 6 to 8 mm. all around. The joints shall be raked to 10 to 12 mm deep and filled with epoxy-basin resin.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.10.a shall be followed.

**9.44 Providing & laying approved quality machine cut mirror finished granite of approved shade, thickness 18-20 mm., in floor, otta, sill, skirting, dado etc. in required sizes (1.8m x 0.8m, 2.1mt x 0.8m, 3.4mt x 0.8 mt, 1.4mt x 1.0mt.) and shapes, including average 45 mm thick cement mortar bedding in 1:6 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the EIC (Only finished work will be measured.) etc. all complete as per approved sample by Architect, drawings and instruction of EIC. at all floors / all levels / all heights and all shapes. The rate includes machine cut edges of uniform thickness, rounding of edges, champhering and mirror polishing of edges, cutting in stone for electrical points/boxes etc. complete. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets.**

### **1.0 Material**

#### **1.1 Granite Stone**

1.1.1 Granite stone shall conform to M-47.

### **2.0 Workmanship**

2.1 Relevant specifications of item no. 9.17 to be followed except that 18 mm thick mirror finish granite shall be used instead of marble stone.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 9.10.a shall be followed.

**9.45 Providing & laying approved quality machine cut river wash finished granite of approved shade, thickness 18-20 mm., in floor, otta, sill, skirting, dado etc. in required sizes (not exceeding 1.5 mt x 1.0mt) and shapes, including average 45 mm thick cement mortar bedding in 1:6 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the EIC (Only finished work will be measured.) etc. all complete as per approved sample by Architect, drawings and instruction of EIC. at all floors / all levels / all heights and all shapes. The rate includes machine cut edges of uniform thickness, rounding of edges, champhering**

and mirror polishing of edges, cutting in stone for electrical points/boxes etc. complete. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets.

Relevant specifications of item no. 9.24.a shall be followed except that 18 mm to 20 mm thick flame finish granite shall be used instead of mirror finished granite

- 9.46 Providing, laying & fixing Smooth/Natural Finish Machine Cut Bansipaahadpur Red/Pink Wet Mechanical Stone Cladding of minimum 30mm thk, best quality selected and sorted for uniform color and texture of specified stone of max. size 1100 X 700mm in position on RCC Wall / Brick Wall up to 8 mtrs ht. (Approximate) from finish level, "using SS-304 clamps comprising of pins and adjustment bolts of SS-304 material of AXEL Industry or equivalent as approved by EIC, clamp shall be fixed to RCC/Brick Wall using stainless steel anchor fasteners- HSA 10/90. clamps & anchor fastener @ 2nos / stone to be considered & however type and no. of SS Clamp shall be as per approval of Architect or EIC. Additional clamps as required at the edges/corners, first row, last row as per the drawing and pattern. Surface of the stone should be uniform without any marking or efflorescence, edges shall be water cut and finished. Top edge with SS-304 angle fixed to RCC Wall using SS anchors as per the drg. Cladding shall only be done after the surface is plastered which shall claim in specific tender item. The rate shall be including grouting with 1:2 cement mortar 12 mm. Rate Should include grooves of minimum 10 mm x 10 mm are to be filled with approved color pigments of approved shade & white cement/ grey cement whichever required as specified by the Architect etc. complete. Including double scaffolding, cleaning, polishing, protecting up till handing over & all necessary tools tackles to complete the work. Drilling in the stone shall be done exactly @ right angle to stone edge. Methodology of drilling the hole in the stone & fixing clamp & stone shall be approved from Architect and EIC prior to starting of the work. The Elevation drawings showing stone cladding are just to provide generic idea about the pattern. However, based on available size of stones within the maximum size stated above will be considered for final stone cladding pattern. The quote rate shall include all design, engineering and shop drawings approval from architect and consultant. The rate shall also include cutting in stone for electrical points/boxes etc. complete.**

**1.0 Material**

**1.1 Water**

1.1.1 Water shall conform to M-1.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Sand Stone Slab**

1.3.1 Sand stone slabs of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. The exposed face shall have no veins or unsightly stains and defects. They shall have uniform colours as approved by the Architect. Samples shall be got approved by the Architect before procurement of the slabs. The surface shall be fine polished and sides' machine cut, true to line and level.

### **1.3 Stone Work**

Cutting of stone work shall be done in conformity with the detailed working drawings for various parts of the structure.

If gets damage due to handling or otherwise, the same shall not be used. Such stones if get damaged after fixing, the same shall be removed and replaced by new one. Broken / damaged stone shall not be allowed to be used by joining damaged / broken pieces with glues, epoxy etc. Fixing of the stones should be in line, level and plumb with each other without any mismatching.

### **2.0 Workmanship**

2.1 Stone slab is fixed with 15 to 20 mm CM (1:2) on to the wall and the sand stone slabs with machine cut edges shall be pressed on to them firmly. By gently tapping of the slab if sound is coming, it shows there are any hollows. When the hollow cannot be filled with grout and the finished slab continues to give a hollow sound on tapping the slab shall be removed and reset.

During execution of the work Cement Mortar and Cement Slurry, if , where ever , spilled on the finished carved and molded work, the same would be immediately removed and the surface should be cleaned.

On completion of the work, Whole work shall be cleaned and polished with perfection. For cleaning use of all types of acids are prohibited. The area surrounding the main structure would be cleaned of all debris. All temporary structures and scaffoldings etc. shall be dismantled and removed.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in sqm. The relevant specifications of item no. 7.01 shall be followed and only clear visible area will be measured and paid. These shall include clamps, fixing with cement mortar, grouting with epoxy grout, cleaning, polishing etc. as directed by engineer in charge.

**9.47 Providing and fixing Carved Stone Patti 150mm. high carved Patti at lintel/Plinth and other places as per shown in drawing. Rate includes supplying, fixing Bansi Pahadpur Pink/Red Sand Stone as per approval of shade ad design from EIC and Architect. Carving should be minimum 25mm deep with require shape as per the drawing in the**



**traditional manor. Carved Patti will be fixed by wet cladding with required chemical anchoring. There will be minimum two pin require in one piece. The linear Length measurement will be taken for payment purpose. Rate includes cleaning of molding after fixing.**

## **1.0 Material**

### **1.1 Water**

1.1.1 Water shall conform to M-1.

### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

### **1.3 Sand Stone Slab**

1.3.1 Sand stone slabs of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. The exposed face shall have no veins or unsightly stains and defects. They shall have uniform colours as approved by the Architect. Samples shall be got approved by the Architect before procurement of the slabs. The surface shall be fine polished and sides' machine cut, true to line and level.

## **1.2 Stone Work**

1.2.1 Molding, Carving, engraving, dressing, cutting of stone work shall be done in conformity with the detailed working drawings for various parts of the structure. The detailed drawings shall be approved by the Main Architect Sompura of the work. All cutting, cutting, dressing, molding, carving work shall be carried out fine and finely polished. Carving work where ever required shall be done with adequate depth and in proportion with the object/ patterns being Carved. - small size or grass, peacock. Hans, lion etc. are part of the carving work.

1.2.2 Stone after carving molding etc. if gets damage due to handling or otherwise, the same shall not be used. Such stones if get damaged after fixing, the same shall be removed and replaced by new one. Broken / damaged stone shall not be allowed to be used by joining damaged / broken pieces with glues, epoxy etc. Fixing of the stones should be in line, level and plumb with each other without any mismatching.

## **2.0 Workmanship**

2.1 Stone slab is fixed with 15 to 20 mm CM (1:2) on to the wall and the sand stone slabs with machine cut edges shall be pressed on to them firmly. By gently tapping of the slab if sound is coming, it shows there are any hollows. When the hollow cannot be filled with grout and the finished slab continues to give a hollow sound on tapping the slab shall be removed and reset.

During execution of the work Cement Mortar and Cement Slurry, if , where ever , spilled on the finished carved and molded work, the same would be immediately removed and the surface should be cleaned.

On completion of the work, Whole work shall be cleaned and polished with perfection. For cleaning use of all types of acids are prohibited. The area surrounding the main structure would be cleaned of all debris. All temporary structures and scaffoldings etc. shall be dismantled and removed.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in Rmt. The relevant specifications of item no. 7.01 shall be followed and only clear visible area will be measured and paid. These shall include clamps, fixing with cement mortar, grouting with epoxy grout, cleaning, polishing etc. as directed by engineer in charge.

**9.48 Providing and fixing Carved Molding 180mm high and 75mm thick. molding at Parapet levels shown in the drawing. Rate includes supplying, fixing Pink Bansi pahadpur sand stone as per approval of shade and design from EIC and Architect. Molding as per shown in drawing with profile and shape with motif in equal interval of distance should be prepared as per traditional way. the fixing of the molding also wet cladding and chemical anchoring. There will be a two pin require in one piece. The linear Length measurement will be taken for payment purpose. Rate includes cleaning of molding after fixing.**

#### **1.0 Material**

##### **1.1 Water**

1.1.1 Water shall conform to M-1.

##### **1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

##### **1.3 Sand Stone Slab**

1.3.1 Sand stone slabs of approved shade, variety, size and thickness as specified in the item shall be used. They shall be of selected quality, dense, uniform and homogeneous in texture and free from cracks or other structural defects. The exposed face shall have no veins or unsightly stains and defects. They shall have uniform colours as approved by the Architect. Samples shall be got approved by the Architect before procurement of the slabs. The surface shall be fine polished and sides' machine cut, true to line and level.

##### **1.2 Stone Work**

1.2.1 Molding, Carving, engraving, dressing, cutting of stone work shall be done in conformity

with the detailed working drawings for various parts of the structure. The detailed drawings shall be approved by the Main Architect Sompura of the work. All cutting, cutting, dressing, molding, carving work shall be carried out fine and finely polished. Carving work where ever required shall be done with adequate depth and in proportion with the object/ patterns being Carved.- small size or grass, peacock. Hans, lion etc. are part of the carving work.

- 1.2.2 Stone after carving molding etc. if gets damage due to handling or otherwise, the same shall not be used. Such stones if get damaged after fixing, the same shall be removed and replaced by new one. Broken / damaged stone shall not be allowed to be used by joining damaged / broken pieces with glues, epoxy etc. Fixing of the stones should be in line, level and plumb with each other without any mismatching.

## **2.0 Workmanship**

- 2.1 Stone slab is fixed with 15 to 20 mm CM (1:2) on to the wall and the sand stone slabs with machine cut edges shall be pressed on to them firmly. By gently tapping of the slab if sound is coming, it shows there are any hollows. When the hollow cannot be filled with grout and the finished slab continues to give a hollow sound on tapping the slab shall be removed and reset.

During execution of the work Cement Mortar and Cement Slurry, if , where ever , spilled on the finished carved and molded work, the same would be immediately removed and the surface should be cleaned.

On completion of the work, Whole work shall be cleaned and polished with perfection. For cleaning use of all types of acids are prohibited. The area surrounding the main structure would be cleaned of all debris. All temporary structures and scaffoldings etc. shall be dismantled and removed.

## **3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in Rmt. The relevant specifications of item no. 7.01 shall be followed and only clear visible area will be measured and paid. These shall include clamps, fixing with cement mortar, grouting with epoxy grout, cleaning, polishing etc. as directed by engineer in charge.

- 9.49 Providing and fixing 60 mm thick abrasion resistant interlocking or Brick type paver blocks of approved make and color as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base.**

(a) Colored (other than grey) - M-45 grade - 60mm thick –shot blasted

- 1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the paver blocks.

Joints of the paver blocks shall be filled with the sand.

- 2) The paver blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.

## **2.0 Material**

### **1.1 Interlocking Paver Block**

- 1.1.1 Interlocking Paver Block shall conform to M-52.

Relevant specifications of item no. 9.25 shall be followed except interlocking paver blocks shall be used instead of cobbler stone.

- 9.50 Extra for providing and grouting grooves of size 3mm to 5 mm in floor or dado of size 300mm x 300mm with PVC spacer and readymix matching colour polymer based cementitious grout of BAL or equivalent of approved shade. Rate shall be inclusive of cleaning the grooves, protecting the edges before filling and cleaning the tiles on completion etc. all complete as per detailed specifications and instructions of Engineer in charge. Rate shall be paid for actual area of floor/dado grouted.**

### **1.0 Material**

#### **1.1 Epoxy Grout**

- 1.1.1 Epoxy Grout shall conform to M-38B.

### **2.0 Workmanship**

Relevant specifications of item no. 9.03.b.1 shall be followed except grooves are to be filled with epoxy grout.

### **3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm.

- 9.52 Providing and fixing embossed tiles which are detectable and act as warning tiles for disabled people of Vyara make or Equivalent in footpaths, pedestrian ways etc., as specified in the drawing and as approved by the Engineer-in-charge 300mm in floor including average 45 mm thick cement mortar bedding in 1:6 laid, embossed such that LINE specifying direction, and Embossed Dots specifying Danger of 30mm of High Strength and high wear resistant Cement Concrete Tiles with high finish with**

**-wear resistant aggregates colour coordinated aggregates in face mix.**

**-Colours specified by the architects, using UV resistant colour pigments from Lanxess. Tiles must confirm to IS 13801: 1993**

**The Tiles will be made using wear resistant materials in the face mix as specified by the architects. The Tiles must be cured in controlled environment to ensure efflorescence**

free material. The Tile Should have minimum average 4.5MPa KG/cm<sup>2</sup> compressive strength at 28 days. The rate shall be inclusive of protecting the flooring by plaster of paris and plastic and/or bubble top sheets, complete etc, as per the satisfaction of EIC

Item as per above description and Manufacture's specification and shall be paid in sqm

**9.53 Providing and laying in position following sizes of mosaics tiles with cutting of sheet of one sqft which making with following sizes of mosaics tiles of required surface finish (Glossy) for curved surface etc. of approved make and shade as per design and drawing. Tile is to be fixed over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand) with keeping a groove of (3mm width). Tile shall be fixed with cement base tile adhesive 3 mm thickness behind the tiles including filling the grooves with cementitious grout and pigment of approved shade etc. complete as approved by architect and directed by engineer-in-charge. Rate shall be inclusive of 12 to 15 mm thick wired finish plaster in cement mortar 1:4, cement base tile adhesive, cementitious grout and pigment, and protection of flooring until the handling of the project by covering the joints with abrotaps, plastic sheet and plaster of Paris etc. complete. (Sample to be approved before mass production/construction/purchase)**

**9.53.1) light shade 25mm x 25 mm**

**9.53.2) Dark Shade 25mm x 25mm**

**9.53-3) Light Shade 50mm x 50mm**

**1.0 Material**

1.1 Ceramic/Mosaic Tile

1.1.1 Ceramic Tile shall conform to M-35.

**1.2 Cement Mortar**

1.2.1 Cement Mortar shall conform to M-11.

**1.3 Water**

1.3.1 Water shall conform to M-1

**2.0 Workmanship**

2.1 The sub-base/wall shall be cleaned, wetted. The plaster in the proportion of 1:4 cement sand mortar as per the relevant specification of wired plaster shall be applied. The plaster shall be cured for 7 days. After curing, the string marking of the glazed tiles with blue or white lime shall be done on the wall after wired plaster is completed as per drawing in such a way that opposite walls shall be mirror image. The outlets for plumbing shall be marked as per drawing and plumbing work shall be carried out accordingly and tested for

- pressure as instructed by engineer –in-charge. The tiles shall be fixed after testing the water supply lines and laying the electrical conduits and boxes.
- 2.2 The tiles before laying shall be soaked in water for at least two hours. Neat grey cement slurry at 3.3 Kg. Cement per sqm. of honey-like consistency shall be spread over the 12 to 15 mm thick wired plaster of cement mortar 1:4 (1 cement: 4 coarse sand) as directed by engineer in charge. Average 6 mm thick Cement sand mortar of 1:1(1 cement: 1 fine sand) shall be evenly spread behind the tiles and thereafter tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. The edges of the tiles shall be smeared with neat cement slurry. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.
  - 2.3 The tiles shall not have staggered joints. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. After the tiles are laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5 mm. and then grouted with white cement with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill up pin holes that may exist on the surface. White cement with or without matching pigment shall be used for pointing the joints. After fixing the tile finally in an even plane the dado shall be kept wet and allowed to cure undisturbed for 7 days.
  - 2.4 While laying any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size between plaster and /or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.
  - 2.6 The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.
  - 2.7 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished and maintained till handing over to client.
  - 2.8 For curing and finishing CPWD specification clause no. 11.16.4 shall be followed.
  - 3.0 Mode of Measurement and Payment
  - 3.1 Nabhi's commentary on CPWD specifications clause no. 11.16.5, 11.16.6 to be followed except no extra will be paid for any type of decorative tiles. Rate is inclusive of 12 to 15 mm thick wired finish plaster on the walls.

- 3.2 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.
- 3.4 The rate shall include for fixing the dado in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

#### 9.54 CEMENT CONCRETE PAVEMENT

**1.0** The work shall consist of construction of unreinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer.

**1.1** The design parameters, viz., thickness of pavement slab, grade of concrete, joint details etc. shall be as stipulated in the drawings.

#### **2.0 Materials**

**2.1 Source of materials:** The Contractor shall indicate to the Engineer the source of all materials to be used in the concrete work with relevant test data sufficiently in advance, and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work. If the Contractor later proposes to obtain materials from a different source, he shall notify the Engineer for his approval, at least 45 days before such materials are to be used with relevant test data.

**2.2 Cement:** Any of the following types of cement capable of achieving the design strength may be used with prior approval of the Engineer, but the preference should be to use at least the 53 Grade.

i) Ordinary Portland Cement, 53 Grade IS : 12269.

If the soil around has soluble salts like sulphate in excess of 0.5 per cent, the cement used shall be sulphate resistant and shall conform to IS : 12330.

Guidance may be taken from IS: SP: 23, Handbook for Concrete Mixes for ascertaining the minimum 7 days strength of cement required to match with the design concrete strength. Cement to be used may preferably be obtained in bulk form. If cement in paper bags are proposed to be used, there shall be bag-splitters with the facility to separate pieces of paper bags and dispose them of suitably. No paper pieces shall enter the concrete mix. Bulk cement shall be stored in accordance with Clause 1014. The cement shall be subjected to acceptance test just prior to its use.

**2.3 Admixtures:** Admixtures conforming to IS : 6925 and IS : 9103 shall be permitted to improve workability of the concrete or extension of setting time, on satisfactory evidence that they will not have any adverse effect on the properties of concrete with

respect to strength, volume change, durability and have no deleterious effect on steel bars. The particulars of the admixture and the quantity to be used, must be furnished to the Engineer in advance to obtain his approval before use. Satisfactory performance of the admixtures should be proved both on the laboratory concrete trial mixes and in trial paving works. If air entraining admixture is used, the total quantity of air in air-entrained concrete as a percentage of the volume of the mix shall be  $5 \pm 1.5$  per cent for 25 mm nominal size aggregate.

## 2.4 Aggregates:

**2.4.1** Aggregates for pavement concrete shall be natural material complying with IS : 383 but with a Los Angeles Abrasion Test result not more than 35 per cent. The limits of deleterious materials shall not exceed the requirements set out in IS: 383.

The aggregates shall be free from chert, flint, chalcedony or other silica in a form that can react with the alkalis in the cement. In addition, the total chlorides content expressed as chloride ion content shall not exceed 0.06 per cent by weight and the total sulphate content expressed as sulphuric anhydride (SO<sub>3</sub>) shall not exceed 0.25 per cent by weight.

**2.4.2 Coarse aggregate:** Coarse aggregate shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of coarse aggregate shall not exceed 25 mm for pavement concrete. Continuously graded or gap graded aggregates may be used, depending on the grading of the fine aggregate. No aggregate which has water absorption more than 2 per cent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS : 2386 (Part-5). After 5 cycles of testing the loss shall not be more than 12 per cent if sodium sulphate solution is used or 18 percent if magnesium sulphate solution is used.

Dumping and stacking of aggregates shall be done in an approved manner. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hrs before batching as directed by the Engineer.

**2.4.3 Fine aggregate:** The fine aggregate shall consist of clean natural sand or crushed stone sand or a combination of the two and shall conform to IS: 383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica and organic and other foreign matter. The fine aggregate shall not contain deleterious substances more than the following:

Clay lumps	4.0 percent
Coal and lignite	1.0 percent
Material passing IS Sieve No. 75 micron	4.0 percent



- 2.5 Water:** Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS: 456.
- 2.6 Mild steel bars for dowels and tie bars:** These shall conform to the requirements of IS : 432, IS : 1139 and IS : 1786 as relevant. The dowel bars shall conform to Grade S 240 and tie bars to Grade S 415 of I.S.
- 2.7 Sillflex (supreme industries make) joint filler:** joint filler material of sill flex (supreme industries make )is only permitted. It shall be 25 mm less in depth than the thickness of the slab within a tolerance of  $\pm 3$  mm and provided to the full width between the side forms. It shall be in suitable lengths which shall not be less than one lane width. Holes to accommodate dowel bars shall be accurately bored or punched out to give a sliding fit in the dowel bars.
- 2.8 Joint sealing compound:** The joint sealing compound shall be of hot poured, elastomeric type or cold polysulphide type having flexibility, resistance to age hardening and durability. If the sealant is of hot poured type it shall conform to AASHTO M282 and cold applied sealant shall be in accordance with BS 5212 (Part 2).
- 2.9 Storage of materials:** All materials shall be stored in accordance with the provisions of Clause 1014 of the Specifications and other relevant IS Specifications. All effort must be made to store the materials in proper places so as to prevent their deterioration or contamination by foreign matter and to ensure their satisfactory quality and fitness for the work. The platform where aggregates are stock piled shall be levelled with 15 cm of watered, mixed and compacted granular sub-base material. The area shall have slope and drain to drain off rain water. The storage space must also permit easy inspection, removal and storage of the materials. Aggregates of different sizes shall be stored in partitioned stack-yards. All such materials even though stored in approved godowns must be subjected to acceptance test as per Clause 903 of these Specifications immediately prior to their use.
- 3.0 Proportion of Concrete**
- 3.1** After approval by the Engineer of all the materials to be used in the concrete, the Contractor shall submit the mix design based on weighed proportions of all ingredients for the approval of the Engineer. The mix design shall be submitted at least 30 days prior to the paving of trial length and the design shall be based on laboratory trial mixes using the approved materials and methods as per IS : 10262 (Recommended Guidelines for Mix Design) or on the basis of any other rational method agreed to by the Engineer. Guidance in this regard can also be obtained from IS : SP : 23 Handbook on Concrete Mixes. The target mean strength for the design mix shall be determined as indicated in Clause 903.5.2. The mix design shall be based on the flexural strength of concrete.

**3.2 Cement content:** The cement content shall not be less than 350 kg per cu.m. of concrete. If this minimum cement content is not sufficient to produce in the field, concrete of the strength specified in the drawings/design, it shall be increased as necessary without additional compensation under the Contract. The cement content shall, however, not exceed 425 kg per cu.m. of concrete.

### 3.3 Concrete strength

**3.3.1** While designing the mix in the laboratory, correlation between flexural and compressive strengths of concrete shall be established on the basis of at least thirty tests on samples. However, quality control in the field shall be exercised on the basis of flexural strength. It may, however, be ensured that the materials and mix proportions remain substantially unaltered during the daily concrete production. The water content shall be the minimum required to provide the agreed workability for full compaction of the concrete to the required density as determined by the trial mixes or other means approved by the Engineer and the maximum free water cement ratio shall be 0.50.

**3.3.2** The ratio between the 7 and 28 day strengths shall be established for mix to be used in the slab in advance, by testing pairs of beams and cubes at each stage on at least six batches of trial mix. The average strength of the 7 day cured specimens shall be divided by the average strength of the 28 day specimens for each batch, and the ratio 'R' shall be determined. The ratio 'R' shall be expressed to three decimal places.

If during the construction of the trial length or during normal working, the average value of any four consecutive 7 day test results falls below the required 7 day strength as derived from the value of 'R', then the cement content of the concrete shall, without extra payment, be increased by 5 per cent by weight or by an amount agreed by the Engineer. The increased cement content shall be maintained at least until the four corresponding 28 day strengths have been assessed for its conformity with the requirements as per Clause 602.3.1. Whenever the cement content is increased, the concrete mix shall be adjusted to maintain the required workability.

### 3.4 Workability

**3.4.1** The workability of the concrete at the point of placing shall be adequate for the concrete to be fully compacted and finished without undue flow. The optimum workability for the mix to suit the paving plant being used shall be determined by the Contractor and approved by the Engineer. The control of workability in the field shall be exercised by the slump test as per IS : 1199.

**3.4.2** The workability requirement at the Batching Plant and paving site shall be established slump tests carried during trial paving. These requirements shall be established from season to season and also when the lead from Batching plant site to the paving site changes. The workability shall be established for the type of paving equipment available. A slump value in the range of  $30 \pm 15$  mm is reasonable for paving works but this may

be modified depending upon the site requirement and got approved by the Engineer. These tests shall be carried out on every truck/dumper at Plant site and paving site initially when the work commences but subsequently the frequency can be reduced to alternate trucks or as per the instructions of the Engineer.

### **3.5 Design mix**

- 3.5.1** The Contractor shall carry out laboratory trials of design mixes with the materials from the approved sources to be used. Trial mixes shall be made in presence of the Engineer or his representative and the design mix shall be subject to the approval of the Engineer. They shall be repeated if necessary until the proportions that will produce a concrete which complies in all respects with this Specification, and conforms to the design/drawings have been determined.
- 3.5.2** The proportions determined as a result of the laboratory trial mixes may be adjusted if necessary during the construction of the trial length. Thereafter, neither the materials nor the mix proportions shall be varied in any way except with the written approval of the Engineer.
- 3.5.3** Any change in the source of materials or mix proportions proposed by the Contractor during the course of work shall be assessed by making laboratory trial mixes and the construction of a further trial length unless approval is given by the Engineer for minor adjustments like compensation for moisture content in aggregates or minor fluctuations in the grading of aggregate.

### **3.6 Sub-base**

The cement concrete pavement shall be laid over the sub-base constructed in accordance with the relevant drawings and Specifications contained in Clause 601. If the sub-base is found damaged at some places or it has cracks wider than 10mm, it shall be repaired with fine cement concrete or bituminous concrete laying separation layer. Prior to laying of concrete it shall be ensured that the separation membrane as per Clause 602.5 is placed in position and the same is clean of dirt or other extraneous materials and free from any damage.

### **3.7 Separation Membrane**

A separation membrane shall be used between the concrete slab and the subbase. Separation membrane shall be impermeable plastic sheeting 125 microns thick laid flat without creases. Before placing the separation membrane, the sub-base shall be swept clean of all the extraneous materials using air compressor. Wherever overlap of plastic sheets is necessary, the same shall be at least 300 mm and any damaged sheeting shall be replaced at the Contractor's expense. The separation membrane may be nailed to the lower layer with concrete nails.

### **3.8 Joints**

**3.8.1** The location and type of joints shall be as shown in the drawing. Joint shall be constructed depending upon their functional requirement as detailed in the following paragraphs. The location of the joints should be transferred accurately at the site and mechanical saw cutting of joints done as per stipulated dimensions. It should be ensured that the full required depth of cut is made from edge to edge of the pavement. Transverse and longitudinal joints in the pavement and sub-base shall be staggered so that they are not coincident vertically and are at least 1 m and 0.3 m apart respectively. Sawing of joints shall be carried out with diamond studded blades soon after the concrete has hardened to take the load of the sawing machine and personnel without damaging the texture of the pavement. Sawing operation could start as early as 6-8 hours depending upon the season.

### **3.8.2 Transverse joints**

**3.8.2.1** Transverse joints shall be contraction and expansion joints constructed at the spacing described in the Drawings. Transverse joints shall be straight within the following tolerances along the intended line of joints which is the straight line transverse to the longitudinal axis of the carriageway at the position proposed by the Contractor and agreed to by the Engineer, except at road junctions or roundabouts where the position shall be as described in the drawings:

- (i) Deviations of the filler board in the case of expansion joints from the intended line of the joint shall not be greater than  $\pm 10$  mm.
- (ii) The best fit straight line through the joint grooves as constructed shall be not more than 25 mm from the intended line of the joint.
- (iii) Deviations of the joint groove from the best fit straight line of the joint shall not be greater than 10 mm.
- (iv) Transverse joints on each side of the longitudinal joint shall be in line with each other and of the same type and width. Transverse joints shall have a sealing groove which shall be sealed in compliance with Clause 602.11.

**3.8.2.2 Contraction joints:** Contraction joints shall consist of a mechanical sawn joint groove, 3 to 5 mm wide and  $1/4$  to  $1/3$  depth of the slab  $\pm 5$  mm or as stipulated in the drawings and dowel bars complying with Clause 602.6.5 and as detailed in the drawings.

The contraction joints shall be cut as soon as the concrete has undergone initial hardening and is hard enough to take the load of joint sawing machine without causing damage to the slab.

**3.8.2.3 Expansion joints:** The expansion joints shall consist of a joint filler board complying with Clause 602.2.7 and dowel bars complying with Clause 602.6.5 and as detailed in the drawings. The filler board shall be positioned vertically with the prefabricated joint assemblies along the line of the joint within the tolerances given in Clause 602.6.2.1 and

at such depth below the surface as will not impede the passage of the finishing straight edges or oscillating beams of the paving machines. The adjacent slabs shall be completely separated from each other by providing joint filler board. Space around the dowel bars, between the sub-base and the filler board shall be packed with a suitable compressible material to block the flow of cement slurry.

**3.8.2.4 Transverse construction joint:** Transverse construction joints shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at the regular location of contraction joints using dowel bars. The joint shall be made butt type. At all construction joints, steel bulk heads shall be used to retain the concrete while the surface is finished. The surface of the concrete laid subsequently shall conform to the grade and cross sections of the previously laid pavement. When positioning of bulk head/stop-end is not possible, concreting to an additional 1 or 2 m length may be carried out to enable the movement of joint cutting machine so that joint grooves may be formed and the extra 1 or 2 m length is cut out and removed subsequently after concrete has hardened.

### **3.8.3 Longitudinal joint**

**3.8.3.1** The longitudinal joints shall be saw cut as per details of the joints shown in the drawing. The groove may be cut after the final set of the concrete. Joints should be sawn to at least 1/3 the depth of the slab  $\pm$  5 mm as indicated in the drawing.

**3.8.3.2** Tie bars shall be provided at the longitudinal joints as per dimensions and spacing shown in the drawing and in accordance with Clause 602.6.6.

### **3.8.4 Dowel bars**

**3.8.4.1** Dowel bars shall be mild steel rounds in accordance with Clause 602.2.6 with details/dimensions as indicated in the drawing and free from oil, dirt, loose rust or scale. They shall be straight, free of irregularities and burring restricting slippage in the concrete. The sliding ends shall be sawn or cropped cleanly with no protrusions outside the normal diameter of the bar. The dowel bar shall be supported on cradles/dowel chairs in pre-fabricated joint assemblies positioned prior to the construction of the slabs or mechanically inserted with vibration into the plastic concrete by a method which ensures correct placement of the bars besides full re-compaction of the concrete around the dowel bars.

**3.8.4.2** Unless shown otherwise on the drawings, dowel bars shall be positioned at mid depth of the slab within a tolerance of  $\pm$  20 mm, and centered equally about intended lines of the joint within a tolerance of  $\pm$  25 mm. They shall be aligned parallel to the finished surface of the slab and to the centre line of the carriageway and to each other within tolerances given hereunder, the compliance of which shall be checked as per Clause 602.10.7.

- (i) For bars supported on cradles prior to the laying of the slab:
  - (a) All bars in a joint shall be within  $\pm 3$  mm per 300 mm length of bar
  - (b) 2/3rd of the bars shall be within  $\pm 2$ mm per 300 mm length of bar
  - (c) No bar shall differ in alignment from an adjoining bar by more than 3 mm per 300 mm length of bar in either the horizontal or vertical plane
  - (d) Cradles supporting dowel bar shall not extend across the line of joint i.e. no steel bar of the cradle assembly shall be continuous across the joint.
- (ii) For all bars inserted after laying of the slab:
  - (a) Twice the tolerance for alignment as indicated in (i) above

**3.8.4.3** Dowel bars, supported on cradles in assemblies, when subject to a load of 110 N applied at either end and in either the vertical or horizontal direction (upwards and downwards and both directions horizontally) shall conform to be within the following limits:

- (i) Two-thirds of the number of bars of any assembly tested shall not deflect more than 2 mm per 300 mm length of bar
- (ii) The remainder of the bars in that assembly shall not deflect more than 3 mm per 300 mm length of bar.

**3.8.4.4** The assembly of dowel bars and supporting cradles, including the joint filler board in the case of expansion joints, shall have the following degree of rigidity when fixed in position: -

- (i) For expansion joints, the deflection of the top edge of the filler board shall be not greater than 13 mm, when a load of 1.3 kN is applied perpendicular to the vertical face of the joint filler board and distributed over a length of 600 mm by means of a bar or timber packing, at mid depth and midway between individual fixings, or 300 mm from either end of any length of filler board, if a continuous fixing, is used. The residual deflection after removal of the load shall be not more than 3 mm.
- (ii) The joint assembly fixings to sub-base shall not fail under the 1.3 kN load applied for testing the rigidity of the assembly but shall fail before the load reaches 2.6 kN.
- (iii) The fixings for contraction joint shall not fail under 1.3 kN load and shall fail before the load reaches 2.6 kN when applied over a length of 600 mm by means of a bar or timber packing placed as near to the level of the line of fixings as practicable.
- (iv) Fixings shall be deemed to fail when there is displacement of the assemblies by more than 3mm with any form of fixing, under the test load. The displacement

shall be measured at the nearest part of the assembly to the centre of the bar or timber packing.

**3.8.4.5** Dowel bars shall be covered by a thin plastic sheath for at least two-thirds of the length from one end for dowel bars in contraction joints or half the length plus 50 mm for expansion joints. The sheath shall be tough, durable and of an average thickness not greater than 1.25 mm. The sheathed bar shall comply with the following pull-out tests:

i. Four bars shall be taken at random from stock and without any special preparation shall be covered by sheaths as required in this Clause. The ends of the dowel bars which have been sheathed shall be cast centrally into concrete specimens 150 x 150 x 600 mm, made of the same mix proportions to be used in the pavement, but with a maximum nominal aggregate size of 20 mm and cured in accordance with IS:516. At 7 days a tensile load shall be applied to achieve a movement of the bar of at least 0.25 mm. The average bond stress to achieve this movement shall not be greater than 0.14 MPa.

**3.8.4.6** For expansion joints, a closely fitting cap 100 mm long consisting of waterproofed card board or an approved synthetic material like PVC or GI pipe shall be placed over the sheathed end of each dowel bar. An expansion space at least equal in length to the thickness of the joint filler board shall be formed between the end of the cap and the end of the dowel bar by using compressible sponge. To block the entry of cement slurry between dowel and cap it may be taped.

### **3.8.5 Tie bars**

**3.8.5.1** Tie bars in longitudinal joints shall be deformed steel bars of strength 415 MPa complying with IS:1786 and in accordance with the requirements given below. The bars shall be free from oil, dirt, loose rust and scale.

**3.8.5.2** Tie bars projecting across the longitudinal joint shall be protected from corrosion for 75 mm on each side of the joint by a protective coating of bituminous paint with the approval of the Engineer. The coating shall be dry when the tie bars are used.

**3.8.5.3** Tie bars in longitudinal joints shall be made up into rigid assemblies with adequate supports and fixings to remain firmly in position during the construction of the slab. Alternatively, tie bars at longitudinal joint may be mechanically or manually inserted into the plastic concrete from above by vibration using a method which ensures correct placement of the bars and recompaction of the concrete around the tie bars.

**3.8.5.4** Tie bars shall be positioned to remain within the middle third of the slab depth as indicated in the drawings and approximately parallel to the surface and approximately perpendicular to the line of the joint, with the centre of each bar on the intended line of the joints within a tolerance of  $\pm 50$  mm, and with a minimum cover of 30 mm below the joint groove.



### 3.9 Weather and Seasonal Limitations

**3.9.1 Concrete during monsoon months:** When concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulin or other water proof cloth shall be provided along the line of the work. Any time when it rains, all freshly laid concrete which had not been covered for curing purposes shall be adequately protected. Any concrete damaged by rain shall be removed and replaced. If the damage is limited to texture, it shall be retextured in accordance with the directives of the Engineer.

**3.9.2 Concreting in hot weather:** No concreting shall be done when the concrete temperature is above 30 degrees Centigrade. Besides, in adverse conditions like high temperature, low relative humidity, excessive wind velocity, imminence of rains etc., if so desired by the Engineer, tents on mobile trusses may be provided over the freshly laid concrete for a minimum period of 3 hours as directed by the Engineer. The temperature of the concrete mix on reaching the paving site shall not be more than 30°C. To bring down the temperature, if necessary, chilled water or ice flakes should be made use of.

No concreting shall be done when the concrete temperature is below 5 degrees Centigrade and the temperature is descending.

### 3.10 Side Forms, Rails and Guide wires

**3.10.1 Side forms and rails:** All side forms shall be of mild steel of depth equal to the thickness of pavement or slightly less to accommodate the surface regularity of the sub-base. The forms can be placed on series of steel packing plates or shims to take care of irregularity of sub-base. They shall be sufficiently robust and rigid to support the weight and pressure caused by a paving equipment. Side forms for use with wheeled paving machines shall incorporate metal rails firmly fixed at a constant height below the top of the forms. The forms and rail shall be firmly secured in position by not less than 3 stakes/pins for each 3m length so as to prevent movement in any direction. Forms and rails shall be straight within a tolerance of 3 mm in 3m and when in place shall not settle excess of 1.5 mm in 3 m while paving is being done. Forms shall be cleaned and oiled immediately before each use. The forms shall be bedded on a continuous bed of low moisture content lean cement mortar or concrete and set to the line and levels shown on the drawings within tolerances  $\pm 10$  mm and  $\pm 3$  mm respectively. The bedding shall not extend under the slab and there shall be no vertical step between adjacent forms of more than 3 mm. The forms shall be got inspected from the Engineer for his approval before 12 hours on the day before the construction of the slab and shall not be removed until at least 12 hours afterwards.

**3.10.2** At all times sufficient forms shall be used and set to the required alignment for at least 200 m length of pavement immediately in advance of the paving operations, or anticipated length of pavement to be laid within the next 24 hrs whichever is more.



### 3.10.3 Use of guidewires

- 3.10.3.1** Trimix vacuumed dewatering system, a guidewire shall be provided along both sides of the slab. Each guidewire shall be at a constant height above and parallel to the required edges of the slab as described in the contract/drawing within a vertical tolerance of  $\pm 3$  mm. Additionally, one of the wires shall be kept at a constant horizontal distance from the required edge of the pavement as indicated in the contract/drawing within a lateral tolerance of  $\pm 10$  mm.
- 3.10.3.2** The guidewires shall be supported on stakes not more than 8 m apart by connectors capable of fine horizontal and vertical adjustment. The guidewire shall be tensioned on the stakes so that a 500-gram weight shall produce a deflection of not more than 20 mm when suspended at the mid point between any pair of stakes. The ends of the guidewires shall be anchored to fixing point or winch and not on the stacks.
- 3.10.3.3** The stack shall be positioned and the connectors maintained at their correct height and alignment from 12 hours on the day before concreting takes place until 12 hours after finishing of the concrete. The guidewire shall be erected and tensioned the connectors at any section for at least 2 hours before concreting that section.
- 3.10.3.4** The Contractor shall submit to the Engineer for his approval of line and level, the stakes and connectors which are ready for use in the length of road to be constructed by 12 hours on the working day before the day of construction of slab. Any deficiencies noted by the Engineer shall be rectified by the Contractor who shall then re-apply for approval of the affected stakes. Work shall not proceed until the Engineer has given his approval. It shall be ensured that the stakes and guidewires are not affected by the construction equipment when concreting is in progress.

## 4.0 Construction

- 4.1 General:** A systems approach may be adopted for construction of the pavement, and the Method Statement for carrying out the work, detailing all the activities including indication of time-cycle, equipment, personnel etc., shall be got approved from the Engineer before the commencement of the work. The above shall include the type, capacity and make of the batching and mixing plant besides the hauling arrangement and paving equipment. The capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of atleast 300 m in one day.
- 4.2 Batching and mixing:** Batching and mixing of the concrete shall be done at a central batching and mixing plant with automatic controls, located at a suitable place which takes into account sufficient space for stockpiling of cement, aggregates and stationary water tanks. This shall be, however, situated at an approved distance, duly considering the properties of the mix and the transporting arrangements available with the Contractor.
- 4.3 Equipment for proportioning of materials and paving**

**4.3.1** Proportioning of materials shall be done in the batching plant by weight, each type of material being weighed separately. The cement from the bulk stock may be weighed separately from the aggregates and water shall be measured by volume. Wherever properly graded aggregate of uniform quality cannot be maintained as envisaged in the mix design, the grading of aggregates shall be controlled by appropriate blending techniques. The capacity of batching and mixing plant shall be at least 25 per cent higher than the proposed capacity of the laying/paving equipment.

**4.3.2 Batching plant and equipment:**

- (1) **General-** The batching plant shall include minimum four bins, weighing hoppers, and scales for the fine aggregate and for each size of coarse aggregate. If cement is used in bulk, a separate scale for cement shall be included. The weighing hoppers shall be properly sealed and vented to preclude dust during operation. Approved safety devices shall be provided and maintained for the protection of all personnel engaged in plant operation, inspection and testing. The batch plant shall be equipped with suitable non-resettable batch counter which will correctly indicate the number of batches proportioned.
- (2) **Bins and hoppers-** Bins with minimum number of four adequate separate compartments shall be provided in the batching plant.
- (3) **Automatic weighing devices-** Batching plant shall be equipped to proportion aggregates and bulk cement by means of automatic weighing devices using load cells.
- (4) **Mixers-** Mixers shall be pan type, reversible type or any other mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specific mixing period, and of discharging the mixture, without segregation. Each stationary mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, provided that each batch is mixed 90 seconds or as per the manufacturer's recommendation. The mixer shall be equipped with a suitable non-resettable batch counter which shall correctly indicate the number of batches mixed.

The mixers shall be cleared at suitable intervals. The pickup and throw-over blades in the drum or drums shall be repaired or replaced when they are worn down 20 mm or more. The Contractor shall (1) have available at the job site a

copy of the manufacturer's design, showing dimensions and arrangements of blades in reference to original height and depth, or (2) provide permanent marks on blade to show points of 20 mm wear from new conditions. Drilled holes of 5 mm diameter near each end and at mid point of each blade are recommended. Batching Plant shall be calibrated in the beginning and thereafter at suitable interval not exceeding 1 month.

- (5) **Control cabin-** An air-conditioned centralised control cabin shall be provided for automatic operation of the equipment.

**4.3.3 Paving equipment:** Trimix vacuumed dewatering system is proposed for paving.

Vibrators shall operate at a frequency of 8300 to 9600 impulses per minute under load at a maximum spacing of 60 cm. The variable vibration setting shall be provided in the machine.

**4.3.4 Concrete saw:** The Contractor shall provide adequate number of concrete saws with sufficient number of diamond-edge saw blades. The saw machine shall be either electric or petrol/diesel driven type. A water tank with flexible hoses and pump shall be made available in this activity on priority basis. The Contractor shall have at least one standby saw in good working condition. The concreting work shall not commence if the saws are not in working condition.

**4.4 Hauling and placing of concrete**

**4.4.1** Freshly mixed concrete from the central batching and mixing plant shall be transported to the paving site by means of trucks/tippers of sufficient capacity and approved design in sufficient numbers to ensure a constant supply of concrete. Covers shall be used for protection of concrete against the weather. The trucks/tippers shall be capable of maintaining the mixed concrete in a homogeneous state and discharging the same without segregation and loss of cement slurry. The feeding to the work is to be regulated in such a way that the paving is done in an uninterrupted manner with a uniform speed throughout the day's work.

**4.4.2 Placing of concrete**

Concrete mixed in central mixing plant shall be transported to the site without delay and the concrete which, in the opinion of the Engineer, has been mixed too long before laying will be rejected and shall be removed from the site. The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C to 30°C. Trucks/tippers delivering concrete shall not run on plastic sheeting nor shall they run on completed slabs until after 28 days of placing the concrete.

- 4.4.3** Before any paving is done, the site shall be shown to the Engineer, in order to verify the arrangement for paving besides placing of dowels, tie-bars etc., as per the relevant Clauses of this Specification. The mixing and placing of concrete shall progress only at such a rate as to permit proper finishing, protecting and curing of the pavement.
- 4.4.4** In all cases, the temperature of the concrete shall be measured at the point of discharge from the delivery vehicle.
- 4.4.5** The addition of water to the surface of the concrete to facilitate the finishing operations will not be permitted except with the approval of the Engineer when it shall be applied as a mist by means of approved equipment.
- 4.4.6** If considered necessary by the Engineer, the paving machines shall be provided with approved covers to protect the surface of the slab under construction from direct sunlight and rain or hot wind.
- 4.4.7** While the concrete is still plastic, its surface shall be brush textured in compliance with Clause 602.9.8 and the surface and edges of the slab cured by the application of a sprayed liquid curing membrane in compliance with Clause 602.9.9. After the surface texturing, but before the curing compound is applied, the concrete slab shall be marked with the chainage at every 100 m interval.
- 4.4.8** As soon as the side forms are removed, edges of the slabs shall be corrected wherever irregularities have occurred by using fine concrete composed of one part of cement to 3 parts of fine chips and fine aggregate under the supervision of the Engineer.
- 4.4.9** If the requirement of Clause 902.4. for surface regularity fails to be achieved on two consecutive working days, then normal working shall cease until the cause of the excessive irregularity has been identified and remedied.

#### **4.5 Cancelled**

#### **4.6 Deleted**

#### **4.7 Surface texture**

- 4.7.1** After the final regulation of the slab and before the application of the curing membrane, the surface of concrete slab shall be brush-textured in a direction at right angles to the longitudinal axis of the carriageway.
- 4.7.2** The brushed surface texture shall be applied evenly across the slab in one direction by the use of a wire brush not less than 450 mm wide but longer brushes are preferred. The brush shall be made of 32-gauge tape wires grouped together in tufts spaced at 10 mm centres. The tufts shall contain an average of 14 wires and initially be 100 mm long. The brush shall have two rows of tufts. The rows shall be 20 mm apart and the tufts in one row shall be opposite the centre of the gap between tufts in the other row. The brush shall be replaced when the shortest tuft wears down to 90 mm long.

**4.7.3** The texture depth shall be determined by the Sand Patch Test as described in Clause 602.12. This test shall be performed at least once for each day’s paving and wherever the Engineer considers it necessary at times after construction as under:

Five individual measurements of the texture depth shall be taken at least 2 m apart anywhere along a diagonal line across a lane width between points 50 m apart along the pavement. No measurement shall be taken within 300 mm of the longitudinal edges of a concrete slab constructed in one pass.

4.7.4 Texture depths shall not be less than the minimum required when measurements are taken as given in Table 600-2 nor greater than a maximum average 1.25 mm.

TABLE : 600-2 Texture Depth

	Time of Test	Number of Measurements	Required Texture Depth (mm)	
			Specified Value	Tolerance
1.	Between 24 hours and 7 days after the constn., of the slab or until the slab is first used by vehicles.	An average of 5 measurements	1.00	±0.25
2.	Not later than 6 weeks before the road is opened to public traffic.	An average of 5 measurements	1.00	+0.25 -0.35

**4.7.5** After the application of the brushed texture, the surface of the slab shall have a uniform appearance.

4.7.6 Where the texture depth requirements are found to be deficient, the Contractor shall make good the texture across the full lane width over length directed by the Engineer, by retexturing the hardened concrete surface in an approved manner.

**4.8 Curing**

**4.8.1** Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin-based aluminised reflective curing compound which hardens into an impervious film or membrane with the help of a mechanical sprayer.

Curing compounds shall contain sufficient flake aluminium in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shall become stable and impervious to evaporation of water from the surface of the concrete within 60 minutes of application and shall be of approved type.

The curing compounds shall have a water retention efficiency index of 90 per cent in accordance with BS Specification No. 7542.

- 4.8.2** The curing compound shall not react chemically with the concrete and the film or membrane shall not crack, peel or disintegrate within three weeks after application. Immediately prior to use, the curing compound shall be thoroughly agitated in its containers. The rate of spread shall be in accordance with the manufacturer's instructions checked during the construction of the trial length and subsequently whenever required by the Engineer. The mechanical sprayer shall incorporate an efficient mechanical device for continuous agitation and mixing of the compound during spraying.
- 4.8.3** In addition to spraying of curing compound, the fresh concrete surface shall be protected for at least 3 hours by covering the finished concrete pavement with tents as described in Clause 602.7.2, during adverse weather conditions as directed by the Engineer. After three hours, the pavement shall be covered by moist hessian and the same shall then be kept damp for a minimum period of 14 days after which time the hessian may be removed. The hessian shall be kept continuously moist. All damaged/torn hessian shall be removed and replaced by new hessian on a regular basis.
- 4.8.4** The Contractor shall be liable at his expense to replace any concrete damaged as a result of incomplete curing or cracked on a line other than that of a joint.

#### **4.9 Trial Length**

- 4.9.1** The trial length shall be constructed at least one month in advance of the proposed start of concrete paving work. At least one month prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a detailed method statement giving description of the proposed materials, plant, equipment and construction methods. All the major equipments like paving train, batching plant; tippers etc., proposed in the construction are to be approved by the Engineer before their procurement. No trials of new materials, plant, equipment or construction methods, nor any development of them shall be permitted either during the construction of trial length or in any subsequent paving work, unless they form part of further, approved trials. These trial lengths shall be constructed away from the carriageway but with at least a subbase layer below it.
- 4.9.2** The Contractor shall demonstrate the materials, plant, equipment and methods of construction that are proposed for concrete paving, by first constructing a trial length of slab, at least 60 m but not more than 300 m long for mechanised construction and at least 30 m long for hand guided methods. If the first trial is unsatisfactory, the Contractor shall have to demonstrate his capability to satisfactorily construct the pavement in subsequent trials.

- 4.9.3** The trial length shall be constructed in two parts over a period comprising at least part of two separate working days, with a minimum of 30 m constructed each day for mechanised construction and a minimum of 15 m on each day for hand guided construction. The trial length shall be constructed at a similar rate (speed, around 1m/hr) to that which is proposed for the main work.
- 4.9.4** Transverse joints and longitudinal joints of each type that are proposed for dowel-jointed unreinforced concrete slabs in the main work shall be constructed and assessed in the trial length. If in the trial length the construction of expansion joint and longitudinal joint is not demonstrated, the first 2 expansion joints and at least the first 150 m of longitudinal construction joint for mechanised paving in the main work, shall be considered as the trial.
- 4.9.5 The trial length shall comply shall the Specification in all respects, with the following additions and exceptions:
- 4.9.6 Surface levels and regularity**
- (i) In checking for compliance with Clause 903.5 the levels shall be taken at intervals at the locations specified in this Clause along any line or lines parallel to the longitudinal centre line of the trial length.
  - (ii) The maximum number of permitted irregularities of pavement surface shall comply with the requirements of Clause 902.4. Shorter trial lengths shall be assessed pro-rata based on values for a 300 m length.
- 4.9.7 Joints**
- (iii) Alignment of dowel bars shall be inspected as described in Clause 602.10.7 in any two consecutive transverse joints. If the position or alignment of the dowel bars at one of these joints does not comply with Clause 602.6.5, if that joint remains the only one that does not comply after the next 3 consecutive joints of the same type have been inspected, then the method of placing dowels shall be deemed to be satisfactory. In order to check sufficient joints for dowel bar alignment without extending the trial length unduly, the Contractor may, by agreement with the Engineer, construct joints at more frequent joint intervals than the normal spacing required in the Contract.
  - (iv) If there are deficiencies in the first expansion joint that is constructed as a trial, the next expansion joint shall be a trial joint. Should this also be deficient, further trial expansion joints shall be made as part of the trial length which shall not form part of the permanent works, unless agreed by the Engineer.
- 4.9.8 Density**
- (v) Density shall be assessed as described in Clause 602.3.3. from at least 3 cores drilled from each part of the trial length.



**4.9.9 Position of tie bars**

(vi) Compliance with Clause 602.6.6 for the position and alignment of tie bars shall be checked by drilling additional cores from the slab unless they can be determined from cores taken for density.

**5.0 Approval and acceptance**

**5.1** Approval of the materials, plant, equipment and construction methods shall be given when a trial length complies with the Specification. The Contractor shall not proceed with normal working until the trial length has been approved and any earlier defective trial lengths have been removed, unless that can be remedied to the satisfaction of the Engineer. If the Engineer does not notify the Contractor of any deficiencies in any trial length within 10 days after the completion of that trial length, the Contractor may assume that the trial length, and the materials, plant, equipment and construction methods adopted are acceptable.

**5.2** When approval has been given, the materials, plant, equipment and construction methods shall not thereafter be changed, except for normal adjustments and maintenance of plant, without the approval of the Engineer. Any changes in material, plant, equipment and construction methods shall entitle the Engineer to require the Contractor to lay a further trial length as described in this Clause to demonstrate that the changes will not adversely affect the permanent works.

**5.3** Trial lengths which do not comply with the Specification, with the exception of areas which are deficient only in surface texture and which can be remedied in accordance with Clause 602.9.8.6 shall be removed immediately upon notification of deficiencies by the Engineer and the Contractor shall construct a further trial length.

**5.4 Inspection of dowel bars**

**5.4.1** Compliance with Clause 602.6.5. for the position and alignment of dowel bars at construction and expansion joints shall be checked by measurements relative to the side forms or guide wires.

**5.4.2** When the slab has been constructed, the position and alignment of dowel bars and any filler board shall be measured after carefully exposing them in the plastic concrete across the whole width of the slab. When the joint is an expansion joint, the top of the filler board shall first be exposed sufficiently in the plastic concrete to permit measurement of any lateral or vertical displacement of the board. During the course of normal working, these measurements shall be carried out in the pavement section at the end of day=s work by extending slab length by 2 m. After sawing the transverse joint groove, the extended 2 m slab shall be removed carefully soon after concrete has set to expose dowels over half the length. These dowels can be tested for tolerances.



**5.4.3** If the position and alignment of the bars in a single joint in the slab is unsatisfactory then the next two joints shall be inspected. If only one joint of the three is defective, the rate of checking shall be increased to one joint per day until the Engineer is satisfied that compliance is being achieved. In the event of non-compliance in two or more successive joints, the Contractor shall revert to the construction of fresh trial lengths and make any necessary alteration to concrete mix, paving plant or methods until the dowel bar position and alignment are satisfactory.

**5.4.5** After the dowel bars have been examined, the remainder of the concrete shall be removed over a width of 500 mm on each side of the line of the joint and reinstated to the satisfaction of the Engineer. The dowels shall be inserted on both sides of the 1 m wide slab by drilling holes and grouting with epoxy mortar. Plastic sheath as per Clause 602.6.5.5 shall be provided on dowels on one of the joints. The joint groove shall be widened and sealed as per Clause 602.11.

## **6.0 Preparation and Sealing of Joint Grooves**

### **6.1 General**

All transverse joints in surface slabs shall be sealed using sealants described in Clause 602.2.8. Joints shall not be sealed before 14 days after construction.

### **6.2 Preparation of joint grooves for sealing**

**6.2.1** Joint grooves usually are not constructed to provide the minimum width specified in the drawings when saw cut joints are adopted. They shall be widened subsequently by sawing before sealing. Depth/width gauges shall be used to control the dimension of the groove.

**6.2.2** If rough arises develop when grooves are made, they shall be ground to provide a chamfer approximately 5 mm wide. If the groove is at an angle upto 10 degree from the perpendicular to the surface, the overhanging edge of the sealing groove shall be sawn or ground perpendicular. If spalling occurs or the angle of the former is greater than 10 degrees, the joint sealing groove shall be sawn wider and perpendicular to the surface to encompass the defects upto a maximum width, including any chamfer, of 35 mm for transverse joints and 20 mm for longitudinal joints. If the spalling cannot be so eliminated, then the arises shall be repaired by an approved thin bonded aris repair using cementitious materials.

**6.2.3** All grooves shall be cleaned of any dirt or loose material by air blasting with filtered, oil-free compressed air. If need arises the Engineer may instruct cleaning by pressurised water jets. Depending upon the requirement of the sealant manufacture, the sides of the grooves may have to be sand blasted to increase the bondage between sealant and concrete.

**6.2.4** The groove shall be cleaned and dried at the time of priming and sealing.

**6.2.5** Before sealing the temporary seal provided for blocking the ingress of dirt, soil etc., shall be removed. A highly compressible heat resistant paper-backed debonding strip as per drawing shall be inserted in the groove to serve the purpose of breaking the bond between sealant and the bottom of the groove and to plug the joint groove so that the sealant may not leak through the cracks. The width of debonding strip shall be more than the joint groove width so that it is held tightly in the groove. In the case of longitudinal joints, heat resistant tapes may be inserted to block the leakage through bottom of the joint.

### **6.3 Sealing with sealants**

**6.3.1** When sealants are applied, an appropriate primer shall also be used if recommended by the manufacturer and it shall be applied in accordance with their recommendation. The sealant shall be applied within the minimum and maximum drying times of the primer recommended by the manufacturer. Priming and sealing with applied sealants shall not be carried out when the naturally occurring temperature in the joint groove to be sealed is below 7°C.

**6.3.2** If hot applied sealant is used it shall be heated and applied from a thermostatically controlled, indirectly heated preferably with oil jacketed melter and pourer having recirculating pump and extruder. For large road projects, sealant shall be applied with extruder having flexible hose and nozzle. The sealant shall not be heated to a temperature higher than the safe heating temperature and not for a period longer than the safe heating period, as specified by the manufacturer. The dispenser shall be cleaned out at the end of each day in accordance with the manufacturer's recommendations and reheated material shall not be used.

**6.3.3** Cold applied sealants with chemical formulation like polysulphide may be used. These shall be mixed and applied within the time limit specified by the manufacturer. If primers are recommended they shall be applied neatly with an appropriate brush. The Movement Accommodation Factor (MAF) shall be more than 10 per cent

**6.3.4** The sealants applied at contraction phase of the slabs would result in bulging of the sealant over and above the slab. Therefore, the Contractor in consultation with the Engineer, shall establish the right temperature and time for applying the sealant. Thermometer shall be hung on a pole in the site for facilitating control during the sealing operation.

**6.3.5** Sealant shall be applied, slightly to a lower level than the slab with a tolerance of 5 ± 2 mm.

**6.3.6** During sealing operation, it shall be seen that no air bubbles are introduced in the sealant either by vapors or by the sealing process.

**6.4** Testing of applied sealants: Manufacturer's certificate shall be produced by the Contractor for establishing that the sealant is not more than six months old and stating

that the sealant complies with the relevant standard as in Clause 602.2.8. The samples shall meet the requirement of AASHTO M 282 for hot applied sealant or BS 5212 : (Part-2) for cold applied sealant.

## **7.0 Measurement of Texture Depth - Sand Patch Method**

### **7.1 The following apparatus shall be used:**

- (i) A cylindrical container of 25 ml internal capacity
- (ii) A flat wooden disc 64 mm diameter with a hard rubber disc, 1.5 mm thick, stuck to one face, the reverse face being provided with a handle.
- (iii) Dry natural sand with a rounded particle shape passing a 300 micron IS sieve and retained on a 150 micron IS sieve.

**7.2 Method:** The surface to be measured shall be dried, any extraneous mortar and loose material removed and the surface swept clean using a wire brush both at right angles and parallel to the carriageway. The cylindrical container shall be filled with the sand, tapping the base 3 times on the surface to ensure compaction, and striking off the sand level with the top of the cylinder. The sand shall be poured into a heap on the surface to be treated. The sand shall be spread over the surface, working the disc with its face kept flat in a circular motion so that the sand is spread into a circular patch with the surface depressions filled with sand to the level of peaks.

**7.3** The diameter of the patch shall be measured to the nearest 5 mm. The texture depth of concrete surface shall be calculated from  $31000/(D \times D)$  mm where D is the diameter of the patch in mm.

## **8.0 Opening to Traffic**

No vehicular traffic shall be allowed to run on the finished surface of a concrete pavement within a period of 28 days of its construction and until the joints are permanently sealed. The road may be opened to regular traffic after completion of the curing period of 28 days and after sealing of joints is completed including the construction of shoulder, with the written permission of the Engineer.

## **9.0 Tolerance for Surface Regularity, Level, Thickness and Strength**

The tolerances for surface regularity, level, thickness and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

## **10.0 Measurements for Payment**

**10.1** Cement Concrete pavement shall be measured as a finished work in square metres with specified thickness. The volume to be paid for will be calculated on the basis of thickness and plans shown on the project drawings and adjusted for the deficiency in thickness. No additional payment shall be made for extra thickness of the slab. The full

payment will be made to this item after 28 days' strength of the concrete is found to be satisfactory.

The unit for measurement for concrete pavement shall be the cubic metre of concrete placed, based on the net plan areas for the specified thickness shown on the Drawings or directed by the Engineer. The rate shall include all provisions of this Specification and shall include the provision of all materials including polythene film, concrete, stock piling, mixing, transport, placing, compacting, finishing, curing together with all formwork, and including testing and submission of test certificates and records. No deduction shall be made in measurement for openings provided that the area of each is less than 0.5 sq.m. The unit rate as entered in the Bill of Quantities shall also include the full costs of contraction, expansion, construction, and longitudinal joints. It shall also include joint filler, keys, caulking rod, debonding strip, sealant primer, joint sealant, dowel bar and tie rod.

### 10.1.2 Pavement thickness

All precautions and care shall be taken to construct pavement having uniform thickness as called for on the plans.

Thickness of the cement concrete pavement shall be calculated on the basis of level data of the cement concrete pavement and the underlying sub-base taken on a grid of 3 m x 3.75 m the former measurement being in longitudinal direction.

A day's work is considered as a 'lot' for calculating the average thickness of the slab. In calculating the average thickness, individual measurements which are in excess of the specified thickness by more than 10 mm shall be considered as the specified as thickness plus 10 mm.

Individual areas deficient by more than 25 mm shall be verified by the Engineer by ordering core cutting and if in his opinion the deficient areas warrant removal, they shall be removed and replaced with concrete of the thickness shown on the plans.

When the average thickness for the lot is deficient by the extent shown in Table 600-3, the Contract unit price will be adjust as per this Table.

TABLE 600-3 PAYMENT ADJUSTMENT FOR DEFICIENCY IN THICKNESS

Deficiency in the average thickness of day's work	Per cent of Contract unit price payable
Up to 5mm	100
6 –10 mm	87
11-15 mm	81
16 – 20 mm	75

21 –25 mm	70
-----------	----

In the stretch where deficiency of average thickness is more than 25 mm, the section whose thickness is deficient by 26 mm or more is identified with the help of cores. Such slabs shall be removed and reconstructed at the cost of the Contractor. During such rectification work, care shall be taken to replace full slab and to the full depth.

#### **11.0 Rate**

The Contract unit rate for the construction of the cement concrete shall be payment in full for carrying out the operations required for the different items of the work as per these Specifications including full compensation for all labour, tools, plant, equipments, testing and incidentals to complete the work as per Specifications, providing all materials to be incorporated in the work including all royalties, fees, storage, rents where necessary and all leads and lifts.

#### **9.55 Cobble block**

**Providing and fixing Concrete Cobble Square 60mm thick Shotblasted finish of Vyara make or equivalent as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base.**

- 1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the blocks. Joints of the blocks shall be filled with the sand**
- 2) The blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.**
- 3) Grade-250, Size 97\*97\*60 mm thick, Using UV resistant colour pigments from Lanxess & PremierShield integral and topcoat treatment for satin finish, water and oil repellence, reduction of algae, moss and efflorescence formation**

#### **Material**

##### **1.1 Cobble block**

- 1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the blocks. Joints of the blocks shall be filled with the sand
- 2) The blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.
- 3) Concrete Grade-M 250, Thickness of stone-60mm, Using UV resistant colour pigments from Lanxess & PremierShield integral and topcoat treatment for satin finish, water and oil repellence, reduction of algae, moss and efflorescence formation

### **Mode of Measurement & Payment**

The rate shall be for a unit of one Sqmt.

#### **9.55 Beganit block**

**Providing and fixing Solid Concrete Cobble Sett in "Beganit Design" having thickness-60mm with undulated surface, colours specified by the architects of Vyara make or equivalent as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base.**

**1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the blocks. Joints of the blocks shall be filled with the sand**

**2) The blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.**

**3) Grade-500, Thickness of stone-60mm, Using UV resistant colour pigments from Lanxess & PremierShield integral and topcoat treatment for satin finish, water and oil repellence, reduction of algae, moss and efflorescence formation**

#### **Material**

#### **1.1 Beganit block**

1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the blocks. Joints of the blocks shall be filled with the sand

2) The blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.

3) Concrete Grade-M 500, Thickness of stone-60mm, Using UV resistant colour pigments from Lanxess & PremierShield integral and topcoat treatment for satin finish, water and oil repellence, reduction of algae, moss and efflorescence formation

Relevant specifications of item no. 9.25 shall be followed except Beganit blocks shall be used instead of cobbler stone.

### **Mode of Measurement & Payment**

The rate shall be for a unit of one Sqmt

**CW 10.00****Structural Steel Work**

**10.01.a** Structural steel work in riveted, bolted or welded in built up sections, trusses and framed work including supplying, fabricating, cutting, assembling, hoisting and fixing in position at all heights of all shapes and size with all leads and lifts of YST 310 grade as per latest IS 4923, IS 1161, IS 806 for the work of Railing, Handrail, flag fixing sleeve pole, garbage box, Street furniture and similar works etc. It should be including necessary rolled joists, channels, angles, tees, flats, angle cleats, gusset plates, position hip and jack lifters, purling, etc. including cutting and welding the members as per detailed drawing and design. The rate shall include dry sanding, degreasing (wet cleaning) & preparation of rust free surface manually or mechanically, metal putty to make the surface even and smooth, 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of MRF or equivalent paint as per manufacture's specification over all the surfaces of the steel sections or as specified in the drawing. (Only standard measurements will be paid for as actual cut length used at site). Shop drawings for the connection details shall be prepared for the approval of the architect.

Rate shall be inclusive of cutting, wastage, welding, bending (shop at site), and bolting wherever necessary, in position welding of required length, grinding, finishing edges, and filling the welded spots with metal putty. Rate shall be inclusive of 5 years guarantee against corrosion.

The fabrication work shall start after approval of finished sample as per drawing by Architect. Fabrication works to be carried out as per relevant IS standards.

Rolled steel sections (equal and unequal angles, square or round bars, flats, angles, tees, channels, plates of different sizes etc.), Solid flats, bars, RHS, SHS, tubular hollow sections of specified thickness & yield strength of TATA or equivalent as approved by engineer in charge & as per drawing (Samples to be approved)

**1.0 Material****1.1 Structural steel**

1.2.1 Structural Steel shall conform to M-60.

**2.0 Workmanship****2.1 Laying Out**

2.1.1 Nabhi's commentary on CPWD specifications clause no. 10.3.1 shall be followed.

**2.2 Preparation of Surface**

2.2.1 Surfaces which are to be welded together shall be free from loose mill scale, rust paint, grease or foreign matters. A coating of linseed oil shall be permitted.

## **2.2 Fabrication**

2.2.1 Nabhi's commentary on CPWD specifications clause no. 10.3.2, 10.4.2.1, 10.4.2.2, 10.4.2.3, 10.4.2.4, 10.4.2.5, 10.4.2.6 shall be followed.

## **2.3 Erection**

2.3.1 Nabhi's commentary on CPWD specifications clause no. 10.3.3, 10.4.2.7 shall be followed. Grouting shall be done with cement mortar 1:3 (1 cement: 3 coarse sand) or nonshrink free flow cement grout of approved make as per manufacture's specification as directed by engineer-in-charge.

## **2.4 Precautions**

2.4.1 Nabhi's commentary on CPWD specifications clause no. 10.4.2.3 shall be followed.

2.4.2 The following points shall be borne in mind during the process of welding

(a) Welds shall be made in flat position wherever practicable.

(b) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.

(c) The segments of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.

(d) Proper care shall be taken while welding, for shrinkage and distortions, as the drawing dimensions are the finished dimensions of the structure.

(e) Cutting of plates shall be profile cut.

(f) Welding rod shall be of Ishab Corporation or equivalent.

(g) The drilling is to be done with drill or magnetic drill.

2.4.3 The defective welds which shall be considered harmful to the strength shall cut out and rewelded.

2.4.4 Finished welds and adjacent part shall be protected with clean boiled linseed oil and after all slag has been removed welds and adjacent parts shall be painted after the same are approved.

2.4.5 All the members shall be thoroughly cleaned of rust, cakes, dust etc. and given a priming coat of zinc chromate red oxide before fixing them in position. All fabricated members shall be suitably packed to be protected from any damage while transportation, if any.



2.4.6 Grinding to the finished level is to be done, if directed by Engineer in charge. All exposed weld shall be ground smooth. Welds which have not been ground shall be scrubbed with a 10% solution of Hydrochloric acid which shall be washed off with water before painting unless alkali resistant paint is used.

2.4.7 The following checking and inspection shall be carried out before, during and after erection:

- Damages during transportation
- Accuracy of alignment of structures
- Erection according to drawings and relevant specifications
- Progress and workmanship

## 2.5 Painting

2.5.1 Nabhi's commentary on CPWD specification clause no. 10.2.2 shall be followed except paint shall be as per

Item description.

2.5.2 First priming coat of zinc chromate yellow oxide is to be applied on the fresh steel arrived at site.

2.5.3 Once the cutting, fabrication, grinding work gets completed second coat of primer and first coat of enamel paint is to be applied on the priming coat.

2.5.4 After paint has been already dried erection is done as specified in the item or as directed by engineer-in-charge.

2.5.5 After the erection final coat or second coat of paint is to be applied on the structural steel.

## 3.0 Mode of Measurement and Payment

3.1 For Riveted and bolted sections Nabhi's commentary on CPWD specification clause no. 10.3.5, 10.4.3 shall be followed except in case of skew cut if the balance material is used at other place, same shall be deducted from quantity of skew cut i.e. **Used wastage from skew cuts shall be deducted from its quantity and shall not be paid in skew cut.**

3.3 The weight of steel plates, sections and strips shall be taken from relevant IS Codes, based on 7.85 kg/m<sup>2</sup> for every mm. sheet thickness, if steel is supplied by the Contractor, otherwise, the weight shall be calculated on the actual weight basis on which steel is supplied to the Contractor by the Client. If the steel is supplied by the client, testing & checking as per relevant IS code, recording and intimation of quality of steel (to client and consultant) shall be sole responsibility of the contractor.

- 3.6 For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/m<sup>3</sup>.
- 3.7 Rolling Margin and wastage shall not be considered when weight is determined by standard weight on the basis of IS codes.
- 3.8 The rate includes cost of all material, labor involved in all operations as described above like erection, hoisting, scaffolding, painting as specified in item description, safety measures and sundry required for proper completion of the item of work, at all heights, all shapes and all places. This shall also include conveyance and delivery, handling, loading, unloading and storing etc. required for completion the item described above including necessary wastage involved.
- 3.9 The rate shall be for an unit of one Kg.

**10.01.b Structural steel work in riveted, bolted or welded in built up sections, trusses and framed work including supplying, fabricating, cutting, assembling, hoisting and fixing in position at all heights of all shapes and size with all leads and lifts as per latest IS 4923, IS 1161, IS 806 for the work of monkey ladder, all types of staircase(stringers, tread, riser and landing), spiral staircase, handrail, railing, grill, gate, insert plate, grating, cattle trap, brackets, frames, MS post and frame work for fencing and similar works. It should be including necessary rolled joists, channels, angles, tees, flats, angle cleats, gusset plates, position hip and jack lifters, purlins, etc. including cutting and welding the members as per detailed drawing and design. The rate shall include dry sanding, degreasing (wet cleaning) & preparation of rustfree surface manually or mechanically, metal putty to make the surface even and smooth, 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of ICI or equivalent paint as per manufacture's specification over all the surfaces of the steel sections or as specified in the drawing. (Only standard measurements will be paid for as actual cut length used at site). Shop drawings for the connection details shall be prepared for the approval of the architect.**

**Rate shall be inclusive of cutting, wastage, welding, bending (shop at site), bolting wherever necessary, in position welding of required length, grinding, finishing edges, and filling the welded spots with metal putty. It should also include the cost of approved ISI make and size zinc coated nut-bolt and Anchor fasteners of Hilti or Fisher as approved by engineer-in-charge. Rate shall be inclusive of 5 years guarantee against corrosion.**

**The fabrication work shall start after approval of finished sample as per drawing by Architect. Fabrication works to be carried out as per relevant IS standards.**

**10.01.b.1 Rolled steel sections (equal and unequal angles, square or round bars, flats, angles, tees, channels, plates of different sizes etc.), Solid flats, bars ,RHS, SHS, tubular**

**hollow sections of specified thickness & yield strength of TATA or equivalent as approved by EIC & as per drawing**

- 2.1 Relevant specifications of item no. 10.01.a shall be followed except the work is to be carried out for monkey ladder, railing, spiral staircase, railing, gate, insert plate, cattle trap, rain water spout etc. as specified in the item description and 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness), 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of ICI or equivalent paint is to be applied.
- 2.2 Unless otherwise specified proprietary treatment shall be executed through approved specialized water proofing agency. Contractor shall furnish a guarantee of 5 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same which is also to be signed by the specialized agency. However, soul responsibility shall be of main contractor for any damages to paint.
- 2.3 Copy of work order mentioning the rate issued to the specialized agency shall be attached with guarantee bond.
- 2.4 A guarantee bond on appropriately stamp paper shall be given by the contractor to the client in the manner form prescribed below:

**FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other form of weather condition, for a period of 5 years after completion of the work of painting as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of weather conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

- 2.5 This guarantee shall remain in force for a period of 5 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 5 years.

**10.02 Providing, fabricating and fixing jali (mesh) including cutting and welding / bolting with or without frame to main post as per detailed drawing and as approved by Architect and engineer-in-charge. The rate shall include application of required coats of metal putty to make the surface smooth, 1 coat of Rustocap primer and 2 coat of Hi-Gloss Metal PU Paint of Asian paint or equivalent over all the surfaces or specified by engineer-in-charge. Frame work for jali and post for fencing & jali will be paid in relevant item. (Clear visible area of the jali shall be measured).**

**10.02.1 MS Weld mash Jali (25mm x 25mm size of 12 gauge (2.6mm))**

**10.02.2 GI Chain Link Jali (50mm x 50mm size of 10 gauge (3.15mm))**

**1.0 Material**

**1.1 Welded Steel wire fabric**

1.1.1 Welded steel wire fabric shall conform to M-62.

**2.0 Workmanship**

2.1 The relevant specifications of item no. 10.02.a shall be followed except the work is to be carried out for wire mesh jail as described in the item or as directed by the engineer-in-charge. The MS Angles, MS Flats etc. shall be used as per the drawing. The rate includes application of required coats of metal putty to make the surface smooth, 1 coat of Rustocap primer and 2 coat of Hi-Gloss Metal PU Paint of Asian paint or equivalent or as specified in item as per manufacture's specification.

**3.0 Mode of Measurement and Payment**

3.1 The rate shall be for an unit of one sqm. Clear visible area of the jail shall be measured. The rate shall be inclusive of all material and labor required for all operations as described in the item.

3.2 Frame work for jali and post for fencing & jail will be paid in relevant item

**10.03 Providing and fixing in position, interlocking rolling shutter of approved make, made of 18 gauge, 75mm wide cold rolled MS lath interlocked, including top cover (16 gauge), spring, axles (specially designed shaft), guide rails(10 gauge), tees, iron pulleys, ball bearings, handles, arrangement for inside and outside locking arrangement, with push and pull arrangement (manually operated), holding down bolts embedded in CC 1:2:4 / anchor fastener of HILTI or equivalent including 1 coat of Rustocap and 2 coat of Hi-Gloss Metal PU Paint of Asian paint over all the surfaces etc. as directed. (Measurements considered for payments shall be clear size of opening plus guide channels on both the sides for width and 450mm on top for drum height.**

**1.0 Material**

**1.1 Rolling Shutter**

1.2 Rolling Shutter shall conform to M-61.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 10.8.2 shall be followed.

**3.0 Mode of Measurement and Payment**

3.1 For measurement Nabhi's commentary on CPWD specifications clause no. 10.8.3 shall be followed. It shall be measured in sqm.

3.2 For rate Nabhi's commentary on CPWD specifications clause no. 10.8.4 shall be followed. Rate is also inclusive of 1 coat of Rustocap and 2 coat of Hi-Gloss Metal PU Paint of Asian paint over all the surfaces

**10.04 Providing and fixing in position, interlocking rolling shutter partly grilled less than 50% (8mm dia MS bars) and partly paneled made of 18 gauge (1.2mm), 75mm wide cold rolled MS lath interlocked of approved make, including top cover (16 gauge), spring, axles (specially designed shaft), guide rails(10 gauge), tees, iron pulleys,ball bearings, handles, arrangement for inside and outside locking arrangement with push and pull arrangement (manually operated), brackets holding down bolts embedded in CC 1:2:4 / anchor fastener of HILTI or equivalent including 1 coat of Rustocap and 2 coat of Hi-Gloss Metal PU Paint of Asian paint over all the surfaces etc. as directed. (Measurements considered for payments shall be clear size of opening plus guide channels on both the sides for width and 450mm on top for drum height.)**

Relevant specifications of item no. 10.03 shall be followed except the shutter shall be partly grilled less than 50% (8mm dia MS bars) and partly paneled. Nabhi's commentary on CPWD specifications clause no. 10.9 shall be followed.

**10.05 Providing and fixing in position, interlocking rolling shutter fully grilled more than 50%, made of 8 mm MS bars of approved make, including top cover (16 gauge), spring, axles (specially designed shaft), guide rails(10 gauge), tees, iron pulleys,ball bearings, handles, arrangement for inside and outside locking arrangement with push and pull arrangement (manually operated), brackets holding down bolts embedded in CC 1:2:4 / anchor fastener of HILTI or equivalent including 1 coat of Rustocap and 2 coat of Hi-Gloss Metal PU Paint of Asian paint over all the surfaces etc. as directed. (Measurements considered for payments shall be clear size of opening plus guide channels on both the sides for width and 450mm on top for drum height.)**

Relevant specifications of item no. 10.03 shall be followed except the shutter will be fully grilled more than 50% made of 8 mm MS bars. Nabhi's commentary on CPWD specifications clause no. 10.9 shall be followed.

**10.06 Extra for providing mechanical device and vertical MS rod with a pair of handles for operating rolling shutters as directed by engineer in charge.**

**10.06.1 Exceeding 10.0 sqm and upto 16.80 sqm in the area**

**10.06.2 Exceeding 16.80 sqm in area**

Relevant specifications clause no. 10.03 shall be followed. Item shall be measured in sqm.

**10.07 Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing and staircase railing including applying a 2 priming coat of approved steel primer and 2 coats of synthetic enamel paint.**

**10.07.1 M.S. Tube**

**10.07.2 E.R.W. Tube**

**10.07.3 G.I. Pipes**

The relevant specifications of item no. 10.01.a shall be followed except the work is to be carried out for handrail as specified in the item. The rate includes the cost of material and labor required for completion of the item as directed by engineer in charge. The rate shall be for an unit of one Rmt.

**10.08 Providing, fabricating and fixing MS bars & Grills of required Pattern as per approved drawing, design and direction to window frames with MS flats/square/round bars at required spacing and frame all around fixed with screws to window frame including three coats of painting etc. complete as directed by the engineer-in-charge.**

**1.0 Material**

1.1 Nabhi's commentary on CPWD specifications clause no. 10.16.0 shall be followed

**2.0 Workmanship**

2.1 The MS Grill shall be prepared as per the drawing as directed by the engineer-in-charge.

2.2 The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be riveted or welded as shown in the plan or as directed. The grill so framed shall be fixed in to the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts of screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to a minimum of 2 Nos. on each side of the frame or as indicated in the drawings or as directed by engineer in charge.

2.3 The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of frame strips.

2.4 Relevant Nabhi's commentary on CPWD specifications clause no. 10.16.1, 10.16.2, 10.16.3 shall be followed

**3.0 Mode of Measurement and Payment**

3.1 Clear dimension of grill shall be measured. No payment shall be made for weight of screws, bolts, nuts etc. Only weight of the grill shall be measured.

3.2 The rate shall be for a unit of one Kg. The rate shall include all material and labour required for all operations as described above and grills of different type will not be measured separately.

3.3 Nabhi's commentary on CPWD specifications clause no. 10.16.4 shall be followed.

**10.09 Fabricating and fixing SS railing of 316 grade made out of round pipes, square or rectangle sections in satin / brush finish including supporting fittings made out of SS 316 grade, anchor fastener of stainless steel, SS base plate, argon arc welding etc. on**

**concrete surface, brick surfaces or floor including bending and bends as per the drawing with best (high) quality finish as per the approval of Architect and as directed by engineer-in-charge Railings, gratings, ladder etc.**

**10.09.1 Spiral Railing**

**10.09.2 Railings, gratings, ladder etc.**

**1.0 Material**

1.1 Stainless steel SS 316 grade of approved make shall be used.

**2.0 Workmanship**

2.1 Clean debris and dust from surfaces and embed holes thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

2.2 Installation of the railing is to be done as per manufacture's specification. If required argon arc welding for joints, L & key joints as approved, polishing, CNC cutting is to be done. The railing should be in true line and level. Area where railing to be fixed should be cleared and neat workmanship manner.

**3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid in Kg of steel. Rate shall be inclusive of protecting the Railing until handing over to client.

**10.10 Providing and fixing teak wood hand rail of the specified size and shape as per the detail design over the MS / SS handrail and railings installed, including 3 coats PU polishing of approved make, shade etc. as directed by engineer in charge. The teak wood shall be first class Ghana teak wood.**

**1.0 Material**

**1.1 Teak Wood**

1.1 Teak Wood shall conform to M-85.

**2.0 Polyurethane Polish**

2.1 Polyurethane Polish shall conform to M-76.

**2.0 Workmanship**

2.1 The Hand rail shall be done as per the details given including sand papering, planning etc. complete as directed by engineer in charge.

2.3 The Hand rail shall be fixed with screws as per drawing and details given.

### **3.0 Mode of Measurement and Payment**

3.1 The Wood work shall be measured for finished sections in cum. No allowances shall be made for wastage and for dimensions supplied beyond those lengths specified.

3.2 The rate shall include painting all timber faces with 2 coats of approved wood primer and Polyurethane polish before fixing in position.

3.4 The rate shall be for an unit of one Rmt.

**10.11 Providing and fixing wooden hand rail as per the drawing, over the verticals already installed, including painting/polishing of approved make, shade etc. as directed by engineer in charge. The teak wood shall be approved quality Burma teak wood.**

### **1.0 Material**

#### **1.1 Teak Wood**

1.1 Teak Wood shall conform to M-85.

#### **2.0 Polyurethane Paint**

2.1 Polyurethane Paint shall conform to M-76.

#### **2.0 Workmanship**

2.1 The Hand rail shall be done as per the details given including sand papering, planning etc. complete as directed by engineer in charge.

2.4 The Hand rail shall be fixed with screws as per drawing and details given.

### **3.0 Mode of Measurement and Payment**

3.1 The Wood work shall be measured for finished sections in cum. No allowances shall be made for wastage and for dimensions supplied beyond those lengths specified.

3.2 The rate shall include painting all timber faces with 2 coats of approved wood primer and Polyurethane paint before fixing in position.

3.5 The rate shall be for a unit of one Rmt.

**10.12 Extra over item no. 10.01.a for additional fabrication labour charges for making & fixing the mural by approved chemical anchor fastener of HILTI or equivalent and applying 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of ICI or equivalent paint as per manufacture's specification over all the surfaces as per drawing in the truss, space frame, cladding etc. (Indicative drawing is attached for reference only).**

**10.13 Providing and fixing Decorative Cast Iron Railing/Fencing/Grill on compound wall and other location as per approved design which includes necessary pattern making, casting, finishing, fabrication, fixing, grinding, shot blasting , necessary tools, tackles,**



**labor and required civil work, welding, riveting and finishing & painting as per detailed specification and satisfaction of Architect and Engineer in Charge. The Cast Iron should be painted with two coats of Zinc Chromate Yellow Oxide and two coats of Enamel Paint of desired shade and make as approved by the Architect and Engineer In Charge etc complete.**

### **1.0 Material**

Cast Iron and MS sections shall be of TATA or APOLLO make as per IS standards. The Cast Iron Railing/Fencing/Grill should be made of Grey soft malleable, machine able Cast Iron. The tensile strength should be about 200N/mm<sup>2</sup>. It should have 1 to 3 % silicon content and the carbon percentage should not increase beyond 4% and should not be less than 2%. The connecting bar should Bright bar square section of minimum 17.5 mm as per IS standards, hold fast and RCC for fixing.

### **2.0 Workmanship**

The metal should be preferably be good soft Grey molded cast iron, sound and clean cast from the second melting, free from injurious cold shuts or blow holes, true to pattern and of excellent finish. Sharp corners should be well rounded, the grinding to be done by grinder and to made smooth and finished. Complete in all respect in the satisfaction of Architect and Engineer In Charge.

First the actual full size pattern should be made in hard wood as per the Architectural drawing and design and approval should be obtained from Architect and Engineer in Charge. The pattern in the shape of the finished component should be of good finish and with good workmanship. The modules to be made from sand and the mould are to be made by hard ramming the molding sand around the pattern. After the removal of the pattern the mould should retain its shape. If required the entire job may be done by forging also. The pattern will be property of owner.

The casting should be free from impurities and external surface to be free from pores and projections. The entire surface must be smooth and grinding must be done to obtain desired finish.

The Railing/Fencing/Grill made out of using the CI units should be put in place using horizontal connector MS bright bar 17.5 mm passing through each unit of Railing/Fencing/Grill in line level and plumb with accurate spacing and should be fixed in the concrete/stone in situ in rich mix on the base.

The complete work should be painted with two coats of Zinc Chromate Yellow Oxide and two coats of Enamel Paint of desired shade and make as approved by the Architect and Engineer In Charge etc complete. MS bright bars of appropriate cross section and length to be used for connecting all the elements of cast iron Railing/Fencing/Grill . Necessary welding, hold fast, fixtures and fasteners should be of good quality and shall

pass as per directed by Architect and Engineer in Charge. The entire work of cast iron Railing/Fencing/Grill should be shot blasted, clean and make the surface free from dirt, and then it should be painted with sprayer and air compressor by two coats of Zinc Chromate Yellow Oxide and two coats of desired Enamel Paint etc complete.

### **3.0 Mode of Measurement and Payment**

The measurement shall be in terms of weight in kilograms and payment will be made per unit rate of kilograms for complete item in all aspect. All the works related to fixing of the railing are included in this item. The rates are inclusive of wastage, fixing, RCC, finishing, painting, providing P.V.C. sleeve of 110 diameter with 3.5 feet length or Insert Plate of 100x100x8mm with steel reinforcement lugs, minor civil work or any other work related of fixing the railing, labor and consumables as per drawing.

**10.14 Providing, supplying and fixing heavy duty GI anchor bolt for the fixing of MS railing, hand rail, light pole, display panel, bracket, other street furniture etc. with injection adhesive (chemical grouting) of HILTI / Fischer or equivalent as approved by the Engineer / Architect for fixing in wet/Dry conditions of following dia. The installation and the setting instructions should be strictly followed as per the manufacturer's recommendations. The rate shall include making required drilling hole, all labour, scaffolding and other incidentals necessary to complete the work as per the drawing and specification.**

**10.14.1. 8 mm dia & 106 mm long**

**10.14.2. 10 mm dia & 125 mm long**

**10.14.3. 12 mm dia & 153 mm long**

**10.14.4. 16 mm dia & 252 mm long**

#### **1.1 Material**

1.1.1 Threaded anchor bolt of HILTI / Fischer or equivalent as approved by the architect / engineer, shall conform to relevant latest I.S. Codes, Specifications.

1.1.2 The chemical shall be urethane methacrylate resin (Vinylester urethane resin). Proportion of hardener & resin shall have ratio of 1:3.

#### **1.2 Workmanship**

1.2.1 The holes shall be drilled with a rotary percussive drill to ensure adequate size, depth of hole for required diameter of anchor bolt. Diamond core drills shall not be used without subsequent surface roughening. Holes shall be dry at the time of drilling.

1.2.2 The hole shall be cleaned with blower and brush to ensure no dust is present inside.

- 1.2.3 Start injecting chemical from the bottom/end of the hole to ensure complete filling. Some mortar should overflow upon inserting the rebar anchor bolt to show complete filling.
- 1.2.4 Allow for complete curing before applying any load.
- 1.2.5 Necessary scaffolding shall be provided by the Contractor.
- 1.2.6 All the anchor bolt shall be accurately placed in exact position shown on the drawings and shall be securely held in position.

### **1.3 Mode of Measurement & Payment.**

- 1.3.1 Rate shall be for per number.
- 1.3.2 Rate shall include all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work.

### **10.15 HOT DIP ZINC GALVANIZATION**

Hot deep galvanizing work confirming to IS 4579/ 2629/ 2633 with zinc of 85 micron thickness on Railing, Handrail, flag fixing sleeve pole, garbage box, Street furniture and similar works etc made from solid flat, bar, RHS, SHS, tubular hollow sections etc. as per the drawing and as instructed by engineer in charge. The rate shall include preparing the surface by shot blasting/ acid washing prior to hot deep galvanizing, labor, tools, machinery etc complete (Sample to be approved).

#### **Scope**

This specification covers the general requirements of hot dip galvanizing for fabricated M.S. sections-plates, foundation bolts including cleaning of any paint, grease, rust, scale, acid or alkali or such other foreign matters.

#### **Applicable Codes**

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable.

- (i) IS: 4759-20.79: Specification for Hot Dip Zinc Coatings on Structural Steel and other allied Products.
- (ii) IS: 209-20.79: Specification for zinc.
- (iii) IS: 2629-20.66: Recommended Practice for Hot Dip Galvanizing of Iron and Steel.

- (iv) IS: 6158-20.71: Recommended Practice for Safe-guarding against Embrittlement of Hot Dip Galvanized Iron & Steel Product.
- (v) IS: 2633-20.72: Method of Testing Uniformity of Coating on Zinc Coated Articles.
- (vi) IS: 6745-20.72: Method for Determination of weight of Zinc Coating on Zinc coated iron and steel articles (with amendment No. 1).
- (vii) ASTM A-123: Spec. for Zinc (Hot Galvanized) Coatings on (20.78) Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars and Strips.

General Requirements

**QUALITY OF ZINC:** Zinc conforming to at least grade Zn 99.95 specified in IS: 209-20.79 shall be used for the purpose of galvanizing.

**BASE METAL:** The steels and castings shall be in accordance with clause 2 of IS: 6158-20.71. Where steel is supplied by the fabricator, it is the responsibility of the fabricator to select suitable steel which will withstand normal galvanizing operation without embrittlement.

The edges of tightly contacting surfaces should be completely sealed by welding. The residue of coated electrodes should be removed, prior to pickling, by brushing, chipping or sand blasting.

**SURFACE PREPARATION:** Surface shall be cleaned and prepared as per clause 4 of IS: 2629-20.66. Malleable iron castings shall be shot and grit blasted before galvanizing.

**GALVANISING:** The members shall be galvanized in accordance with the practice contained in the IS: 2629-20.66 unless otherwise specified in the succeeding paragraphs.

Coating Requirements

**MASS OF ZINC COATING:** Minimum average mass of zinc coating on different kinds of articles shall be as under:

- a) Fabricated steel

Thickness less than 2 mm

but not less than 1.2 mm

340 gms/sq.m

Thickness 2 mm and above

750 gms/sq.m

b) Fasteners	
Up to nominal size M10	270 gms/sq.m
Over M10	300
gms/sq.m	

Note: Articles galvanized with  $1000 \text{ g/m}^2$  zinc coatings shall be identified by a band of green paint by the galvanizer.

**FREEDOM FROM DEFECTS:** The zinc coatings shall be uniform, adherent, reasonably smooth and free from imperfections such as flux ash and dross inclusions, bare patches, black spots, pimples, lumpiness and runs, rust stains, bulky white deposits and blisters, etc. These terms have been defined in IS: 2629-20.66 (duly amended wherever necessary).

**STEEL EMBRITTLEMENT:** The design of the product and the selection of steel, wherever steel is to be supplied by fabricator, for its suitability to withstand normal galvanizing operations without embrittlement or the method of fabrication shall be the responsibility of the fabricator. Recommended precautions to properly design, fabricate and prepare the material for galvanizing to prevent embrittlement shall be as per IS: 6158-20.71.

Tests

#### TYPE TESTS

- (a) Visual Inspection
- (b) Adhesion of coating
- (c) Uniformity of coating
- (d) Mass of zinc coating

Each test shall be conducted on three samples.

#### ACCEPTANCE TESTS

- (a) Visual Inspection
- (b) Adhesion of coating
- (c) Uniformity of coating
- (d) Mass of zinc coating

#### ROUTINE TESTS

**(a) Visual Inspection**

Scale of Sampling and criteria for conformity

LOT: All the material of the same type in a coating bath whose characteristics are intended to be uniform shall be grouped together to constitute a lot.

A lot shall not consist of more than one shift's production or 100 nos. whichever is lower.

Sample shall be taken from each bath and tested for conformity of coating. Where the galvanizing is done without the presence of Purchaser, the manufacturer may prepare lots consisting of the articles of the same type and material and galvanized in the same bath. If there are more than one bath, separate lots shall be prepared for each bath.

**SCALE OF SAMPLING:**

Samples in accordance with TABLE 1 shall be taken, at random, from each lot for tests.

**TABLE 1: Scale of Sampling**

Lot size	Sample size	Permissible no. of defective units
Up to 25	3	0
26-50	5	0
51-100	8	0
101 and above	13	1

For materials of inconvenient lengths and from which it is not possible to cut a specimen for coating characteristic tests, two test pieces of same cross section and not less than 90 cms length shall be galvanized in the same bath.

The samples selected in accordance with Table 1 above shall be subjected to the visual inspection.

If any sample fails to conform to the requirement, the lot shall be rejected. The galvaniser, however, may segregate the good pieces of the lot and submit them once again for inspection.

If the lot inspected for visual inspection, passes the test, 3 samples for coating characteristics shall be taken from the samples, which were subjected to the visual tests.

Each of the 3 samples will be subjected to test for adhesion, uniformity, mass of zinc coating. Should any sample fail in any test, six more samples shall be taken from the lot and all the 3 tests repeated. Should any sample fail in the retest, the lot shall be rejected. If it is not possible to take six samples for the test, the lot shall be rejected.

The material in a lot which has been rejected may be stripped and re-galvanized and submitted for inspection and tests.

#### TEST METHODS

**VISUAL INSPECTION:** The material shall be inspected visually to observe that it is smooth, reasonably bright, continuous and free from such imperfections as flux/ash/dross inclusions, bare patches, black spots, pimples, lumpiness runs, rust stains, bulky white deposits and blisters. The stains of flux, usually white in colour, shall not be regarded as flux intrusions.

#### **ADHESION OF GALVANISED COATING:**

Coating shall withstand the knife tests as prescribed in IS: 2629-20.66. When cut or pried into, such as with a stout knife applied with considerable pressure, in a manner tending to remove a portion of the coating, it shall only be possible to remove small particles of the coating; and it shall not be possible to peel any portion of the coating so as to expose iron or steel underneath.

On articles fabricated from angles, channels, beams and rolled sections of 8 mm or more thickness, the adhesion may, alternatively, be tested by pivoted hammer tests as per IS : 2629-20.66. This test is not suitable for curved and round surfaces.

#### **UNIFORMITY OF GALVANISED COATING:**

On small articles, which can be conveniently handled the uniformity of the coating shall be determined by Preece Test in accordance with IS: 2633-20.66 by dipping the whole article in the copper sulphate solution. For sheets, strips and other fabricated articles a 10 cm x 10 cm specimen may be cut for tests. For tubes, 100 mm long piece shall be cut from each end of the product, after discarding 300 mm length from the end. The article shall withstand 5 dips of one minute each.

For long articles, measurement of coating thickness at a number of places by magnetic method shall be taken as a uniformity test.

Note: The Preece Test is primarily meant for articles where surface is mechanically scrapped or wiped after dip in the galvanizing baths etc

### **MASS OF GALVANISED COATING:**

The average mass of galvanized coating shall be determined by any one of the following methods as agreed between the purchaser and the galvaniser before the tests.

**Mass before and after galvanizing:** The mass of coating may be determined by weighing the article before and after galvanizing, subtracting the first mass from the second and dividing the result by the coated surface area. The first mass shall be determined after pickling, rinsing and drying; and the second after cooling to the ambient temperature.

**Stripping method:** In case of materials galvanized without purchasers' inspection, average mass of coating shall be determined by stripping the entire article in accordance with IS: 6745-20.72. If the surface area of the entire article cannot be measured easily or if the article is inconveniently large, a specimen of 100 sq. cm. area may be cut from each of the three samples and stripped.

### **Magnetic thickness gauge method:**

For large products such as poles, towers, structural shapes and castings the average weight of the coating shall be determined by a magnetic thickness gauge.

Before making the measurement the gauge shall be calibrated by measuring the thickness of zinc coating on a test panel and comparing the measured value with the value obtained by stripping method on the same piece.

For castings etc. at least 5 readings may be taken at convenient locations nearly in the centre. Thickness, in micro-meters, when multiplied by 7.047 would give the average mass of zinc coating ( $\text{g/m}^2$ ). Three articles in each lot of up to 100 shall be tested in this manner.

### **RECTIFICATION OF DAMAGE**

Normally all fabrication work in the case of galvanized articles shall be completed prior to galvanizing. If, for any reason, fabrication such as cutting,



drilling or welding has to be undertaken after galvanizing, protection of metal exposed as a result of fabrication and rectification of damaged galvanized areas shall be done in accordance with either the following methods or any other method approved by the Purchaser.

**USE OF ZINC BASED SOLDERS:** The surface to be protected, or the surface where galvanizing has been damaged, shall be cleaned and any oxides removed with a weak acid solution and a wire brush. The surface shall be thoroughly washed with water to make it free from any traces of acid. The cleaned area shall be heated with a welding torch and rubbed with white salammoniac. A piece of zinc stick or rod 5-10 mm diameter of high purity shall be melted on this area and spread out with a heated piece of salammoniac. The areas shall then be washed down by water and lightly wire brushed. The workmanship shall be such that the finished surface is smooth and non-porous.

**USE OF ZINC RICH PAINTS:** The damaged surface after cleaning, as mentioned in para 7.2 shall be painted with two or more coats of zinc rich primer followed by a finishing coat of a zinc rich paint as per the painting schedule recommended by the manufacturers. It is to be ensured that the dry film thickness of zinc rich primer shall not be less than the average thickness of the galvanized coating. The complete painting system i.e. zinc rich primer with the finishing zinc rich paint for this purpose shall be produced from a source of repute and approved by the Purchaser.

**DEFECTS, THEIR CAUSES AND REMEDIAL MEASURES**

Defects	Causes	Recommended actions	Ground for rejection
	Paint grease or oil residues	Check cleaning practices	
Bare spots	Scale or rust residues	Check pickling practices	Yes, if bare spots are bigger than 8 mm dia. or 8 mm diagonal.
	Residual welding slag	Blast-clean wells; avoid coated rods	
	Breakdown of preflux coating	Check preflux and drying conditions	
	Aluminum content of bath too high	Regulate aluminum additions	
	Rolling defects in basic steel	Check steel supply	
	Article in contact during galvanizing.	Keep articles separated.	

Defects	Causes	Recommended actions	Ground for rejection
General roughness	Analysis or original surface condition of steel.	Check steel supply.	
	Over-pickling	Reduce pickling use inhibitor	No
	High galvanizing temperature or long immersion time or both	Adjust galvanizing conditions.	
Pimples	Entrapped dross particles	Avoid agitation of dross layer; check carryover of pickle salt.	No, unless dross contamination is heavy
Lumpiness and runs (uneven drainage)	Withdrawal speed too high	Remove work slowly	No.
	Cold galvanizing bath.	Increase temperature.	
	Delayed run-off from seams, joints, bolt holes, etc.	Remove work slowly.	
	Article in contact during withdrawal.		
Flux inclusions	Stale flux burnt on during dipping.	Refresh or renew flux blanket.	Yes.
	Surface residues on steel.	Check steel preparation.	
	Flux picked up from top of bath.	Skim before withdrawal.	
Ash inclusion	Ash burnt on during dipping.	Skim bath before dipping.	Yes, if in gross lumps.
	Ash picked up from top of bath.	Skim before withdrawal.	

Black spots	Includes flux particles from flux 'dusting'.	Confine fluxing to top of bath.	Yes.
	Dirt smuts, splash marks.	Check storage conditions.	No.
Dull grey coating (all alloy, no free zinc).	Steel composition (high silicon, phosphorous or carbon) severe cold work.	Check steel supply for composition order to adjust for galvanizing.	No.
	Slow cooling after galvanizing.	Avoid hot stacking quench.	

	Release of absorbed hydrogen during solidification of coating.	Avoid over pickling; use inhibitor.	
	Weeping of acid etc. from seams and folds.	Check product design and fabrication.	
Rust stains	Storage near rusty material.	Check storage condition.	No.
Bulky white deposit (wet storage stain, white rust).	Confinement of close packed articles under damp conditions.	Storage dry well-ventilated conditions, separate articles with spacer.	No.
	Packing of articles while damp.	Dry before packing; include desic can't.	
Blisters	Expansion of entrapped hydrogen and moisture in flaws.	Check steel quality	Yes, if general.
	Driving off of hydrogen absorbed during pickling.	Use shot blast instead of pickle; check steel supply.	
	Improper malleabilising (for malleable iron castings only)	Check malleabilising practice.	
Tiny blisters	Effect sometimes observed on quenched work notably malleable castings. May be caused by gas evolved from the work resulting from absorbed hydrogen or break-down of combined carbon near surface.	Use shot blast instead of pickle. Check malleabilising treatment. Should have no combined carbon near surface of casting.	Yes, if blistering is generally wide spread.

### STRIPPING METHOD (Extracted from IS: 6745-20.72)

**Cleaning of test piece:** The test pieces shall be washed with solvent naphtha, trichloro ethylene or any other suitable organic solvent, then with alcohol and finally dried thoroughly.

#### Stripping Solutions:

Dissolve 20 g of antimony trioxide (Sb<sub>2</sub>O<sub>3</sub>) or 32 g of antimony trichloride (SbCl<sub>3</sub>) in 1000 ml of concentrated hydrochloric acid (specific gravity 1.1).

Immediately before tests, prepare the stripping solution by adding 5 ml of the solution, 1 to 100 ml of concentrated hydrochloric acid (specific gravity 1.16).

Mix well.

**Procedure** - Weigh the cleaned test specimen whose mass is less than 200 g nearest to 0.01 g; for test piece whose mass is between 300 to 1000 g to the nearest 0.1 g; and for test specimen of over 1000 g to the nearest 0.5 g. After weighing immerse each test piece singly in test solution and allow to remain there until the violent evolution of hydrogen and only a few bubbles are being evolved. This requires about 15 to 30 seconds.

The mass of zinc coating (in  $\text{g/m}^2$ ) of surface may be calculated as per the following formula:

$$M = \frac{M1 - M2}{A} \times 10^6$$

Where,

M = mass of zinc coating, in  $\text{g/m}^2$ , of surface. M1 = original mass, in g, of test piece. M2 = mass in g, of stripped test piece, and A = coated area of the test piece, in  $\text{mm}^2$ .

**Mode of Measurement and Payments:**

The item shall be measured and paid in unit of kg.

## CW 11.00

### Painting and Polishing Work

**11.01. a White wash with lime on any surfaces (3 coats with brush) to give an even shade at all heights and all levels., including thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter etc. complete.**

#### 1.0 Materials:

- 1.1 The clearcolle: This shall be made from glue and boiling water by mixing 1 Kg. of glue to every 15 litres of water. Mixture shall be suitably tinted where required for use under coloured distemper, if directed. Glue shall conform to IS: 852-1969 (Specifications for animal glue).
- 1.2 Lime used shall be freshly burnt class `C' Lime (fat lime) and white in colour conforming to IS: 712:1973. Water shall conform to M-1. Best quality of gum (D.D.L) of Pidilite Industries Ltd. shall be used in the preparation of white wash. Ultramarine blue or Indigo: They shall conform to IS: 55-1970 for paints and shall be used for preparation of white wash. Pigments: Mineral colours, not affected by lime shall be used in preparing colour wash.

#### 2.0 Workmanship

- 2.1 **Preparation of white wash solution: Surface already white washed or coloured:** The fat lime shall be slaked at site and shall be mixed and stirred with about five litres of water for 1 Kg. of unslaked lime to make the mixture creamy. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth. 4 Kg. of gum or glue of Pidilite Co. (D.D.L.) dissolved in hot water shall be added to each cubic meter of lime cream. Small quantity of ultramarine indigo (neel) (upto 3 gms. per kg. of lime dissolved in water) shall also be added to the last two coats of white wash solution, if directed and the whole solution shall be stirred thoroughly before use.
- 2.2 **Preparation of surface**
  - 2.2.1 The surface shall be thoroughly cleaned of all dust, dirt, mortar dropping and other foreign matter before white wash is to be applied.
  - 2.2.2 The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brick bats. The surface shall be then broomed to remove all dust and dirt and shall be washed with clean water.
  - 2.2.3 Oil or grease spots shall be removed by suitable chemical. Smooth surfaces shall be rubbed with wire brushes.
  - 2.2.4 All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portions shall be wetted and allowed to dry. Any crevices, at any level shall be cleaned and

filled with the plaster mortar and cured as above. They shall then be given one coat of white wash.

2.2.5 All unnecessary nails shall be removed, the holes, cracks, patches etc. shall be made good with material similar in composition to the surface to be prepared.

2.3 **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 or colour washed. A properly secured, strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary. Also, while painting the ceiling, the floor area shall be covered properly with plastic so that the flooring is not spoiled.

#### 2.4 **Application of white wash:**

2.4.1 On the surface so prepared, white wash shall be applied with moonj brush. The first stroke of the brush shall be from top to downwards, another from bottom to upwards over the first stroke and similarly one stroke from the right and another from the left over the first stroke of the brush before it dries. This will form one coat. Each coat shall be allowed to dry before next coat is applied. Number of coats as specified in the item shall be applied. It shall present smooth and uniform finish, free from brush marks and it should not come off easily when rubbed with a finger.

2.4.2 Splashing and droppings, if any on the doors and windows, ventilators, floors etc. shall be removed and the surface shall be cleaned.

2.4.3 Each coat shall be allowed to dry before next coat is applied. If additional coats are required then what have been specified and applied, the same shall be applied to obtain uniform and smooth finish. It shall be done at no extra cost. The finished dry surface shall not show any signs of cracking and peeling nor shall come off easily on the hand when rubbed.

2.4.4 Sample shall be approved by the Architect and Engineer-in-charge before execution of the work.

#### 2.5 **Protective Measures**

2.5.1 The surface of doors, windows, ventilators, floors, furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of with white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.

#### 3.0 **Mode of Measurements and Payment:**

- 3.1 **For mode of measurement actual flat measurement shall be measured. Deduction shall be as per IS 1200.** All the work shall be measured in the decimal system as under
- (a) Dimensions shall be measured to the nearest 0.01 m.
- (b) Area in individual items shall be worked out to the nearest 0.01 m<sup>2</sup>.
- 3.2 All works shall be measured in sq.mt. In jambs, soffits, sills etc. and for openings not exceeding 0.5 m<sup>2</sup> each in area, for ends of joists, posts, beams, girders, steps etc. not exceeding 0.5 m<sup>2</sup> each in area and for openings exceeding 0.5 m<sup>2</sup> and not exceeding 3.0 m<sup>2</sup> each in area, deductions and additions shall be made as under :-
- 1) No deductions shall be made for ends of joists, beams, posts, etc. and for openings not exceeding 0.5 m<sup>2</sup> each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joists, beams, posts etc.
- 2) Deductions for openings exceeding 0.5 m<sup>2</sup> but not exceeding 3.0 m<sup>2</sup> each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc. of these openings:
- (a) When both the faces of walls are provided with the same finish, deduction shall be made for one face only.
- (b) When each face of wall is provided with a different finish, deduction shall be made for that side of frame for door, windows, etc. on which width of reveals is less than that of the other side. Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area of finish.
- (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if when width of reveal on the treated side is less than that on the untreated side, but if the width of reveals is equal or more than on the untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.
- 3) In case of area of openings exceeding 3.0 m<sup>2</sup> each, deduction shall be made for openings but jambs, soffits shall be measured.
- 4) No deductions shall be made for attachment such as casing, conduits, pipe, electric wiring and the like.
- 3.2 Corrugated surfaces shall be measured flat as fixed and not girth. The quantities measured shall be increased by the following percentage and the resultant shall be included with the general areas:
- (a) Corrugated steel sheets ----- 14%
- (b) Corrugated A.C. Sheets ----- 20%

(c) Semi corrugated A.C. Sheets -----	10%
(d) Nainital pattern roof (Plain sheeting with rolls) ----	10%
(e) Nainital pattern roof (with corrugated sheets) -----	25%
(f) Sand faced Plaster / textured plaster / Smooth or mala plaster -----	0%

- 3.3 Cornices and other wall features, when they are picked out in a different finish / colour shall be girthed and included in the general area.
- 3.4 The rate shall include the cost of all materials, labour, scaffolding, protective measures etc. required for the above specified operation, at all floors, at any height, in any position. Priming and Alkali resistant treatments, scrapping of surface washing etc. surface spoiled by smoke soot, removal of oil and grease spots, treatment for infection with efflorescence moulds, moss, fungi, algae and lichen and patch repairs to plaster wherever done shall not be paid extra. This shall also include conveyance, delivery, handling, unloading, storing work etc.
- 3.5 The rate shall be for a unit of one m<sup>2</sup>.

**11.01.b Colour washing with lime on any surfaces (3 coats), including priming coat of white wash to give even shade at all heights and levels, including thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter, etc. complete**

**1.0 Materials:**

- 1.1 Clear-colle: This shall be made from glue and boiling water by mixing 1 Kg. of glue to every 15 liters of water. The mixing shall be suitably tinted to match with colour of colour washing as directed. Glue shall conform to IS : 852-1969.
- 1.2 Lime : Lime used shall be freshly burnt class `C' lime (fat lime) and white in colour conforming to IS : 712-1973.
- 1.3 Water : Water shall conform to M-1.
- 1.4 Gum : Best quality of gum (D.D.L) of Pidilite Industries Ltd. shall be used in the preparation of white or colour wash. The colour pigment of required tint and shade shall be mixed in lime cream. The mineral colour not affected by lime shall be used in preparing in the colour wash.
- 1.5 The relevant specifications for the material preparation, shall be as per item no. 11.01.a except that it shall be for colour wash.

**2.0 Workmanship:**



2.1 Sufficient quantity of colour washes enough for the complete job shall be prepared in one operation to avoid any difference in shade. The basic white wash solution shall be prepared in accordance with item 11.01.a. Mineral colours not affected by lime shall be added to the white wash solution. No colour wash shall be done until a sample of the colour has been approved. It shall be noted that small samples of colour appears lighter in shade than when the same shades are applied precisely to large surface. The colour shall be of even tint, over the whole surface. If it is patchy or otherwise badly applied, it shall be rejected. Preparation of the colour wash with pigment shall be as under:

(a) With Yellow and Red Ocher:

Solid lumps if any in the powder shall be crushed to powder and solution in water prepared and then added to white wash, sieving it through a coarse cloth, mixed evenly and thoroughly to white wash in small quantities till the required shade is obtained.

(b) With Blue Vitriol:

Fresh crystals of hydrous copper sulphate (i.e. blue vitriol) shall be ground to fine powder and dissolved in small quantity of water. Sufficient quantity of solution enough to produce the colour wash of required shade shall be strained through a clean cloth, the filtrate being mixed evenly and thoroughly to the white wash.

(c) Colour wash from other colouring pigment/ stainer shall be prepared in accordance with the instructions of the manufacture. Stainers used shall be of approved make like Asian, Berger or Nerolac.

2.2 **Preparation of Surface:**

2.2.1 The surface shall be prepared by removing mortar dropping and other foreign matter and thorough cleaning with wire or fiber brush or any other suitable means as directed by the Engineer-in-charge or Architect. All Loose pieces and scales shall be scrapped off and holes/crevices filled with mortar.

2.3 For **Scaffolding and Application of colour wash**, relevant specification of item no. 11.01.a above shall be followed. And in addition the colour wash shall be applied as under :

2.3.1 "Application of white wash or colour wash on undecorated surface" - After the surface has been prepared, the first primary coat shall be of white wash and subsequent coats (minimum two) shall be of colour wash and the entire surface shall represent a smooth and uniform finish. To start with, a patch of 0.1 m<sup>2</sup> on prepared surface shall be colour washed with first coat of white wash and subsequent coats of colour wash solution in full numbers of coats as described in the item and the shade so obtained shall be examined before the entire work of colour washing is taken up in hand. It shall be noted that small areas of colour wash will appear lighter in shade than when the same shade is applied to the large surface.

2.3.2 "Application of colour wash on decorated surfaces"- After the surface has been prepared, a coat of white wash shall be applied for the patches and repairs. Then one coat or more of colour wash shall be applied over the entire surface, such that the colour washed surface shall present a uniform colour shade. No primary coat is needed for a decorated surface-bearing colour of same shade. On surface requiring change of colour, after the surface has been prepared as described above, two coats of white wash shall be applied before application of specified number (minimum two) of coats of colour wash of the new shade.

**2.4 Protective measure:**

The surface of doors, windows, ventilators, floors, furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of with white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.

**3.0 Mode of Measurements and Payment:**

3.1 The relevant specifications of item No. 11.01.a shall be followed.

3.2 The rate shall be for a unit of one m<sup>2</sup>.

**11.02.a Providing and applying oil bound washable distemper (Synthetic) (minimum 3 coats) of approved make and of approved colour & shade, on newly dry interior plastered surface at all heights to give an even shade, including applying required coats (min two coats) of white cement based putty of Birla white or equivalent after thoroughly brushing the surfaces free from mortar dropping and other foreign matter, preparing the surface even and sand papered smooth etc, after applying every coat of putty complete. Priming coat of alkali resistant cement primer (water or solvent based) is to be applied over prepared smooth surface (undulation free) etc. complete as directed by engineer-in-charge. Sample to be approved before starting of the work. The rates shall include the cost of filler for filling the cracks on surface.**

**2.0 Materials**

**1.1 Oil Bound Washable Distemper**

1.1.1 Oil Bound Washable Distemper shall conform to M-64.

1.1.2 Alkali resistant Cement primer shall conform to IS: 109 shall be of approved brand and manufacture and **shall be of same brand of paint.**

**3.0 Workmanship**

**2.1 Scaffolding**

**2.1.1** Where scaffolding is required, it shall be erected in such a way that as far as possible, no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (Zoola) may be used for distempering. Where

ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distemping to ceiling, proper stage scaffolding shall be erected where necessary and the floor area shall be covered with plastic so that the flooring is not spoilt.

## **2.2 Preparation of surface**

- 2.2.1 Nabhi's commentary on CPWD specifications clause no. 13.30.2 shall be followed.
- 2.2.2 The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brick bats. The surface shall be then broomed to remove all dust and dirt and shall be washed with clean water.
- 2.2.3 Oil or grease spots, algae or other foreign materials shall be removed by suitable chemical and vigorous brush. If the surface is cleaned with water than it should be allowed to dry before application of paint. In no case the finishing shall be allowed on damp course.
- 2.2.4 All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portions shall be wetted and allowed to dry. Any crevice, at any level shall be cleaned and filled with the plaster mortar and cured as above. They shall then be given one coat of white wash.
- 2.2.5 All unnecessary nails shall be removed; the holes, cracks, patches etc. shall be made good with material similar in composition to the surface to be prepared.
- 2.2.6 New plaster surface shall be allowed to dry for atleast 2 months before applications of distemper or one coat of white wash or white cement shall be done prior to painting with distemper.
- 2.2.7 The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS: 2395 (Part-1)-1966.
- 2.2.8 All unnecessary nails, hooks etc. shall be removed. Pitting in plaster shall be made good with plaster again and papered with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is applied. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS : 2395 (Part-1)-1966. Before applying distemper, any unevenness shall be made good by applying putty made out of plaster of paris mixed with water, on entire surface, including filling up the undulation and then sand papering the same after it has dried.

## **2.3 Application**

### **2.3.1 Application of Primer and putty**

A coat of putty (lapi) shall be applied to the entire surface. Putty shall be used of readymade or brought of the company like Birla White, Asian or equivalent as directed by the Engineer-in-charge and Architect. The second coat of putty shall then be applied and it

shall thereafter be allowed to dry for at least 48 hours. The primer shall then be applied with a brush on the clean, dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks.

It is not recommended to apply oil bound distemper within six months of completion of wall plaster as directed by engineer in charge.

### 2.3.2 Application of Oil Bound Washable distemper

On any surfaces, after the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes, which together shall constitute one coat.

The subsequent coat shall be applied in the same way. Two or more coats of distemper as are found necessary shall be applied over the primer coat to obtain an even shade.

The subsequent coats shall be applied after a time interval of at least 24 hours between 2 consecutive coats to allow proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room, which cannot be completed on the same day.

15-cm. double-bristled distemper brush shall be used. After a day's work, brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes, which are dirty and caked with distemper, shall not be used on the work.

### 2.3.3 Nabhi's commentary on CPWD specifications clause no. 13.30.3 shall be followed

## 2.4 Protective Measures

2.4.1 The surface of doors, windows, ventilators, floors, articles of furniture etc. and such other part of the buildings which are not to be distempered shall be protected from being splashed upon. Splashings and droppings, if any shall be removed by the contractor at his own cost and surfaces cleaned. Damages if any to the furniture or fittings and fixtures shall be recoverable from the contractor.

## 3.0 Mode of Measurement

3.1 Length and breadth shall be measured correct to a cm and area shall be calculated in sqm correct to two places of a decimal.

3.2 Priming coat of distemper primer, scraping of surface spoiled by smoke soot, removal of oil

and grease spots, treatment for infection of efflorescence, mould, moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid for.

3.3 All the work shall be measured net in this item as in place subject to the following limits unless otherwise stated herein after

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 m<sup>2</sup>.

All work shall be measured in m<sup>2</sup>. No deductions shall be made for ends of joints, beams, posts etc. and openings, not exceeding 0.5 m<sup>2</sup>. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joints, beams posts etc.

3.4 Deductions of opening exceeding 0.5 m<sup>2</sup> but not exceeding 3.0 m<sup>2</sup>, each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these opening

(a) When both the faces of walls are provided with same finish, deductions shall be made for one face only.

(b) When each face of is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveal is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc

3.5 In case of opening of area exceeding 3.0 m<sup>2</sup>, each, deduction shall be made for actual size of the openings and jambs, sills and soffits shall be measured and paid separately.

3.6 No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.

3.7 Corrugated surfaces shall be measured flat as fixed and not girth. The quantities measured shall be increased by the following percentage and the resultant shall be included with the general areas:

(a) Corrugated steel sheets	14%
(b) Corrugated A.C. Sheets	20%
(c) Semi corrugated A.C. Sheets	10%

(d) Nainital pattern roof (Plain sheeting with rolls)	10%
(e) Nainital pattern roof (with corrugated sheets)	25%
(f) Sand faced Plaster / textured plaster / Smooth or mala plaster -----	0%

3.8 Cornices and other wall features, when they are picked out in a different finish/colour shall be girthed and included in the general area.

3.8.1 Item includes removing nails, making good holes, cracks, patches with materials similar in composition of distemper.

**3.9 Rate**

3.9.1 The rate includes cost of all materials, labors, scaffolding, protective measures etc. involved in all the operations described above, carried out at all floor heights in any position at all levels. This shall also include conveyance, delivery, handling, unloading, storing work etc. as directed by engineer in charge.

3.9.2 The rate shall be for a unit of one m<sup>2</sup>.

**11.02.b Providing and applying oil bound washable distemper (Synthetic) (minimum 3 coats) of approved make and of approved colour & shade, on newly dry interior plastered surface at all heights to give an even shade including priming coat of alkali resistant cement primer (water or solvent based) after thoroughly brushing the surface free from mortar droppings and other foreign matter etc. complete as directed by engineer-in-charge. Sample to be approved before starting of the work.**

Relevant specifications of item no. 11.02.a to be followed except putty shall not be used.

**11.02.c Providing and applying water bound (Acrylic washable distemper) (minimum 3 coats) of approved make and of approved color & shade, on newly dry interior plastered surface at all heights to give an even shade, including applying required coats (min three coats) of white cement based readymade putty of Birla or equivalent make after thoroughly brushing the surfaces free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth etc. complete after applying every coat of putty. Priming coat of cement primer (water or solvent based) is to be applied on putty etc. complete as directed by engineer-in-charge. Sample to be approved before starting of the work. The rates shall include the cost of filler for filling the cracks on surface.**

Relevant specifications of item no. 11.02.a to be followed except Water Bound (Acrylic Washable Distemper) are to be used instead of Oil Bound washable distemper.

**11.03.a Providing and applying three coats of plastic emulsion paint from following of approved make, color & shade (first two coats with brush and final coat**

with roller), on newly dry interior plastered surface at all heights give an even shade, including required coats (minimum two coats) white cement based putty of Birla white / Acrylic putty of Asian paint or equivalent after thoroughly brushing the surfaces free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth etc. after applying every coat of putty. Priming coat of alkali resistant cement primer (water or solvent based) is to be applied on putty etc. complete as directed by engineer-in-charge. Sample to be approved before starting of the work. The rates shall include the cost of filler for filling the cracks on surface.

1) Regular interior Plastic emulsion of Asian or equivalent

2) Highly washable interior Plastic emulsion like Supreme 3 in 1 of ICI or equivalent

**1.0 Materials:**

1.1 Plastic Emulsion paint shall conform to M-66.

**2.0 Workmanship**

**2.1 Scaffolding**

Relevant specifications of item no. 11.02.a to be followed.

**2.2 Preparation of surface**

Relevant specifications of item no. 11.02.a to be followed.

**2.3 Preparation of Mix**

2.3.1 This shall be done as per manufacture's specifications.

**2.4 Application**

2.4.1 Before pouring paint into small containers for use of applying, it shall be stirred thoroughly in its container. Also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

3.2.1 The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.

3.2.2 The paint shall be applied with brush for two coats and final coat shall be done with roller only. The surface shall be treated with minimum two coats of water/ solvent based primer.

3.2.3 The surface on finishing shall present relevant flat, velvety, smooth, pearl luster (semi gloss) /matt and glossy finish, as specified in the item. It shall be even and uniform in shade

without patches, brush marks, paint drops etc. complete.

- 3.2.4 The number of coats shall be as specified in the item. The paint will be applied in the usual manner with brush, spray or roller. The paint dries by evaporation of the water content and as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces and 2 to 3 hours on nonabsorbent surfaces.
- 3.2.5 The surface on finishing shall represent a flat velvety smooth finish. If necessary more coats will be applied till the surface presents a uniform appearance.

## **2.5 Precautions**

- 2.5.1 Old brushes if they are to be used with emulsions paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and shall be kept immersed in water during break periods to prevent the paint from hardening on the brush.
- 2.5.2 In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- 2.5.3 Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
- 2.5.4 Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

## **2.6 Protective measures**

- 2.6.1 The surface of doors, windows, ventilators, floors, furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of with white/colour wash splashed, if any, immediately after completing the painting, at no extra cost

## **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 11.02.a to be followed.
- 3.2 The rate shall be for an unit of sqm.

**11.03.b Providing and applying three coats of flat / lusture paint / enamel paint from following of approved make, color & shade (first two coats with brush and final coat with roller), on newly dry interior plastered surface at all heights give an even shade, including required coats (minimum two coats) white cement based putty of Birla white / Acrylic putty of Asian paint or equivalent after thoroughly brushing the surfaces free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth etc. after applying every coat of putty. Priming coat of cement primer (water or solvent based) is to be applied on**



**putty etc. complete as directed by engineer-in-charge. Sample to be approved before starting of the work. The rates shall include the cost of filler for filling the cracks on surface.**

- 1) Flat paint**
- 2) Soft sheen enamel like Pearl lustre of Asian or equivalent**
- 3) Premium enamel like Supergloss 3 in 1 of ICI or equivalent**

Relevant specifications of item no. 11.03.a shall be followed except lustre / Flat paint is to be used instead of plastic emulsion paint. The item shall be measured and paid in sqm.

**11.04 Providing & applying three coats of External Cement paint like Snowcem or equivalent with brush on exterior surfaces at all heights & all places including thoroughly brushing the surfaces with sand paper free from mortar dropping and other foreign matter, applying primer and scaffolding etc. complete as per the manufacture's specification and up to the satisfaction of Engineer-in-charge or Architect.**

**1.0 Material**

**1.1 Cement Paint**

1.1.1 Cement Paint shall conform to M-67.

**2.0 Workmanship**

**2.1 Scaffolding**

Relevant specifications of item no. 11.02.a to be followed.

**2.2 Preparation of Surface**

Relevant specifications of item no. 11.02.a to be followed.

Pitting in plaster shall be made good and a coat of water proof cement paint shall be applied over patches after wetting them thoroughly.

**2.3 Preparation of paint**

2.3.1 The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flowing and finish. The lids of cement paint drums shall be kept tightly shut when not in use, as by exposure to atmosphere the cement paint rapidly becomes air set due to its hygroscopic qualities.

2.3.2 Mixing of the cement paint shall be as per the manufacture's specification.

2.3.3 In case of cement paint brought in gunny bags, once the bag is opened, the contents should be consumed in full on the day of its opening. If the same is not likely to be consumed in full, the balance quantity should be transferred and preserved in airtight container to avoid its exposure to atmosphere.

## **2.4 Application**

- 2.4.1 Nabhi's commentary on CPWD specification clause no. 13.24.4 shall be followed.
- 2.4.1 No painting shall be done when the paint is likely to be exposed to a temperature of below 7°C within 48 hours after application.
- 2.4.2 When weather conditions are such as to cause damage, the work shall be carried out in shadow as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.
- 2.4.3 To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.
- 2.4.4 The surface shall be treated with minimum three coats of water proof cement paint. Not less than 24 hours shall be allowed between two consecutive coats. Next coat shall not be started until the proceeding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be slightly moistened before applying the subsequent coat.
- 2.4.5 The finished surface shall be even and uniform in shade, without patches, brush marks, paint drops etc.
- 2.4.6 The cement paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lumps shall be well brushed out.
- 2.4.7 Water proof cement paint shall not be applied on surfaces already treated with white wash, colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.
- 2.4.8 For smooth surfaces approved bonding agent by the supplier/manufacturer shall be used at no extra cost.

## **2.5 Curing**

- 2.5.1 Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for atleast two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after the application.

## **2.6 Protective Measures**

- 2.6.1 Relevant specifications of item no. 11.02.a to be followed.
- 2.6.2 Nabhi's commentary on CPWD specifications clause no. 13.32.5 to be followed.

## **3.0 Mode of measurement and Payment**

- 3.1 Relevant specifications of item no. 11.02.a to be followed.

**11.05.a Providing & applying External Acrylic Paint from following of desired shed from ICI or equivalent in minimum three coats (1 coat of exterior grade primer and 2 coats of paint) to give an even shade with brush on exterior sand faced plastered surfaces / mala plastered surfaces / textured surface or any surfaces at all heights including scaffolding, thoroughly brushing the surfaces with sand paper to make it free from mortar dropping and other foreign matter etc. complete as per the manufacture's specification and up to the satisfaction of Engineer in charge. The rate shall also include the cost of filler for cracks on the surfaces. (Rate shall be inclusive of minimum 1 coat of exterior grade cement based putty on Mall finish surface and coat of exterior grade primer)**

- 1) Dulux Weather Shield**
- 2) Dulux Weather Shield Ultra Clean**
- 3) Dulux Weather Shield max**

**1.0 Material**

**1.1 Acrylic paint**

1.1 Acrylic paint shall conform to M-71.

**2.0 Workmanship**

**2.1 General**

2.1.1 The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, cage etc. with seal unbroken.

2.1.2 All materials not in actual use shall be kept properly protected, lid of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of water to prevent formation of skin. The materials, which have become stale or flat due to improper and long storage, shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins when not in use. The paint shall be stirred thoroughly in its container before pouring into small containers.

2.1.3 If for any reasons, thinning is necessary, water shall be added as per supplier's instructions.

2.1.4 The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

## **2.2 Scaffolding**

Relevant specifications of item no. 11.02.a to be followed.

## **2.3 Preparation of Surface**

Relevant specifications of item no. 11.02.a to be followed.

## **2.4 Application**

- 2.4.1 Before pouring into small containers for use of applying, the paint shall be stirred thoroughly in its container. Also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.
- 2.4.2 The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.
- 2.4.3 On the newly plastered surface, the first coat shall be applied with 100% dilution or exterior grade primer, second and third coat shall be applied with 40 % dilution or as per the supplier's instructions. The second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking of the brush being used.

## **2.5 Precautions**

- (a) Old brushes if they are to be used with emulsions paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and shall be kept immersed in water during break periods to prevent the paint from hardening on the brush.
- (b) In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- (c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
- (d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.
- (e) paint shall be applied in dry weather only. Paint shall be applied on dry plastered surface and if the surface becomes wet due to any reason first it shall be allowed to 100% dry as directed by EIC.
- (f) Wet surface shall be protected with plastic sheet or by convenient means before it gets dry in monsoon season.

## **2.6 Protective measures**

- 2.6.1 The surface of doors, windows, ventilators, floors, furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of with white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.

## **3.0 Mode of measurement and payment**

- 3.1 Relevant specifications of item no. 11.02.a to be followed.

### **11.05.b Extra over for applying a minimum one coat of external acrylic based putty on exterior smooth finish plastered surface.**

Relevant specifications of item no. 11.05.a to be followed.

- 11.06 Providing and applying External finish of average 1.5 to 2 mm thick acrylic polymer based texture of "Ruff & Tuff" finish of NITCO, or equivalent make with standard tool and applicator as specified by company, on exterior surfaces at all heights including scaffolding to give even shades including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand papared smooth with two coats 100% Acrylic Paint etc complete as per the manufacture specifications and to the satisfaction of Engineer In charge or architect. The rate includes making of grooves, pattas etc. and finishing as directed by engineer in charge.**

## **1.0 Material**

### **1.1 Textured Wall Finish**

- 1.1.1 "Ruff n Tuff" finish of as per specification of NITCO.

## **2.0 Workmanship**

- 2.1 Relevant specifications shall be followed as per item No. 11.05 except that External Ruff 'N' tuff finish average 1.5 to 2mm thick acrylic polymer textured of NITCO or equivalent make shall be used and the paint shall be applied with standards tools and applicators as specified by the company and under close supervision of representatives of companies. Sample shall be got approved prior to application.

- 2.2 Rate will be inclusive of including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand papared smooth with two coats 100% Acrylic Paint.

## **3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm. No extra will be paid for the protective coat on textured wall finish.

**11.07.a Providing & applying Heritage surface texture, of desired shade (multicolored/ mono colored) of approved make on interior surfaces at all heights to give an even shade including thoroughly brushing the surface with sandpaper to make it free from water mortar dropping and other foreign matter . The texture shall be applied on smooth finish mala plaster. The rate shall be inclusive of applications by company authorized applicator, material and top coat of 100% solvent based acrylic top coat of approved make. The sample shall be approved by Architect or engineer-in-charge and work to be carried out as per the satisfaction of engineer-in-charge.**

**11.07.a.1 Heritage Texture – Flaked**

**11.07.a.2 Heritage Texture – Granules**

**11.07.a.3 Heritage Texture – Granite**

**11.07.a.4 Heritage Texture – Stone Range**

**1.0 Materials**

1.1 Textured wall finish shall conform to M-68.

**2.0 Workmanship**

2.1 The relevant specifications clause no. 11.05.a is to be followed except Heritage Texture is to be applied on interior surfaces.

2.2 The surface on which the texture is to be applied should be completely dry. The newly applied surface shall not be exposed to water except for curing of 7 days minimum.

**2.3 Scaffolding**

Relevant specifications of item no. 11.02.a to be followed.

Wherever scaffolding is required, it shall be erected with suitable supports and bracing. A properly secured strong and well-tied suspended platform shall also be provided. Where ladders are used, piece of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls.

**2.4 Preparation of Surface**

Relevant specifications of item no. 11.02.a to be followed.

**2.5 Preparation of Mix**

2.5.1 This shall be done as per manufacture's specification.

**2.6 Application**

2.6.1 The sample of the heritage surface work shall be approved by the Architect or Engineer-in-charge.

2.6.2 Samples shall be carried out for various finishes (granules, roller coat, flakes etc) as per instruction and satisfaction of the Architect or Engineer-in charge.

- 2.6.3 One coats of paint shall be applied on the surface with the help of trowel to give a uniform thickness of 0.8 to 1.2 mm No conventional primer or putty shall be applied on the exterior surface.
- 2.6.4 To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.
- A gap of twenty-four hours shall be kept between two subsequent coats, if required for uniform finish. The finished surface shall be even and uniform in shape, without patches, brush marks, paint drops etc.
- 2.6.5 The surfaces of door, windows, floors, etc and other parts of the buildings shall be protected from paint being splashed upon. Such surfaces shall be cleaned properly after the completion of the work.
- 2.6.6 The application shall be done by trained applicators as per the manufacture's instruction and as per the approval of architect.
- 2.6.7 The application shall not be carried out in the rainy/ cloudy season. When rain is expected, the work shall not be commenced.
- 2.6.8** An additional top coat available in both glossy and matt finishes, is recommended for high traffic area applications like lifts, lobbies, corridors etc. this shall be measured and paid in relevant items.
- 2.6.9** Relevant specifications of item no. 11.02.a to be followed.

### **3.0 Mode of Measurement and Payment**

The relevant specifications of item no. 11.02.a to be followed.

The rate shall be for a unit of one sqm.

**11.07.b Providing & applying Heritage surface texture, of desired shade (multicoloured/ mono coloured) of approved make on exterior surfaces at all heights to give an even shade including thoroughly brushing the surface free from water mortar dropping and other foreign matter and sand paper smooth. The texture shall be applied on sand faced smooth level plaster. The rate shall be inclusive of scaffolding, application by company authorised applicator, material and top coat of 100% solvent based acrylic top coat of approved make. The sample shall be approved by Architect or engineer-in-charge and work to be carried out as per the satisfction of engineer-in-charge.**

**11.07.b.1 Heritage Texture – Flaked**

**11.07.b.2 Heritage Texture – Graunules**

**11.07.b.3 Heritage Texture – Granite**

**11.07.b.4 Heritage Texture – Stone Range**

Relevant specifications of item no. 11.07.b shall be followed except texture shall be followed on the exterior surface including scaffolding wherever required with suitable supports. The texture shall be applied on sand faced smooth finish plaster.

**11.07.c Extra for providing & applying an additional top coat either in glossy, semi glossy or matt finishes on any type of Heritage surface (Flaked, Granules, Granite, Stone Range etc.) of approved make on interior/Exterior surfaces, at all heights to give an even shade.**

Relevant specifications of item no. 11.07.a shall be followed.

**11.08 Providing and applying Silicone paint SILRES(R) BS 290 of Wacker -1 liter & 13-liter solvent of recommended make or approved equivalent over exposed concrete surfaces (Two coats on wet on wet applied) etc complete as directed by the Engineer-in-charge, so as original look does not change. The contractor shall furnish a minimum 5 years guarantee on stamp paper to the employer directly.**

**a. For RCC surface**

**b. Over brick surfaces (2 coats comprising second coat is applied on previous coat is still wet)**

**1.0 Materials**

**1.1 Silicone paint**

1.1 Silicone Paint shall conform to M-69.

**2.0 Workmanship**

2.1 The silicone paint shall be diluted with water or solvent (benzene or toluene) based in proportion as per manufacturer's specifications. The paint shall be sprayed with spray gun as directed. As far as possible ready mix paint shall be used.

2.2 Concentration of silicon content shall be in proportion so that after the application, surface is clear and as it is. The sample shall be approved by architect or engineer-in-charge. Normally 5% concentration is sufficient for not to have change in parent color.

**2.3.a** Before applying the surfaces should be thoroughly cleaned of dust, dirt, concrete slurry or any other foreign material or efflorescence from within the brick if any, using method like pressurized water jets, rubbing with gunny bags and soft brush, washing with biowash chemical etc. as approved by the EIC. Pressurized water jet shall be applied in such a way that the surface on which it is applied does not get damaged.

**2.3.b** Before applying the specified coats of silicon paint the efflorescence of the exposed brick work should be removed in the following manner

1) Apply solution of - mixer of liquid ammonia and soft water (1:6) + mixer of teapol (mild detergent) and water (1:6) on brick surface using brush.

2) After required / specified time interval the surface treated as mentioned in 1 above



should be washed with soft water using brush or spray.

- 2.4 The concrete surfaces shall also be thoroughly cleaned of dust, dirt, rust, concrete slurry or any other foreign material using appropriate method so as not to damage the RCC work, as approved by the EIC
- 2.4 Rate shall be inclusive of moping, cleaning, masking the door windows/floor/plants etc during and after the execution for protection.
- 2.5 Unless otherwise specified silicone paint shall be executed through approved specialized agency. Contractor shall furnish a guarantee of 5 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same which is also to be signed by the specialized agency. However, soul responsibility shall be of main contractor for any leakages.
- 2.6 Copy of work order mentioning the rate issued to the specialized agency shall be attached with guarantee bond.

A guarantee bond on appropriate stamp paper, shall be given by the Contractor to the Client in the manner form prescribed below

#### **FORM OF GUARANTEE BOND**

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other humid conditions, for a period of 5 years after completion of the work of Silicone painting as per the terms and conditions of the contract and Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of exposure to water and hereby Guarantees to make good any loss or damages suffered by the Client and further guarantee to redo the affected work without claiming any extra cost."

This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

- 2.7 The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of the work and 10% of shall be retained for the balance of defects liability period and shall be refunded only after the completion of the defects liability period.
- 3.0 Mode of Measurements and Payment
- 3.1 The relevant specifications of item no. 11.02.a shall be followed.
- 3.2 The rate shall be for an unit of one sqm.

**11.09 Applying priming coat with ready mixed wood primer of approved brand and manufacture over new wood and wood based surface after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter sand papering and knotting etc. complete for all heights, all levels as per satisfaction of engineer-in-charge.**

**1.0 Material**

1.1 The ready mixed primer brushing wood primer pink of Asian paints or equivalent to be used. It shall conform to IS: 3536-1966.

**2.0 Workmanship**

**2.1 Preparation of surfaces**

2.1.1 The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. All wood work shall be dry and free from any foreign matter incidental to building operations. Nails shall be punched well below the surface to provide a firm key for painting. Mouldings shall be carefully smoothed with abrasive paper and projecting fibres shall be removed. Flat portion shall be smoothed off with abrasive paper used across the grain prior to painting and with the grain prior to staining, if the wood is to be left in its natural colour. Woodwork that is to be stained may be smoothed by scraping instead of by glass papering if so required.

2.1.2 Any knots, resinous or streaks or bluish sap wood that are not large enough to justify cutting out shall be treated with two coats of pure shellac knotting applied thinly and extended about 25 mm. beyond the actual area requiring treatment.

**2.2 Application**

2.2.1 After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

2.2.2 During painting every time after the priming coat has been worked out of the brush bristles or after the brush has been unloaded of the primer, the bristles of the brush shall be opened up by striking the brush against portion of the unpainted surface with the end of the bristles, held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again into a paint container. The primary coat shall be allowed to dry completely before painting is started.

- 2.2.3 No hair marks from the brush or clogging of paint puddles in the corner or panels angles of mouldings etc. shall be left on the work.
- 2.2.4 Special care shall be taken while painting over bolts, nuts, rivets overlaps etc.
- 2.2.5 The container when not in use shall be kept close and free from air so that paint does not get thickened and also shall be kept guarded from dust.

### **3.0 Mode of Measurement and Payment**

The wood and wood based surface (girth x length) shall be measured in sqm under this item.

- 3.1 All the work shall be measured net, in the decimal system as executed, subject to the following limits unless otherwise stated herein after:
  - (a) Dimensions shall be measured to the nearest 0.01 m.
  - (b) Areas shall be worked out to the nearest 0.01 m<sup>2</sup>.
- 3.3 No deductions shall be made for openings not exceeding 0.5 m<sup>2</sup> each and no addition shall be made for painting to beading, moldings, edges, jambs, soffits etc. of such opening.
- 3.5 The different surfaces shall be grouped into one general item; areas of uneven surface being converted into equivalent plain areas in accordance with the relevant I.S. code for payment.
- 3.5.1 The rate shall include the cost of all materials, labour, scaffolding, protective measures etc. required for the above specified operation, at all floors, at any height, in any position. Scrapping of surface, washing etc. of surfaces spoiled by smoke, soot, removal of oil and grease spots, treatment for infection with efflorescence, moulds, moss, fungi, algae and lichen shall not be paid extra. This shall also include conveyance, delivery, handling, unloading, storing work etc. complete as per engineer-in-charge.

**11.10 Providing and applying minimum two coats of Premium Gloss Enamel paint of Asian Paint or equivalent (including relevant priming coat and putty as approved by Architect) of approved make on wood and wood based surfaces at all heights as desired, brushing, to give an even shade, including cleaning the surface of all dirt, dust and other foreign matter etc. complete as per satisfaction of engineer-in-charge.**

### **1.0 Material**

#### **1.1 Enamel Paint**

- 1.1.1 Enamel Paint shall conform to M-70.
- 1.1.2 Paint and primer shall be of same brand.

### **2.0 Workmanship**

2.1 The relevant specifications of item no. 11.09 shall be followed except enamel paint is to be applied with wood primer and relevant putty.

### **3.0 Mode of Measurement and payment**

3.1 The relevant specifications of item no 11.09 shall be followed.

**11.11 Applying priming coat of primer over new steel surfaces of approved brand and manufacture after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter sand papering smooth etc. complete as per satisfaction of engineer-in-charge**

**11.11.1 Red Lead**

**11.11.2 Zinc Chromate Red Oxide**

**11.11.3 Zinc Chromate Yellow Oxide**

Relevant specification of item no. 11.09 shall be followed except primer for steel and other metal surfaces is to be used instead of wood primer.

**11.12 Providing and applying minimum two coats of enamel paint (2 coats of zinc chromate yellow primer and 2 coats of enamel paint) of approved make on new steel and other metal surfaces at all heights and all levels as desired, brushing, to give an even shade, including cleaning the surface of all dirt, dust and other foreign matter etc. complete as per satisfaction of engineer-in-charge.**

### **1.0 Material**

#### **1.1 Enamel Paint**

1.1.1 Enamel Paint shall conform to M-70.

#### **2.0 Workmanship**

2.1 The relevant specifications of item no. 11.09 shall be followed except zinc chromate yellow primer is to used instead of wood primer. In addition to that synthetic enamel paint shall be applied evenly and smoothly on primer.

**if priming coat and synthetic enamel paint is not included in structural steel item for providing fabrication and erection item then it shall be measured in m<sup>2</sup>.** Compound girders, stanchions, lattices, girder and similar work, actual area shall be measured in m<sup>2</sup> and no extra shall be paid for painting on bolts, heads, nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site

### **3.0 Mode of Measurement and payment**

3.1 The relevant specifications of item no 11.09 shall be followed.

**11.13.a Providing & applying minimum three coats of enamel paint (1 coat of wood primer and 3 coat of enamel paint) of approved make and shade on external wooden door window or any other surfaces of Glossy, flat, pearl luster and Matt finish, at all heights, all levels to give an even shade, including thoroughly brushing the free from mortar droppings and other foreign matter and sand papering smooth etc. complete. The paint shall be applied after applying a coat of primer (wood primer) and required coats (min one coat) of putty. (KPF – Knifing paste filler putty)**

Relevant specifications of item no. 11.09 shall be followed except KPF- Knifing paste filler putty is to be used instead of other putty.

**11.13.b Providing & applying minimum two coats of enamel paint ( 2 coat of zinc chromate yellow primer and 2 coat of enamel paint) of approved make and shade on metal door window or any other surfaces of Glossy, flat, pearl luster and Matt finish, at all heights, all levels to give an even shade, including thoroughly brushing the free from mortar droppings and other foreign matter and sand papering smooth etc. complete. The paint shall be applied after applying a coat of primer (zinc chromate yellow primer) and required coats (min one coat) of putty. (KPF – Knifing paste filler putty)**

Relevant specifications of item no. 11.09 shall be followed except KPF- Knifing paste filler putty is to be used instead of other putty.

**11.14 Painting with aluminum paint (min two coats) of approved brand and manufacture to give an even shade as per satisfaction of engineer-in-charge after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter sand papering etc. complete as per satisfaction of engineer-in-charge.**

Nabhi's commentary on CPWD specifications clause no. 13.45 shall be followed.

**11.15 Painting with acid proof paint (min two coats) of approved brand and manufacture to give an even shade as per satisfaction of engineer-in-charge after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter sand papering etc. complete as per satisfaction of engineer-in-charge.**

Nabhi's commentary on CPWD specifications clause no. 13.46 shall be followed.

**11.16 Painting (two or more coats) on rain water, soil, waste and vent pipes and fittings with black "anticorrosive bitumastic paint" of approved brand and manufacture over and including a priming of ready mixed zinc chromate yellow primer on new work.**

**11.16.1 100 mm diameter pipes**

**11.16.2 150 mm diameter pipes**

Nabhi's commentary on CPWD specifications clause no. 13.46 shall be followed.

**11.17 Providing and applying French polish on new wood and wood based surfaces of approved make and finish to give an even surface, including cleaning the surface of all dirt, dust and sand papered smooth etc. complete as per satisfaction of engineer-in-charge and including a coat of wood filler.**

**1.0 Material**

1.1 French polish shall conform to M-72.

**2.0 Workmanship & Mode of Measurement**

2.1 Nabhi's commentary on CPWD specifications clause no. 13.50 shall be followed.

**11.18 Providing and applying wax polish on new wood work and wood based surfaces with bee's wax polish in proportion 2:1.5:1:0.5 (2 Bees Wax: 1.5 linseed oil: 1 Turpentine oil: 0.5 Varnish by weight) of approved make and finish to give an even surface including cleaning the surface off all dirt, dust and sand papered smooth etc. complete as per satisfaction of engineer-in-charge**

**1.0 Material**

1.1 Wax Polish shall conform to M-74.

**2.0 Workmanship & Mode of Measurement**

2.1 Nabhi's commentary on CPWD specifications clause no. 13.52 shall be followed.

**11.19 Providing and applying melamine polish of matt /semi gloss/glossy finish in interiors of approved make and finish as approved by the Architect or Engineer-in-charge for new wood and wood based surfaces. The final coat should be sprayed by gun with pressure as per requirement.**

**1.0 Material**

1.1 Melamine polish shall conform to M-75.

**2.0 Workmanship**

2.1 The melamine polish shall be applied on doors and windows or any woodwork or wood based surfaces with the help of spray gun. The work shall be carried out as per instruction of Engineer-in-charge and to the satisfaction of Architect or engineer in charge. Sample shall got approved before full scale application.

2.2 For preparation of surface Nabhi's commentary on CPWD specifications clause no.13.49.2.1 shall be followed.

The melamine polish shall be applied on doors and windows or any woodwork or wood based surfaces with the help of spray gun. The work shall be carried out as per instruction

of Engineer-in-charge and to the satisfaction of Architect or engineer incharge. Sample shall got approved before full scale application

**Directions of use on new surface:**

- 1) Sand the surface along the grains with Emery paper no 180 or with a suitable grade of sand paper. Brush the surface free of loose dust.
- 2) Fill the wood using Apcolite wood filler. Remove excess filler immediately after applications. Allow 2-3 hrs of drying, before sanding with Emery paper no 180 followed by 320. ensure complete removal of filler from the surface.
- 3) Apply a coat of Apcolite Natural wood finish clear sealer. After overnight drying, smooth sand with emery paper no 320 and wipe the surface free of loose dust. Clear sealer is a two-component system consisting of base and hardner. These should be mixed in the recommended ratio. The two components should be mixed in a glass, plastic, or enamelled container. Allow the mixture to stand for 30 mins and then apply by brushing or spraying using the recommended thinner for consistency adjustment. The mixture of base and hardner should be used within 8 hrs. Compressed air used for spray application should be free from oil and water.
- 4) if instructed by the engineer-in-charge apply apcolite wood stains by ragging after filling step or mix it in apcolite natural wood finish upto 20% by volume and apply by spraying after sealer coat. In application by ragging allow a drying time of 5-10 mins In between coats and 30-60 mins before over coating with finish coats.
- 5) Apply apcolite natural wood finish-clear matt/semi glossy/ glossy as follows. Apcolite natural wood finish- is a two-component system consisting of base and hardner. These should be mixed in the recommended ratio. The two components should be mixed in a glass, plastic, or enamelled container. Allow the mixture to stand for 30 mins and then apply by brushing or spraying using the recommended thinner for consistency adjustment. The mixture of base and hardner should be used within 8 hrs.
- 6) Apply two coats of Apcolite Natural Wood finish-clear matt/semi glossy/ glossy by spraying with a overnight time gap in between coats.

For pre-polished wood-

- 1) Sand the surface along the grains with emery paper no 100 or 180 followed by no 320 to get a smooth uniform surface. If staining is desired, completely remove the old finish. Wipe the surface free of loose dust.
- 2) If instructed apply apcolite wood stains by ragging or mix it in apcolite natural wood finish upto 20% by volume and apply by spraying after sealer coat. Staining is optional

- 3) Apply a coat of apcolite natural wood finish-clear sealer. After overnight drying smooth sand with emery paper no 320 and wipe the surface free of loose dust.
- 4) Apply a coat of apcolite natural wood finish-matt/semi glossy/glossy by brushing or spraying with a overnight time gap in between coats.
- 5) Compressed air used for spray application should be free from oil and water.

### **3.0 Mode of Measurement and Payment**

Relevant technical specifications clause no. 11.09 shall be followed.

#### **11.20 Providing and applying Lacquer polish of approved make and finish on new wood and wood based surface to give an even surface, including cleaning the surface of all dirt, dust and sand papered smooth and including a coat of wood file.**

##### **1.0 Material**

- 1.1 Lacquer Polish shall conform to M-73.

##### **2.0 Workmanship**

- 2.1 Relevant technical specifications item no. 11.19 shall be followed except lacquer polish is to be used instead of melamine polish.

##### **2.2 Preparation of Surface**

- 2.1.1 Prepare the surface by proper sanding, filling and priming as per the conventional method in polishing wood surfaces.
- 2.1.2 In case, surface previously polished with French polish is to be re polished, the surface is sandpapered with emery paper no. 180 along the grains, thoroughly. This should be followed by emery paper no 320 or 400 and cleaning of the surface to remove loose dust. Apply 1 to 2 coat of Asian NC clear sanding sealer and allow it to dry for 1.5 to 2 hrs. smooth sand the surface with emery paper no 180 followed by emery paper no 320 or 400 and cleaning of the surface to remove loose dust.

##### **2.2 Application:**

- 2.2.1 for making sanding sealer, mix 1 part by volume Asian NC clear sanding sealer with 1.5 to 2 parts by volume of Asian NC thinner. For clear glossy/matt, mix 1 part by volume Asian NC clear glossy / matt with 1 part by volume of Asian NC thinner. For semi glossy surface mix 1 part by volume of both Asian NC clear glossy and matt with 1part of thinner.use spray method for application. With 2.2 to 2.8 kg/cm<sup>2</sup> pressure. The recommended thinner is APCA NC thinner 249 from asian.
- 2.2.2 for optimum performance Asian NC clear wood finish must be applied at temperatures between 20 degrees and relative humidity not above 75%. At a very high humidity, the



lacquer surface can appear whitish due to excessive quick evaporation.

- 2.2.3 After complete drying, buffing will enhance the gloss of the finish substantially. Buffing is not recommended for matt finish.

### 2.3 Precautions

Store in a cool and dry place

Avoid skin contact contains volatile organic solvents.

Wear protective clothing like overalls, gloves and goggles.

Dispose in land filling. Do not dispose in any drain or water channel.

Base and hardner must be consumed within one week of opening the base and hardner containers.the containers are sensitive to moisture so they should be tightly closed after use.

### 3.0 Mode of Measurements and Payment:

- 3.1 The relevant specification of item no. 11.9a shall be followed except the work of polishing with lacquer polish shall be paid under this item.

- 3.2 The rate shall be for a unit of one m<sup>2</sup>.

#### 11.21 Providing and applying Varnish of approved make, on new wood and wood based surface to give an even surface, including cleaning the surface of all dirt, dust and sand papered smooth and including a coat of wood filler.

Nabhi's commentary on CPWD specifications clause no. 13.49 shall be followed.

#### 11.22 Providing & applying four coats of Polyurethane paint (first two coats of sealer and then 2 coats of paint) of approved make and desired shade on any surfaces at all heights to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth etc. complete as per satisfaction of engineer-in-charge. The paint shall be applied after applying a coat of primer and putty.

### 1.0 Materials

#### 1.1 Polyurethane paint

- 1.1 Polyurethane Paint shall conform to M-76.

### 2.0 Workmanship

- 2.1 Prepare the surface by sanding with sand paper and cleaning with cotton or cloth.

- 2.2 Apply 1<sup>st</sup> coat of epoxy primer either with spray or brush. After 8 to 12 hrs sanding is to be done with emery paper of 320 or 400 no. and wipe clean.

- 2.3 Apply 2nd coat of epoxy primer either with spray or brush. After 8 to 12 hrs sanding is to be done with emery paper of 320 or 400 no. and wipe clean

2.4 Apply 1<sup>st</sup> coat of PU paint either with spray or brush. After 8 to 12 hrs sanding is to be done with emery paper of 320 or 400 no. and wipe clean.

2.5 Apply 2nd coat of PU paint either with spray or brush. After 8 to 12 hrs sanding is to be done with emery paper of 320 or 400 no. and wipe clean.

**3.0 Mode of Measurements and Payment:**

3.1 The relevant specifications of 11.01.a shall be followed.

3.2 The rate shall include the cost of all materials, labour, scaffolding, protective measures etc. required for the above specified operation at all floors, all heights.

3.3 The rate shall be for a unit of one m<sup>2</sup>.

**11.23 Powder coating with Powder paints of approved make on all metal surfaces of minimum 50 micron including all operations required for the the work to be completed as per satisfaction of engineer-in-charge.**

**1.0 Material**

**1.1 Powder Paint**

1.1.1 Powder Paint shall conform to M-77.

**2.0 Workmanship**

2.1 Powder coating shall be provided using powder paints, with an Electrostatic spray gun or by Fluidized bed, as per the manufacturer's instructions. The work shall be carried out in the best workmanship.

**3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 11.09 shall be followed

**11.24 Providing and applying oil and water finish polish to all wood and wood based surfaces with the help of sand paper of 60, 80, 100, 120 nos, linseed oil, turpentine oil etc. as directed by engineer-in-charge. Sample shall be approved by architect or engineer-in-charge.**

**1.0 Material**

1.1 Linseed Oil, Turpentine of approved make is to be used.

**2.0 Workmanship**

2.1 Wood or wood based surface shall be grinded with sand paper of 60 no. The surface shall be cleaned with cotton to remove dust and sand particles.

- 2.2 The surface shall be grinded with sand paper of 80 no. The surface shall be cleaned with cotton to remove dust and sand particles. The surface should be wiped with hot water.
- 2.3 The surface shall be grinded with sand paper of 100 no. and it shall be cleaned with cotton to remove dust and sand particles.
- 2.4 Turpentine and Linseed oil of approved make in proportion (1:3) shall be mixed and **first coat** of specified mix shall be applied. Allow it to dry in sunlight for 6 hours.
- 2.5 Once it gets dry, the surface shall be grinded with sand paper of 120 no. and clean with cotton to remove dust and sand particles.
- 2.6 Turpentine and Linseed oil of approved make in proportion (1:1) shall be mixed and **second coat** of specified mix shall be applied and allow it to dry for 12 hours.
- 2.7 After getting dry for 12 hours, surface shall be grinded with sand paper of 150 no. and clean with cotton to remove dust and etc.
- 2.8 Turpentine and Linseed oil of approved make in proportion (3:1) shall be mixed and single coat at once is to be applied at every three hours for **three times**.
- 2.9 After applying three coats of Turpentine and Linseed oil in proportion (3:1), linseed oil is to be applied and  
wipe with cotton cloth.

### **3.0 Mode of Measurement and Payment**

- 3.1 Relevant specifications of item no. 11.09 shall be followed.

**11.25 Providing and applying 6 mm to 8mm POP punning of JK Lakhmi Cement or equivalent over plastered surface at all levels including thoroughly brushing the surface free from mortar dropping and other foreign matter, preparing the surface even and sand papered smooth etc. complete to receive the coat of painting as directed by engineer in charge.**

#### **1.0 Material**

- 1.1 Material shall conform to M-94.

#### **2.0 Workmanship**

Relevant specifications of second coat of mala plaster in best workmanship manner shall be followed except curing shall not be carried out after the POP. Finishing shall be smooth, silky, even, finished in line level and plumb to the satisfaction of architect & EIC. POP of approved make and quality shall be applied on wired plastered surface at all heights. The item shall be measured and paid in sqm.

**11.26 Providing & applying External 100% Acrylic Paint "Apex" of desired shed from Asian paint or equivalent in minimum three coats (first coat with external primer & balance two coat with apex or equivalent paint as per supplier's specification) with brush on exterior sand faced plastered surfaces / mala plastered surfaces with a minimum one coat of external cement based putty of Birla or equivalent at all heights / all floors / all heights & all places including scaffolding to give even shades including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand papered smooth etc complete as per the manufacture's specification & to the satisfaction of Engineer incharge Newly plastered surfaces requires minimum three coats -first coat with exterior primer with 1 :1 ratio or as per supplier's specifications & balance coats with with 40% dilution). The rate shall also include the cost of filler for cracks on the surfaces. (Sample to be approved).**

**1.1 Materials:**

Water shall conform to as per general specifications for other concreting.

Acrylic paint shall conform to its supplier's specification

**1.2 Workmanship:**

**1.2.1 General**

The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, cage etc. with seal unbroken.

All materials not in actual use shall be kept properly protected, lid of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of water to prevent formation of skin. The materials, which have become stale or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins when not in use. The paint shall be stirred thoroughly in its container before pouring into small containers.

If for any reasons, thinning is necessary, water shall be added as per supplier's instructions

The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavourable weather and all the surfaces shall be thoroughly dry before painting work is started.

**1.2.2 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 or colour washed. A properly secured, strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings, proper stage scaffolding shall be erected where necessary. Also, while painting the ceiling, the floor area shall be covered properly with plastic so that the flooring is not spoiled.

### **1.2.3 Preparation of surface:**

All unnecessary nails, hooks etc. shall be removed. Pitting in plaster shall be made good with plaster again and papered with a fine grade sand paper and made smooth. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS : 2395 (Part-1)-1966.

### **1.2.4 Preparation of Mix:**

This shall be done as per the manufacturer's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added to shall be as per manufacturer's instructions.

### **1.2.5 Application:**

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

The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.

On the newly plastered surface, the first coat shall be applied with 100% dilution and second and third coat shall be applied with 40 % dilution or as per the supplier's instructions. The second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking of the brush being used.

### **1.2.6 Precautions:**

(a) Old brushes if they are to be used with paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed

in water immediately after use and shall be kept immersed in water during break periods to prevent the paint from hardening on the brush.

(b) In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.

(c) Splashes on floors etc. shall be cleaned out without delay, as they will be difficult to remove after hardening.

(d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

### **1.2.7 Protective measure:**

The surface of doors, windows, ventilators, floors, of furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.

### **1.3 Mode of Measurements and Payment:**

1.3.1 The relevant specifications of item of External acrylic paint shall be followed.

1.3.2 The rate shall be for a unit of one m<sup>2</sup>.

**11.27 Providing and applying (minimum 3 coats but painting upto the satisfaction of Engineer-in-charge with primer & putty) with oil bound / Acrylic washable distemper of approved manufacturer like Asian, Berger, ICI or equivalent and of approved colour & shade, on newly dry interior plastered surface at all heights / all floors / all levels to give and even shade, including priming coat of primer / cement (water or solvent based) primer and applying required coats (min two coats) of white cement based putty of Birla white or equivalent after thoroughly brushing the surfaces free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth etc., after applying every coat of putty, complete as directed sample to be approved before starting of the work. The rates shall include the cost of filler for filling the cracks on surface. (Sample to be approved before mass production/construction/purchase).**

### **1.1 Materials:**

Oil bound washable distemper and cement primer shall be of approved brand and manufacture. The distemper shall be of required colour and shade and the same shall conform to IS: 428-1969. Paint shall conform to M-44.

### **2.2 Workmanship:**

#### **2.2.1 Scaffolding:**

Where scaffolding is required, it shall be erected in such a way that as far as possible, no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (Zoola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary and the floor area shall be covered with plastic so that the flooring is not spoilt.

### **2.2.2 Preparation of surface:**

The surface shall be thoroughly cleaned of all dust, dirt, mortar dropping and other foreign matter before white wash is to be applied.

The surface spoiled by smoke soot shall be scrapped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brick bats. The surface shall be then broomed to remove all dust and dirt and shall be washed with clean water.

Oil or grease spots shall be removed by suitable chemical. Smooth surfaces shall be rubbed with wire brushes.

All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portions shall be wetted and allowed to dry. Any crevices, at any level shall be cleaned and filled with the plaster mortar and cured as above. They shall then be given one coat of white wash.

All unnecessary nails shall be removed; the holes, cracks, patches etc. shall be made good with material similar in composition to the surface to be prepared.

The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper or one coat of white wash with white cement shall be done prior to painting with distemper.

All unnecessary nails, hooks etc. shall be removed. Pitting in plaster shall be made good with plaster again and papered with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is applied. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS : 2395 (Part-1)-1966. Before applying distemper, any unevenness shall be made good by applying putty made out of plaster of paris mixed with water, on entire surface, including filling up the undulation and then sand papering the same after it has dried.

### **2.2.3 Priming coat:**

A priming coat of water based/solvent based cement primer of approved manufacture shall be applied over the papered surface in case of new work or undecorated surface. If the distemper priming is done after the plastered wall surface dries completely, the cement primer shall be avoided.

Application of primer and putty shall be done as under:

The primer shall be applied with a brush on the clean, dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. A coat of putty (lapi) shall be applied to the entire surface. Putty shall be used of readymade or brought of the company like Asian as directed by the Engineer-in-charge and Architect. The second coat of primer and putty shall then be applied and it shall thereafter be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

It is not recommended to apply Oil bound distemper within six months of the completion of wall plaster.

#### **2.2.4 Preparation of oil bound distemper:**

The distemper shall be diluted with mineral turpentine oil or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

#### **2.2.5 Application of Distemper coat:**

On any surfaces, after the primer coat has dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes, which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between 2 consecutive coats to allow proper drying of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room, which cannot be completed on the same day.

15-cm. double-bristled distemper brush shall be used. After a day's work, brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes, which are dirty and caked with distemper, shall not be used on the work.

#### **2.2.6 Protective measure:**



The surface of doors, windows, ventilators, floors, articles of furniture etc. and such other part of the buildings which are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes, if any.

### **2.3 Mode of Measurements and Payment:**

2.3.1 Priming coat of distemper primer, scraping of surface spoiled by smoke soot, removal of oil and grease spots, treatment for infection of efflorescence, mould, moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

2.3.2 All the work shall be measured net in this item as in place subject to the following limits unless otherwise stated here in after:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 m<sup>2</sup>.

All work shall be measured in m<sup>2</sup>. No deductions shall be made for ends of joints, beams, posts etc. and openings, not exceeding 0.5 m<sup>2</sup>. Each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joints, beams posts etc.

2.3.3 Deductions of opening exceeding 0.5 m<sup>2</sup> but not exceeding 3.0 m<sup>2</sup>, each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings:

(a) When both the faces of walls are provided with same finish, deductions shall be made for one face only.

(b) When each face of is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveal is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

2.3.4 In case of opening of area exceeding 3.0 m<sup>2</sup>, each, deduction shall be made for actual size of the openings and jambs, sills and soffits shall be measured and paid separately.

2.3.5 No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.

2.3.6 Corrugated surfaces shall be measured flat as fixed and not girth. The quantities measured shall be increased by the following percentage and the resultant shall be included with the general areas:

(a) Corrugated steel sheets	14%
(b) Corrugated A.C. Sheets	20%
(c) Semi corrugated A.C. Sheets	10%
(d) Nainital pattern roof (Plain sheeting with rolls)	10%
(e) Nainital pattern roof (with corrugated sheets)	25%

2.3.7 Cornices and other wall features, when they are picked out in a different finish/colour shall be girthed and included in the general area.

2.3.8 Item includes removing nails, making good holes, cracks, patches with materials similar in composition of distemper.

The rate includes cost of all materials, labors, scaffolding, protective measures etc. involved in all the operations described above, carried out at all floor heights, in any position, at all levels. This shall also include conveyance, delivery, handling, unloading, storing work etc.

The rate shall be for a unit of one m<sup>2</sup>.

**CW 12.00****Roofing Work**

**12.01 Providing and fixing tiles roofing with mangalore tiles inclusive seasoned and chemically treated for anti termite treatment good quality teak reepers / battens of size 50mm x 25mm.**

**1.0 Material****1.1 Mangalore Roof Tiles**

1.1.1 Mangalore Roof Tiles shall conform to M-78.

**1.2 Teak Wood**

1.2.1 Teak wood shall conform to M-78.

**2.0 Workmanship****2.1 Laying**

2.1.1 The maximum distance between center to center of rafters shall not be more than 600 mm. Teak wood reapers 50 mm. x 25 mm. size, shall be nailed to each rafter at center to center distances, suited to the size of the tiles, by means of nails, 50 mm. long. The reapers shall be made from well seasoned teak wood and shall be straight pieces of uniform size and color and not shorter than the length necessary to cover at-least 4 rafters. The under face and sides of the reapers shall be planed before fitting. Joints shall come over the rafters. The joints of two adjacent rows of reapers shall not come over the same rafter. At the caves, there shall be two reapers of such thickness and shape, that the uniformity of the top slope of the roof shall be preserved.

2.2 In the execution of valleys Galvanised iron sheet, 1200 mm. wide and 1.25 mm. thick, shall be used for valleys. The sheet shall be extended by about 450 mm. under the tiles on either side, with a depth of 100 mm. at center. The sheet shall be carried 75 mm. into the wall and set with cement mortar unless flashing is specified. The laps, if any, on the slope, shall be 300 mm. The sheets shall be laid over the reapers and nailed. Two reapers, 50 mm. x 25 mm. each, shall be fixed over the galvanised iron sheet, 150 mm. away from the centre line of the valley, on either side, to keep the tiles and mortar from falling into the gutter of the valley.

2.3 The tiles shall be laid from the eaves towards the ridges after fitting of the reapers is done. The rebate of the tiles shall rest fully against the reapers. The joints of the hip and ridge tiles and also those between them and the plain tiles shall be set watertight and well grouted with cement mortar and the mortar surface shall be painted and finished off with a mixture of red paint and cement /exterior grade waterproofing paint to match the colour of the tiles. The finished slope of the roof shall be uniform from ridges to eaves. The eave line shall be perfectly straight, horizontal and parallel to each other. The end

over gables shall be protected by line borders and neatly finished.

- 2.4 At the side of the valleys and for 230 mm. on either side of the roof at valleys, cement plastering, 12 mm. thick shall be done to prevent the rain water collected in the gutter to leak by the side of the valleys.
- 2.4 At the eaves, wind tie shall be placed over the ends of the last tiles and secured by means of galvanised iron washers and screws, 25 mm. deep into the rafter, to prevent tiles from being blown off. Care shall be taken to put the screws in the ridges and not in the gutter of the tiles. Where full tiles are not necessary, half tiles manufactured for the purpose, shall be used.

### **3.0 Mode of Measurement and Payment**

- 3.1 The measurements of the roof shall be taken for the finished work, for the superficial area flat in the plan of the roof and not girth. Laps shall not be measured.
- 3.2 No deduction in measurements of roof shall be made for openings of area upto 0.40 m<sup>2</sup> nor shall any extra be paid for labour and wastage in forming such openings.
- 3.3 The rate includes the cost of all materials and labour, including forming ridges, hips, eaves and battens as directed by engineer in charge.
- 3.4 The rate shall be for a unit of one m<sup>2</sup>.

**12.02 Providing corrugated GI sheet roofing of TATA or equivalent including vertical/curved / flat surface fixed with polymer coated / galvanised J or L hooks , bolts and nuts 8 mm diameter with G.I. limpet washers filled with white lead or SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) and including a coat of approved steel (itch) primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces) excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required as directed by engineer-in-charge.**

**12.02.1 1.00 mm (20 guage) thick with zinc coating not less than 275gm / m2**

**12.02.2 0.8 mm (22 guage) thick with zinc coating not less than 275gm / m2**

**12.02.3 0.63 mm (24 guage) thick with zinc coating not less than 275gm / m2**

### **1.0 Material**

#### **1.1 Corrugated GI Sheet**

1.1 Corrugated GI Sheet shall conform to M-83.

### **2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4, 12.1.5, 12.1.6 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566

Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19)of Hilti as per manufacture's specification of SDST bolt.

### **3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.

3.2 The item shall be measured and paid in sqm.

**12.03 Providing and fixing 0.50 mm thick SMP Top coated as approved by consultant and alkyd backer coated, Pre coated 240 MPA yield strength Galvanized profiled sheets of meta colour profile 930 or equivalent including vertical / curved / flat surface fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bond EPDM washer of size V16 or V19) of HILTI or equivalent and necessary side & end overlaps (minimum 150 mm) as recommended by supplier including cutting, erecting and fixing at all levels, providing openings, all fixtures and fixing accessories with EPDM seals, profiled foam fillers & both side adhesive tape at ridge ,valley & flashings etc. including all materials labor scaffolding wastage, tools, tackles, equipment, transportation, preparation and getting approval of shop drawing, and excluding the cost of purlins, rafters etc. all complete as per specifications drawings and as directed by architect/engineer-in-charge. The sheets shall be supplied in custom lengths upto 12.0 m. All overlaps shall be sealed with neutral grade weather silicone sealant of DOW corning 789 or equivalent of approved color.**

Relevant specifications of item no. 12.2 shall be followed except sheet should be profiled instead of corrugated sheet and it should be SMP / PVDF / HDP top coated as approved by the consultant or as per item description. The sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bond EPDM washer of size V16 or V19.) For rate Nabhi's commentary on CPWD specification clause no. 12.1.8 shall be followed except the rate is exclusive of steel primer and steel paint on overlapping of the sheets.

**12.04 Providing and fixing 0.50 mm thick / SMP / PVDF / HDP Top coated as approved by consultant and alkyd backer coated, Pre coated 240 MPA Galvalume / zinalume profiled sheets of meta colour profile 930 or equivalent, fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) of HILTI or equivalent and necessary side & end overlaps (minimum 150 mm) including cutting, erecting at all levels, providing openings, all fixtures and fixing accessories with EPDM seals, profiled foam fillers & both side adhesive tape at ridge ,valley & flashings etc. including all materials labour scaffolding wastage, tools, tackles, equipment, transportation, preparation of shop drawing, and excluding the cost of purlins, rafters etc. all complete as per specifications drawings and as directed by architect/engineer-in-charge. The sheets shall be supplied in custom lengths upto 12.0 m. All overlaps shall be sealed with silicone sealants.**

**1.0 Material**

**1.1 Galvalume / Zincalume Sheet**

1.1.1 Galvalume / Zincalume sheet of TATA or equivalent is to be followed.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt. Sheet should be pre coated like SMP / PVDF / HDP as approved by the consultant.

**3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.

3.2 The item shall be measured and paid in sqm.

**12.05 Providing and fixing 0.70 mm thick average 245 MPA yield strength Aluminium profiled (troughed factory finished) sheets of mill/ tucco finish of Hindalco or equivalent, fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) and necessary side & end overlaps (minimum 150 mm) including cutting, erecting at all levels, providing openings, all fixtures and fixing accessories with EPDM seals, profiled foam fillers & both side adhesive tape at ridge ,valley & flashings etc. including all materials labour scaffolding wastage, tools, tackles, equipment, transportation, preparation of shop drawing, and excluding the cost of purlins, rafters etc. all complete as per specifications drawings and as directed by architect/engineer-in-charge. The sheets shall be supplied in custom lengths upto 6.5 m. All overlaps shall be sealed with silicone sealants.**

**1.0 Material**

1.1 Aluminum Sheet shall conform to M-79. Aluminum sheet should be profiled and pre coated as per manufacture's specification.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt. Sheet should be pre coated like SMP / PVDF / HDP as approved by the consultant.

**3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.

3.2 The item shall be measured and paid in sqm.

**12.06 Providing and fixing 0.7 mm thick circular corrugated mill / stucco finish Aluminium sheet roofing of Hindalco or equivalent including vertical/curved / flatsurface fixed with polymer coated / galvanised J or L hooks, bolts and nuts 8 mm diameter with G.I. limpet washers filled with white lead or SDST bolt (Kltex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) including a coat of approved steel (itch) primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces) excluding the cost of purlins, rafters and trusses and including cutting to size and shape wherever required as directed by engineer-in-charge**

Relevant specifications of item no. 12.5 shall be followed except the Aluminum sheet should be corrugated of mill / stucco finish instead of Aluminum profiled sheet.

**12.07 Extra for straight cutting in GI /galvalume/alluminium corrugated or profiled sheet making opening of diameter exceeding 70 cm for chimney stacks, skylight and roof extractor etc. complete as directed by engineer-in-charge.**

**12.07.1 1.00 mm thick**

**12.07.2 0.8 mm thick**

**12.07.3 0.63 mm thick**

Relevant specifications of item no. 12.2 shall be followed and item shall be measured in running meter.

**12.08 Extra for circular cutting in GI /galvalume/alluminium corrugated or profiled making opening of diameter exceeding 70 cm for chimney stacks, skylight and roof extractor etc. complete as directed by engineer-in-charge.**

**12.08.1 1.00 mm thick**

**12.08.2 0.8 mm thick**

**12.08.3 0.63 mm thick**

Relevant specifications of item no. 12.2 shall be followed and item shall be measured in running meter.

**12.09 Providing plain ridges or hips of width 60 cm over all width fixed with polymer coated J or L hooks, bolts and nuts 8 mm dia GI limpet washers filled with white lead OR SDST bolt (Kltex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) of HILTI or equivalent as approved by consultant etc. complete as directed by engineer-in-charge**

**12.09.1 GI Sheet of 0.8 mm thk**

**12.09.2 GI / Galvalume / zinalume precolorcoated sheet of 0.8 mm thk**

**12.09.3 Aluminum Sheet of 0.9 mm thk**

Nabhi's commentary on CPWD specifications clause no. 12.2 shall be followed except that the ridges or hips is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonded EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt. For rate Nabhi's commentary on CPWD specification clause no. 12.2.5 shall be followed except the rate is exclusive of painting. Item shall be measured and paid in sqm.

**12.10 Providing valleys of any size of 90 cm wide overall in plain GS sheet fixed with polymer coated J or L hooks, bolts and nuts 8 mm dia GI limpet washers filled with white lead OR SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) of HILTI or equivalent as approved by consultant etc. complete as directed by engineer-in-charge.**

**12.10.1 GI Sheet of 0.8 mm thk**

**12.10.2 GI / Galvalume / zinalume precolorcoated sheet of 0.8 mm thk**

**12.10.3 Aluminum Sheet of 0.9 mm thk**

Relevant Nabhi's commentary on CPWD specifications clause no. 12.3 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt and as per manufacture's specification. For rate Nabhi's commentary on CPWD specification clause no. 12.3.6 shall be followed except the rate is exclusive of painting. Item shall be measured and paid in sqm.

**12.11 Providing and fixing 15 cm wide 45 cm over all semi circular plain G.S. sheet gutter with iron brackets 40x3mm size, bolts, nuts and washers etc. including making necessary connections with rain water pipes complete as directed by engineer-in-charge.**

**12.11.1 GI Sheet of 0.8 mm thk**

**12.11.2 GI / Galvalume / zinalume precolorcoated sheet of 0.8 mm thk**

**12.11.3 Aluminum Sheet of 0.9 mm thk**

Relevant Nabhi's commentary on CPWD specifications clause no. 12.4 shall be followed as per manufacture's specification as directed by engineer in charge.

**12.12 Providing flashing of 40 cm over all width fixed with polymer coated J, or L hooks, bolts and nuts, G.I. limpet and bitumen washer / SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) complete,**



**bent to shape and fixed in wall with cement mortar 1:3 (1cement: 3 coarse sand) as directed by the engineer-in-charge.**

**12.12.1 GI Sheet of 0.8 mm thk**

**12.12.2 GI / Galvalume / zincalume precolorcoated sheet of 0.8 mm thk**

**12.12.3 Aluminum Sheet of 0.9 mm thk**

Relevant Nabhi's commentary on CPWD specifications clause no. 12.3 shall be followed except flashing is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of flashing and SDST bolt.

**12.13 Providing Non-Asbestos high impact Polypropylene reinforced cement 6mm thick corrugated sheets (as per IS: 14871) roofing up to any pitch and fixing with polymer coated J, or L hooks, bolts and nuts 8mm dia. G.I. plain and bitumen washers or with self drilling fastener and EPDM washers etc. complete excluding the cost of purlins, rafters and trusses: corrugated sheets and including cutting to size and shape wherever required as directed by engineer-in-charge.**

**1.0 Material**

**1.1 Non Asbestos Cement Sheet**

1.1 Non Asbestos Cement Sheet of approved make shall be followed.

**2.0 Workmanship**

2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt.

**3.0 Mode of Measurement and Payment**

3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.

3.2 The item shall be measured and paid in sqm.

**12.14 Extra for providing and fixing wind ties of 40 x 6 mm flat iron section**

Nabhi's commentary on CPWD specifications clause no. 12.1.5 shall be followed.

**12.15 Providing and fixing PVC sheet roofing of approved make in different structures for roofing etc. of approved make, as per design and manufacture's specifications as directed by engineer-in-charge.**

**1.0 Material**

1.1 PVC Sheet shall conform to M-80.

## **2.0 Workmanship**

2.1 Relevant specifications of item no. 12.2 shall be followed except PVC sheet is to be used instead of

Corrugated GI Sheet. The sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) as per manufacture's specification of SDST bolt.

## **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 12.2 shall be followed except PVC sheet is to be used instead of corrugated GI Sheet.

**12.16 Providing and fixing fibre glass in skylights of approved make in different structure for roofing of approved make as per design, as per manufacture's specification as directed by engineer-in-charge.**

### **1.0 Material**

1.1 Fiber Glass Sheet shall conform to M-81.

### **2.0 Workmanship**

2.1 The sheets shall be fixed to the purlins as per manufacture's specification and relevant specifications of item no. 12.2 shall be followed except fiber glass sheet is to be used instead of corrugated GI sheet. Care shall be taken to make the joints leak proof. The sheets shall be drilled with the help of a hand drill or power drill and shall be cut with Hacksaw blades. Holes shall never be punched but only drilled through the crowns of the corrugations.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 12.2 shall be followed except Fiber Glass sheet is to be used instead of corrugated GI Sheet. The rate shall be for an unit of sqm.

**12.17 Providing and fixing Polycarbonate sheet for roofing structure of approved make as per design, manufacture's specification and as directed by engineer-in-charge.**

### **1.0 Material**

1.1 Polycarbonate Sheet shall conform to M-82.

### **2.0 Workmanship**

2.1 The sheets shall be fixed to the purlins as per manufacture's specification and relevant specifications of item no. 12.2 shall be followed except polycarbonate sheet is to be used instead of corrugated GI sheet. Care shall be taken to make the joints leak proof. The sheets shall be drilled with the help of a hand drill or power drill and shall be cut with

Hacksaw blades. Holes shall never be punched but only drilled through the crowns of the corrugations.

### **3.0 Mode of Measurement and Payment**

3.1 Relevant specifications of item no. 12.2 shall be followed except Polycarbonate sheet is to be used instead of corrugated GI Sheet. The rate shall be for an unit of sqm.

**12.18 Providing and fixing polycarbonate domes embossed/transparent/milky white with flat flange including fixing with brass screws/anchor fasteners of HILTI or equivalent, EPDM rubber and neutral grade weather silicone sealant of DOW corning 789 or equivalent of approved color etc. complete as per manufacture's specifications and as directed upto the satisfaction of Engineer-in-charge.**

**12.18.1 Polycarbonate doms 2mm thick with 450 mm dia clear opening**

**12.18.2 Polycarbonate doms 2mm thick with 600 mm dia clear opening (500mm inner dia)**

**12.18.3 Polycarbonate doms 3mm thick with 900 mm dia clear opening**

### **1.0 Material**

1.1 Polycarbonate Sheet shall conform to M-82. Domes shall be manufactured from polycarbonate sheet as one piece with side step as per drawing. Approval of dome shall be taken before mass procurement and manufacturing.

### **2.0 Workmanship**

2.1 The dome shall be fixed as per the manufacturer's instructions using approved brass screws / anchor fasteners with PVC grip from the sides to RCC, neutral grade weather silicone sealant of DOW corning 789 or equivalent of approved color, EPDM rubber profiles and setting blocks as instructed. Water tightness and neat fixing shall be sole responsibility of contractor.

### **3.0 Mode of Measurement and Payment**

3.1 The item shall be measured and paid for a unit of each. The rate includes the material and labour required for completing the work upto the satisfaction of engineer in charge.

**12.19 Providing and fixing Ventilator of approved make with FRP plates or connecting piece as per design in line level and plumb on top of roof/ slab over the cut outs provided in roof slab etc. complete as per the manufacture's specifications and as directed by engineer-in-charge.**

**12.19.1 Turbo Ventilator**

**12.19.2 Power Ventilator**

Turbo ventilator shall be of approved make and shall be fixed as per the manufacturer's specifications. Care shall be taken to avoid water leakage from the junction of ventilator with roof slab. Rate shall be inclusive of neoprene rubber, brass/SS screws/anchor fasteners, silicone sealant etc. complete. Rate shall be for per no.

**12.20 Providing and fixing color pre-coated roofing sheet with 0.45 mm (BMT) thick high strength steel with 550 MPA yield strength manufactured and supplied by TATA Blue scope having trapezoidal profile like TRIMDECK (or equivalent) of nominal 1015 effective cover width and 28mm deep ribs with square fluting at 230mm c/c, metallic hot dip coated with aluminum zinc alloy (55% Alluminum, 45% Zinc) as per AS 1397 Zinalume AZ150 (min 150 gms/sqm total on both sides) with color bond steel quality paint coat as per AS/NZS 2728 type 3-4. The paint shall have total coating thickness of nominal 35 µm, comprising of nominal 20 µm exterior coat on top surface 5µm reverse coat on back surface over nominal 5µm primer coat on both surfaces of approved color shade by Architect.**

The sheets shall be fixed with SDST bolts with nominal 40 µm zinc coated hex head of Buildex or equivalent make with EPDM washer as per the requirement including cutting, erecting at all levels, providing openings, all fixtures and fixing accessories with EPDM seals, for end laps silicon sealant profiled foam fillers etc. at ends below ridge and valleys, including all materials labour scaffolding wastage, tools, tackles, equipment, transportation, preparation of shop drawing, and excluding the cost of purlins, rafters etc. all complete as per specifications drawings and as directed by architect/engineer-in-charge. Rate shall include end laps, side laps, bolts etc complete excluding the cost of purlins, rafters and trusses

**1.0 Materials:** Pre-coated 0.45 mm thick SMP top coated and alkyd backer coated meta color sheet with trapezoidal profile and as per the supplier specifications. The color and length shall be approved by the Architect and Engineer-in-charge. The shape of sheet shall be as shown in the drawings.

**2.0 Workmanship:**

2.1 Spacing of the purlins shall be provided such that one purlin rests at the ridge and one at the caves. The other purlins for 0.55 mm. thick Meta color pre-coated sheet shall not exceed a center to center distance of 1.40 m. The purlin shall coincide with the centre line of the end lap. The ridge purlins shall be placed in such a way that the ridges can be fixed properly. The portion overhanging the wall support shall not be more than one fourth of the spacing of purlins.

2.2 The bottom surface of the purlins shall be painted before the sheets are fixed to them. Embedded portions of purlins shall be finished with two coats of coal-tar.

**2.3 Laying of Sheets:**

- 2.3.1 The sheets shall be fixed to the purlins from underside, to a true plane with the line of corrugations truly parallel or normal to the sides of area to be covered. The sheets shall not generally be built into the gables and parapets. They shall be bent up along their side edges close to the wall and the junction shall be protected by suitable flashing or by projecting drip course.
- 2.3.2. The laps at the end shall be provided, 150 mm. minimum, for roof slope of 1 in 2 (1 vertical:2 horizontal) and steeper but a lap of 200 mm. shall be provided for flatter slopes than those above. The side lap shall be provided between two ridges of corrugations, at each side.
- 2.3.3 The sheets shall be cut to the dimensions and to the shape of the roof, either along their lengths or their width and in slant across the line of corrugations, at hips and valleys. The sheets shall be cut carefully with a straight edge and chisel, to give a straight finish. The sheets shall be laid such that the laps are turned away, from the usual direction of local heavy rain.
- 2.3.4 Rate shall be inclusive of mobile platform, scaffolding, for fixing the cladding and sheets from inside/ underside of the shed.

#### 2.4 **Fixing of Sheets:**

- 2.4.1 Sheets shall be fixed to the purlins or other roof members such as hips and valleys, rafters, etc., with SDST bolts with EPDM seals complete as per supplier's specifications. As far as possible they shall be fixed over the ridges. The fixing of ridge with the sheets shall be done with GI seam bolts.
- 2.4.2 The roof when complete, shall be true to lines and slopes and shall be leak-proof.

#### 3.0 **Mode of Measurements and Payment:**

- 3.1 The measurements of the sheets, both at their ends and along the side edges shall be measured. The overlaps of the sheets over the valley piece and their under lap under the ridge, hip and flashing piece shall be included in the measurements.
- 3.2 No deductions in measurements shall be made for openings like chimney stacks, sky-light, etc., having area upto 0.40 m<sup>2</sup>. nor extra be paid for extra labour in cutting and for wastage, etc., in forming such openings.
- 3.3 The rate shall include the cost of all materials and labour involved in all operations described above. The rate also includes the cost of provision, erection and removal of the scaffolding, benching, ladders, templates and tools required for the proper erection and completion of the work. The rate excludes the cost of purlins, rafters and trusses.
- 3.2 The rate shall be for an unit of one m<sup>2</sup>.

**12.21. a Providing Asbestos cement corrugated sheet roofing, fixed with G.I. plain and bitumen washers etc. complete and excluding the cost of purlins, rafters and trusses.**

**1.0 Materials:** Corrugated Asbestos cement sheets shall conform to M-94.

**2.0 Workmanship:**

2.1 The maximum spacing of purlins shall be 1.6 m. in case of 7 mm. thick A.C. sheets and 1.35 m. for 6 mm. thick A.C. sheets.

2.2 **Laying and fixing of sheets:** The sheets shall be laid on the purlins and other roof members, as indicated on the drawings and as directed, as per the code of practice. Top bearing surfaces of all purlins and other roof members shall be in one plane so that the sheets when being fixed, shall not be forced down to rest on the purlins/roof members. The sheets shall be laid with the smooth side upwards.

The finished roof shall present an uniform slope and the line of corrugations shall be straight and true. The sheets shall be laid, starting at the eaves either from left to right or right to left, depending upon the direction of wind, which shall be checked before actual laying of the sheets is started. The purlin spacing and the size of sheets shall be checked to ensure that the arrangements shall provide the laps required and the specified overhang at the eaves. In case the sheets are laid from right to left, the first sheet shall be laid uncut but the remaining sheets in the bottom row shall have the top left hand corners cut or mitred. The sheets in the second and other immediate rows shall have the bottom right hand corner of the first sheet cut. All other sheets except the last sheet shall have both bottom right hand corners and top left hand corners cut. The last sheet shall have only top left hand corner cut. The last of the top row sheets shall have the bottom right hand corner cut with exception of the last sheet which shall be left uncut, if the sheets are laid from left to right, the first sheet shall be laid uncut and the remaining procedure shall be reversed.

2.3 The free overhang of the sheets, at the caves shall not exceed 400 mm. in case of 7 mm. thick sheets and 300 mm. in case of 6 mm. thick sheets.

2.4 The mitring described above is necessary to provide a snug fit. Where 4 sheets meet at a lap the length of mitre shall be 150 mm. and the width of mitre shall be equal the width of the side lap. The cutting may be done with ordinary wood saw at site. Cat ladders or planks shall be used while laying and fixing the sheets to avoid damage to the sheets.

2.5 **Laps:** The sheet shall be laid with an end lap of 150 mm. minimum, in case of roof with a pitch flatter than 1 vertical to 2.5 horizontal (Approx. 22°) and for roofs flatter than mentioned above or for very exposed situation, end lap shall be 225 mm. The side lap shall be sheltered from the prevailing wind direction. The sheets shall be laid with side lap of half a corrugation.

## 2.6 Fixing Accessories

- 2.6.1 The sheets shall be secured to the purlins and other roof members by means of 8 mm. dia. galvanised iron bolts 'J' type hook bolts, in case of angles, iron purlins and 'L' type bolts, in case of R.S. joists, precast concrete or timber purlins, and nuts, bearing on the galvanised iron washers and bitumen washers. The grip of 'J' or 'L' bolts on the side of purlins shall not be less than 25 mm. Each galvanised iron 'J' or 'L' hook bolts shall have a bitumen washer and galvanised iron washer placed over the sheets before the nuts are screwed down from above. On each purlin there shall be one hook bolt, on the crown adjacent to the side lap, on either side. Bitumen washer shall be of approved quality. The G.I. flat washer shall be 25 mm. in diameter and 1.60 mm. thick and bitumen washer shall be 35 mm. in dia and 1 mm. thick with a hole to suit the required size of fixing accessory. Each nut shall be screwed lightly at first. After a dozen or more sheets are laid, the nuts shall be tightened to ensure a leak-proof joint and the nuts shall be tightened only to an extent so as to prevent damage to the sheets. The length of the 'J' bolts or crank bolts shall be 75 mm. more than the depth of purlins for single sheets fixing and 90 mm. more, where two sheets overlap or where ridges or other accessories are to be fixed. The minimum length of coach screw for timber purlins shall be 110 mm.
- 2.7 **Holes :** The holes for fixing the sheet shall be drilled and never punched in the crown of the corrugations, to suit the purlins i.e. on the centre line of the purlins, if these are of timber and square head coach screws are used, or as close as possible to the back of purlins if 'J' or 'L' bolts are used, as with steel angles or precast concrete or timber purlins. Holes for hook bolts, etc. shall be 2 mm. more than the diameter of the fixing bolts. No holes shall be nearer than 40 mm. to any edge of sheet or accessory.

## 3.0 Mode of Measurements and Payment

- 3.1 The relevant specifications of item 12.02 shall be followed except that the overlap of the corrugated sheets over valley, gutters, roof lights, caves, filler pieces and underlay of the corrugated sheets below ridges, hips, north light curves, flashing pieces, roof light sheets and barge board shall be included in the measurement. No deduction shall be made for holes cut for extractors, cowl type ventilators. Deductions shall be made for roof light sheets.
- 3.2 The rate shall be for an unit of one m<sup>2</sup>.

### 12.21.b Providing Asbestos cement semi-corrugated sheet roofing, fixed with G.I. plain and bitumen washers etc. complete and excluding the cost of purlins, rafters and trusses.

The relevant specifications of item no. 12.21.a shall be followed except that the following additional measures shall be taken.

- (a) The sheets shall invariably be laid from right to left, starting at the eaves with necessary procedure of mitring.

- (b) The side laps provided shall be of one corrugation.
- (c) An Asbestos cement expansion joint shall be inserted at every 45 mm. or so in the length of the roofing.
- (d) There shall be additional hook bolt through one of the two intermediate corrugations, on each sheet.

**12.21.c Providing Asbestos cement curved sheet roofing, fixed with G.I. plain and bitumen washers etc. complete and excluding the cost of purlins, rafters and trusses.**

**1.0 Material**

- 1.1 Asbestos cement curved roofing sheets shall be of Everest or equivalent as approved by the Architect and Engineer-in-charge. It shall conform to M-94B.

**2.0 Workmanship**

- 2.1 Curved roofing sheets form a self-supporting roofing system which does not require purlins, rafters or trusses. Hence the entire super structure is eliminated.
- 2.2 The maximum span shall be obtained by using 3 sheets of length 3048 mm. in a semi-circular arch of radius 2743 mm. The ends of the arch formed shall be supported on RCC channel which in turn may be supported by column or shall rest on a Gable wall, in case of Industrial structures. The end laps of the curved sheets shall be 406 mm. and the side laps shall be one and a half corrugations, so as to give total protection against rain.
- 2.3 The laps shall be formed by 50 mm. x 8 mm. galvanized iron bolts and nuts. Each galvanised iron 'J' or 'L' hook bolts shall have a bitumen washer and galvanized iron washer placed over the sheets and a galvanised iron washer beneath the sheet, before the nuts are screwed down from above. Bitumen washer shall be of approved quality. The G.I. flat washer shall be 25 mm. in diameter and 1.60 mm. thick and bitumen washer shall be 35 mm. in diameter and 1 mm. thick, with hole to suit the required size of fixing accessory. Each nut shall be screwed lightly at first. After a dozen or more sheets are laid, the nuts shall be tightened to ensure a leak-proof joint and the nuts tightened only to an extent so as to prevent damage to the sheets. For making holes and laying the sheets, the relevant specifications of item no. 12.05.a shall be followed.

**3.0 Mode of Measurements and Payment:**

- 3.1 The relevant specifications of item no. 12.02 shall be followed.
- 3.2 The rate shall for an unit of one m<sup>2</sup>.

**12.22 Providing and fixing corrugated GI sheet roofing of TATA or equivalent for barrication fixed with polymer coated / galvanised J or L hooks , bolts and nuts 8 mm diameter with G.I. limpet washers filled with white lead or SDST bolt (Kitex coated as per AS 3566 Class**



**3 with SS 304 metal bonde EPDM washer of size V16 or V19) and including a coat of approved steel (itch) primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces) excluding the cost of purlins, rafter, trusses and including cutting to size and shape wherever required as directed by engineer-in-charge.Civil Work required shall be paid under relevant tender items. Sample should be approved by EIC and Architect.**

**12.22.1 0.8 mm (22 guage) thick with zinc coating not less than 275gm / m2**

1.0 Material

1.1 Corrugated GI Sheet

1.1 Corrugated GI Sheet shall conform to M-83.

2.0 Workmanship

**2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4, 12.1.5, 12.1.6 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) of Hilti as per manufacture's specification of SDST bolt.**

3.0 Mode of Measurement and Payment

3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.

3.2 The item shall be measured and paid in Sqmt.

**12.23 Dismantling and Re-fixing the same Corrugated GI sheet roofing of TATA or equivalent for barrication at a different location fixed with polymer coated / galvanised J or L hooks , bolts and nuts 8 mm diameter with G.I. limpet washers filled with white lead or SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) and including a coat of approved steel (itch) primer and two coats of approved paint on overlapping of sheets complete (up to any pitch in horizontal/ vertical or curved surfaces) excluding the cost of purlins, rafter, trusses and including cutting to size and shape wherever required as directed by engineer-in-charge.Civil Work required shall be paid under relevant tender items.Item shall be executed with confirmation from EIC.Rate is inclusive of extra washers, bolts, nuts and hooks to be used fresh.**

**12.23.1 0.8 mm (22 guage) thick with zinc coating not less than 275gm / m2**

4.0 Material

1.1 Corrugated GI Sheet

1.1 Corrugated GI Sheet shall conform to M-83.

5.0 Workmanship

- 2.1 Nabhi's commentary on CPWD specifications clause no. 12.1.4, 12.1.5, 12.1.6 shall be followed except that the sheet is to be fixed with SDST bolt (Kitex coated as per AS 3566 Class 3 with SS 304 metal bonde EPDM washer of size V16 or V19) of Hilti as per manufacture's specification of SDST bolt.
- 6.0 Mode of Measurement and Payment
- 3.1 Nabhi's commentary on CPWD specifications clause no. 12.1.7, 12.1.8 shall be followed.
- 3.2 The item shall be measured and paid in Sqmt.

## DE 13.00

### Demolition and Dismantling Works

---

#### GENERAL INSTRUCTIONS FOR WORKING IN ALREADY FUNCTIONING AREA.

Possession of premises for construction can be given part by part.

It may be noted specifically that the rates of all items are uniformly applicable to working on any height.

Care should be taken to minimize noise during construction operations. Quicker methods using mechanical tools might be more beneficial in carrying out the work. Of course, mechanical tools do have their own vibration and shrill.

Utmost care should be exercised in handling the construction materials as well as muck / debris to minimize spread of dust to maintain hygiene. Loose materials should be transported from one location to the other in covered sacks. Muck from upper floors should not be thrown freely to the ground. The same should be carried in special muck – chutes carefully located in premises.

While working in a particular part / department of the client, contractor should carefully plan with all agencies so as to complete all operations in a sequence and give possession of that part / department as soon as possible, without keeping any operation pending, so that working in the same can be reinstated immediately and other part / department can be made free for working. Team for electrical installation should work hand in hand with teams of other civil work right from beginning of work till the end.

#### DOCUMENTATION

Before starting actual operations in any part of the structure, dated photographs should be taken with the help of digital camera for purpose of record, in consultation with the consultant and supervisory staff. In the same way photographs should be taken for the final condition after completion of operations for the particular job. These shall be conveyed to the authorities and consultant through E-mail on the same day. Hard copies of selected photographs will be attached with bill.

#### COMMON DESCRIPTION FOR DEMOLITION AND PREPARTORY WORK

All items mentioned under the criteria of "Demolition" shall include – Providing, erecting and dismantling all necessary scaffolds, tools, tackles, construction cranes and other equipments etc. working at any floors in the functioning facilities, breaking as far as practicable – with Mechanical Breakers using appropriate attachments, scrapping the surfaces with wire-brush or broom to remove the remnant lumps, cleaning the surface with air-jet or water jet, transporting via external independent temporary passage to avoid disturbance, all debris down to ground level, with the help of covered sacs or chutes

or through adjustable, flexible garbage ducts for preventing spread of dust and avoiding free hurling or throwing from upper floors, hauling immediately to the demarcated dump – yards on site, for temporary stacking, segregating the salvable / resaleable scrap and finally carting away remaining debris from the site etc. complete.

For all operations involving “Demolition” there is an option to work manually or by mechanical tools like breakers. Working with mechanical breaker is specified here for

- a. Speeding up construction work
- b. Controlling numbers of workers
- c. Reducing impact to the structure due to heavy hammer blows,
- d. Controlled collection of debris,
- e. Possibility of deferring working hours to harmonise with working of the Institute.

For efficient working with mechanical breaker proper planning of temporary platforms for supporting both men and machine should be done. Along with the main jack hammer for breaking, various tools and attachments are provided. Depending upon required depth of demolition, strength of material to be demolished and accuracy required specific attachment should be used.

Cost of working with the mechanical breaker should include cost of all maintenance repairs required for the main machine, consumption of power or fuel and tool-bits cables for drawing power, cost of operator and helper, transportation etc.

Along with the operator for breaker, sufficient number of labourers should be kept for fast removal of debris from the site, which will be done in stages as under;

- a. Horizontal conveyance from the spot of breaking on a particular floor to a muck station on that floor, where retention period should not exceed 24 hours.
- b. Vertical conveyance from the floor muck station downwards with the help of chutes or through ramp to a temporary stack – yard at ground level, where retention period should not exceed 48 hours.
- c. Horizontal conveyance of salvaged material to store located on ground level, and disposal of rubbish to a spot outside the premises.

After using the breaker, manual demolition operations with the help of chisel or scrapper might be needed for accurate manipulation of the work. The surfaces might be scrapped with wire brush or scrapper and cleaned with brooms etc to receive further repair materials under controlled environment. The surfaces might have to be cleaned with jet of water or air to prevent any loose fine material mixing up with repair materials.

For items pertaining to demolition, no material is consumed. Workmanship and mode of measurement are defined separately in items. Number of sets of machinery to be installed depends upon quantum of work to be handled in given time frame. Proper organization of labour gangs for debris disposal is very important. Workers and

supervisory staff should be provided with helmets and safety belts while working at heights. The whole area where demolition work is going on should be cordoned and warning signs prominently displayed.

**General.**

- 1). **All rates should be inclusive of taking all required precaution measures to execute and carry out the work in safe manner.**
- 2). **To keep good in condition all the structural elements those required to be retained.**
- 3). **Protecting structure & its surroundings where movements (patients, visitors, vehicular etc.) are envisaged.**
- 4). **Providing necessary barricading, coverings, additional steel supports to the existing structure by forms, props, H Frames, Spans, shuttering etc., where by the purpose of providing the safety & no damage gets solved.**
- 5). **No extra payments will be made for providing such measures stated above.**

**13.01. a Demolition and disposal of unserviceable materials at non objectionable place with all leads and lifts: Lime Concrete. Site shall be selected by contractor.**

**1.0 Workmanship**

- 1.1 The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item, as specified or shown in the drawings.
- 1.2 The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Engineer- in-charge before starting the work. This however will not absolve the contractor from the responsibility of proper and safe demolition.
- 1.3 Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property.
- 1.4 Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.
- 1.5 Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.
- 1.6 All materials obtained from demolition shall be the property of Government. Unless

otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

- 1.7 Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed, with all lead and lift. All serviceable materials, rubbish etc. shall be stacked as directed by the engineer-in-charge.
- 1.8 On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

## **2.0 Mode of measurement and payment**

**2.1** Measurement of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this item. Specifications for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

**2.2** All work shall be measured in decimal system as fixed in this place subject to the following limits, unless otherwise stated hereinafter:

- (a) Dimensions shall be measured to the nearest 0.01mt.
- (b) Area shall be worked out to the nearest 0.01 sq.mt.
- (c) Cubical connection shall be work out to the nearest 0.01 cu.m.

**2.3** The rate shall include the cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

**2.4** The rate shall be for a unit of one cubic meter.

**13.01. B Demolition and disposal of unserviceable materials at non objectionable place with all leads and lifts. The contractor rate includes all necessary machinery, labour for dismantling, constructing of ring bund, shoring, strutting, dewatering, finishing the broken edges, etc. complete as instructed by engineer in charge including disposing of dismantled material with all lead and lift. Unreinforced cement concrete (PCC)**

## **1.0 Workmanship**

1.1 The relevant specifications of item 13.01.a shall be followed except that the reinforced cement concrete work is to be demolished instead of lime concrete.

## **2.0 Mode of measurement & payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed.
- 2.2 The rate shall be for a unit of one cubic meter.

**13.01.c Demolition including stacking of serviceable materials and disposal or unserviceable materials at non objectionable place with all leads and lifts including cutting the reinforcement, and finishing the broken surfaces to match with the surroundings etc. complete: RCC Works.**

**1.0 Workmanship**

- 1.1 The relevant specifications of items no. 13.01.a shall be followed except that demolition of RCC Work is to be done.
- 1.2 Where ever necessary while breaking concrete for RCC slabs, a complete centering should be done below, as if a new slab is to be cast. Breaking is being done from upper level. The centering should be strong to withstand impact and vibration while working with breaker. Sometimes there is a temptation to work from one edge and proceed towards the other edge, working on the reinforcement jail, this would result into avoidance of centering with another objective of dropping the debris to the lower level without involving extra labor. In the distressed structure, it cannot be relied on reinforcement to carry load of men and machinery. Corroded steel might give way any time. If fresh slab is not to be cast at the same location, reinforcement is cut off after removal of concrete.
- 1.3 While breaking concrete for RCC beams, care should be taken to support slabs on both sides of the beam. If beam is to be retrofitted after partial removal of concrete, all superimposed loads should be relieved and adequate props be placed at selected locations below the beam too. In case of partial precise demolition of beams, manual breaking might be advantageous.
- 1.4 Column demolition is normally partial only. Before executing demolition of column, adequate props have to be provided to transfer of loads from the uppermost level up to the working level. Damaged concrete should be removed all round including the one behind the corroded bars, very carefully, preferably manually.

**2.0 Mode of Measurement and payment**

- 2.1 The relevant specifications of items No. 13.01.a shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.
- 2.2 The rate shall be for a unit of one cubic meter.

**13.02. a Demolition of brick work and stone masonry with or without plaster including stacking of serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts in lime mortar.**

**1.0 Workmanship**

- 1.1 The relevant specification of item No. 13.01.a shall be followed except that demolition of brick or stone masonry in lime mortar is to be done.

**2.0 Mode of measurement and payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic meters. All copings, corbels, cornices and other projections shall be included with the wall measurements.
- 2.2 In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlar face stones dressed stone etc. if required to be taken down intact shall be dismantled and measured separately in cubic meter.
- 2.3 The rate is exclusive of cleaning of bricks or stones. Honey comb works or hollow block walling shall be measured as solid.
- 2.4 The rate shall be for a unit of one cubic meter.

**13.02.b Dismantling of brick work and stone masonry including both side plastering or cladding, stacking of serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts including dismantling concealed pipes etc. complete in cement mortar.**

**1.0 Workmanship**

- 1.1 The relevant specifications of item no. 13.01.a shall be followed except demolition of brick or stone masonry in cement mortar is to be done.

**2.0 Mode of measurement and payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic meters. All copings, corbels, cornices and other projections shall be included with the wall measurements.
- 2.2 In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlar face stones dressed stone etc. if required to be taken down intact shall be dismantled and measured separately in cubic meters.
- 2.3 The rate is exclusive of cleaning of bricks and stones. Honey comb works and hollow block walling shall be measured as solid.
- 2.4 The rate shall be for a unit of one cubic meter.

**13.03. a Dismantling tiled or stone floors laid in mortar (75 mm thick) including stacking of serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts.**

**1.0 Workmanship**

- 1.1 The relevant specifications of item 13.01.a shall be followed except the dismantling of tiled or stone floors laid on mortar shall be done. Dismantling implies carefully taking up



or down or these are fixed by nail, screws, bolts etc. these shall be taken out with proper tools.

- 1.2 Before removing floor-finish the slab below the finishing should be inspected and its damage be assessed. Impacts and vibration given to the supporting slabs below the finishing material might worsen the distress. If structural system supporting the finish is very weak, the same should be adequately propped as precautionary measure.

## **2.0 Mode of measurement and payment**

- 2.1 The supporting materials such as joints, beams if any etc., shall be measured separately, the relevant specifications of item no 13.03.a shall be followed. The rate shall include stacking the unserviceable materials as directed with all lead and lift.

- 2.2 The rate shall be for a unit of one sqm.

### **13.03.b Dismantling of wooden floors, including stacking of serviceable materials and disposal of unserviceable materials at nonobjectionable place with all lead and lifts.**

#### **1.0 Materials**

- 1.1 The relevant specifications of item no. 13.01.a shall be followed except that wooden floors shall be dismantled.

#### **2.0 Mode of measurement and payment**

- 2.1 The relevant specifications of item No.13.01. a shall be followed. The supporting members such as joints, beams, etc., shall be measured separately. The rate shall include disposal of unserviceable materials as directed with all leads and lifts.

- 2.2 The rate shall be for a unit of sq. meter.

### **13.04.a Dismantling of sheet roofing including ridges, hips, valley, gutters etc, stacking of serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts G.I. Sheet roofing.**

#### **1.0 Materials**

- 1.1 The relevant specifications of item No. 13.01.a shall be followed except that G.I. sheet roofing shall be dismantled instead of concrete work.

#### **2.0 Mode of measurement and payment**

- 2.1 The area of G.I. Sheet roofing shall be measured in sq. meter, Ridge, hips and valley shall be girthed and included with roof area. Corrugated and semi-corrugated surfaces shall be measured flat and not girthed.
- 2.2 Supporting member such as rafters, purlins, beams, joints, trusses, etc., shall be measured separately.
- 2.3 The rate shall be including disposal of unserviceable materials with all leads and lifts and stacking the serviceable materials as directed.

2.4 The rate shall be for a unit of one sqm.

**13.04.b Dismantling of sheet roofing including ridges, hips, valleys, gutters etc. stacking or serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts: A.C sheet roofing & G.I. Sheet roofing.**

**1.0 Workmanship**

1.1 The relevant specifications of item No. 13.01.a shall be followed except that the A.C. Sheets roofing shall be measured in this item.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed except that the A.C. Sheets roofing shall be measured in this item.

2.2 The rate shall be for a unit of one sq. meter.

**13.04.c Dismantling Mangalore or country tile roofing with battens, boarding etc. including stacking of serviceable materials and disposal of unserviceable materials at nonobjectionable place with all leads and lifts.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed that the country tile roof of mangalore roof shall be dismantled.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 The supporting members shall be measured under separate item.

2.3 The rate includes labour required for disposal of unserviceable item with all leads and lifts.

2.4 The rate shall be for a unit of one sq. meter.

**13.04.d Dismantling cement asbestos / hard board in ceiling or partition walls, wooden trellis work including frames, stacking of the serviceable materials and disposal of unserviceable materials at non objectionable place with all leads and lifts.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the cement asbestos hard board in ceiling partitions walls, wooden trellis, works etc.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed. The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed off with all leads and lifts.

2.2 The rate shall be for a unit of one sq. meter.

**13.05 Dismantling wood work, wrought frame and fixed in frames, trusses including stacking the materials with all leads and lift.**

**1.0 Workmanship**

1.1 The relevant specifications of item No. 13.01.a shall be followed except that the wood work, wrought framed, and fixed in frames, trusses, etc., shall be dismantled.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 The materials shall be stacked as and where directed with all leads and lifts.

2.3 The rate shall be for a unit of one cubic meter.

**13.06 Dismantling expanded metal or I.R.C. fabric with necessary battens and beadings including frame work and stacking the serviceable materials and disposal of unserviceable material at nonobjectionable place with all leads and lifts.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling of expanded metal or I.R.C. fabric shall be done.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 The rate shall be for a unit of one sq. meter.

**13.07 Dismantling steel work including dismembering and stacking the materials and disposal of unserviceable material at non objectionable place with all leads and lifts.**

**1.0 Materials**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling of steel works shall be carried out.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.

2.3 Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.

2.4 In farmed steel gate, the weight of any covering materials of filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.

2.5 The rate includes stacking the materials as and where directed with all leads and lifts.

2.6 The rate shall be for a unit of one kg.

**13.08.a Dismantling doors, windows, ventilators etc. (woods or steel) shutters, including chowkhats, architraves, holdfasts and other attachment (such as grill etc.) directly or indirectly attached to etc. complete and stacking them within and disposal of unserviceable material at non objectionable place for all leads & lift.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, architraves, holdfasts and other attachments etc. are to be dismantled.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item no. 13.01.a shall be followed.

2.2 The doors, windows, ventilators etc. not exceeding 3 sqm In area (each) including shutters and chowkhats, Architraves, holdfasts and other attachment to grames etc. will be dismantled and measured under this item.

2.3 The rate includes stacking serviceable materials as and where directed with all leads and lifts.

2.4 The rate shall be for a unit of one number.

**13.08.b Dismantling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, Architraves, hold fasts and other attachments etc. complete and stacking them within all leads and lifts exceeding 3 sq. meters in area and disposal of unserviceable material at non objectionable place for all leads and lift. Site shall be selected by contractor.**

**1.0 Workmanship**

1.1 The relevant specifications of item No. 13.08.a shall be followed except that the area of doors, windows, ventilators, exceeding 3 sq. meter are to be dismantled under this item.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.08.a above shall be followed.

2.2 The rate shall be for a unit of one number.

**13.09 Dismantling barbed wire / chain link / any other type of fencing including marking rolls and also including dismantling fencing posts including all earth work concrete in base and making good the disturbed ground stacking useful materials as directed and disposal of the unserviceable materials at nonobjectionable place with all lead and lift. Site shall be selected by contractor.**

**1.0 Workmanship**

1.1 The relevant specifications of item No. 13.01.a shall be followed except that the dismantling of barbed wire fencing shall be carried out.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 The rate includes making rolls of dismantled wires and including dismantling fencing posts, concrete works, in case and making good the disturbed ground etc. complete.

2.3 The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed with all leads and lifts.

2.4 The rate shall be for a unit of one running meter.

**13.10 Dismantling C.I pipes, G.S.W pipes and A.C rain water pipes with fitting and clamps including staking the material and disposal of unserviceable material at non objectionable place with all lead & lift (for any dia pipe). Site shall be selected by contractor.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling work of pipe lines of C.I. G.S.W & A.C. pipes with fittings shall be carried out.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item No. 13.01.a shall be followed.

2.2 Water pipe lines, including rain water pipes, with clamps and specials, sewer pipe lines (Salt glazed ware or concrete) etc. shall be measured in running meter inclusive of joints (The measurements shall be taken along the centre line of pipes and fittings).

2.3 The rate shall be for a unit of one running meter.

**13.11 Dismantling of sanitary fitting like washbasin, Water closet pan Indian & European type, flushing tank including stacking the materials and disposal of unserviceable material at non objectionable place with all lead and lift. Site shall be selected by contractor. Site shall be selected by contractor.**

**1.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling work of sanitary fittings such as wash basin, W. C. Pan (all type of pans), Flushing tanks etc. shall be carried out.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item no. 13.01.a shall be followed.

2.2 The rate shall be for a unit of one number.

**13.12 Scraping oil paint from steel and other metal surface and making the surface even (with hand scraping) and disposal of unserviceable material at nonobjectionable place with all leads and lifts.**

**1.0 Workmanship**

1.1 The oil paint from steel and other metal surface shall be scraped thoroughly with hand scrapper followed by wire brushing (first with coarse and then with fine brushes) and finally sand papering with coarse and paper (No. 3) steel wood (No.2) or emery paper (No. 3) or with emery clothes. This shall then be wiped finally with mineral terpening to remove grease and perspiration of hand marks etc. and allowed to dry. The surface shall be made even and smooth.

**2.0 Mode of measurement and payment**

2.1 The work shall be measured in actual area of work done.

2.2 The rate shall be for a unit of one sq. meter.

**13.13 Dismantling glazed tiles dado / flooring etc. and as directed including taking the materials and disposal of unserviceable material at non objectionable place to all leads and lifts.**

**2.0 Workmanship**

1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling work of glazed tiles dado and flooring work to be done.

**2.0 Mode of measurement and payment**

2.1 The relevant specifications of item no. 13.01.a shall be followed.

2.3 The rate shall be for a unit of one sq. meter.

**13.14 Dismantling of all types of Plaster, raking out joints and cleaning the surface for new plaster at all heights,**

**including disposal of unserviceable material at nonobjectionable place for all leads and lifts. Site shall be selected by contractor.**

**1.0 Workmanship**

1.1 The demolition shall consist of demolition of any type of plaster for different thickness with niru finishing and/ or sand faced plaster at any floor and at any height. Wherever required temporary enclosures or partition shall be provided necessary precaution shall be taken to keep up the dust nuisance down as and where necessary. It should be done with the help of flat scrapper attachment of the breaker machine, taking care not to damage RCC or masonry wall, while removing the plaster special care should be taken.

Sometimes manual removal of plaster might be safer as compared to mechanical breaker.

- 1.2 Dismantling shall be commenced in systematic manner. Necessary scaffolding shall be provided for the safety of the adjoining work or property. Dismantling is taken up and work shall be carried out in such way that no damage is caused to the buildings and adjoining property. All usable materials obtained from dismantling shall be stacked as and where directed and unserviceable materials shall be disposed as and where directed.
- 1.2.1 In case of removal of plaster over the masonry walls, the joints of masonry should be racked off. Peeling of plaster and racking of masonry joints might be done simultaneously with the breaker.

## **2.0 Mode of measurement and payment**

- 2.1 The rate includes the cost of tools, centering and labour required for dismantling at any existing surface of the wall.
- 2.2 The rate shall be for a unit of one Sqm.

**13.15. a Making weep holes upto 10cm diameter size, in RCC work and filling the same with PCC (1:2:4) and finishing the same as per surrounding, including scaffolding, cutting and reinforcement bars, curing etc. complete as per direction.**

## **1.0 Workmanship**

- 1.1 The PVC pipe shall conform to the relevant specification PVC pipe of plumbing section, except the pipe length shall be of required length work providing water spout in R.C.C. retaining walls.
- 1.2 The pipe shall be provided as per detail drawing and as directed during concreting of R.C.C. work. The surrounding of the PVC pipe shall be made good by finishing with cement mortar 1:2.

## **2.0 Mode of Measurements and Payment**

- 2.1 The rate includes cost of all materials, labour, scaffolding, tools and plants required for satisfactory completion of the item.
- 2.2 The rate shall be for a unit of one number.

**13.15. b Making Weep holes upto 15 cm. diameter size in R.C.C. work and filling the same with P.C.C. 1:2:4 and finishing the same as per surrounding, including scaffolding, cutting, and reinforcement bars curing etc. complete, as per direction of engineer in charge.**

The relevant specification of item no. 13.15.a shall be followed except the diameter of P.V.C. pipe shall be of 150 mm.

**13.16 Providing and fixing FRP gratings of size 568mm x 328mm having mesh size of 33 x 33 x 22 mm of approved make (Coromandal or equivalent) including the embedded angle frame of 25x25x3 mm with continuous integral anchor etc. complete all set in concrete as approved by consultant and engineer in charge. Rates shall be inclusive of painting the MS angle with two coats of approved make & shade enamel paint over two coats of metal primer – zinc chromate yellow oxide.**

**1.0 Material**

1.1 Material shall conform to M-92.

**2.0 Workmanship**

2.1 The work shall be carried out as per the best workmanship.

**3.0 Mode of Measurement and payment**

3.1 The item shall be measured and paid in sqm.

**13.17 Removal of telephone / Electric poles including excavation and dismantling of foundation concrete and lines under the supervision of concerned department, disposal with all lifts and up to a lead of 1000 metres and stacking the serviceable and unserviceable material separately**

**1.0 Workmanship**

1.1 The demolition shall consist of demolition of any type of concrete for foundation, with prior approval from Engineer in charge and proper permissions from concerned departments.

1.3 Dismantling shall be commenced in systematic manner. Necessary scaffolding shall be provided for the safety of the adjoining work or property. Dismantling is taken up and work shall be carried out in such way that no damage is caused to the buildings and adjoining property. All usable materials obtained from dismantling shall be stacked as and where directed and unserviceable materials shall be disposed as and where directed.

**2.0 Mode of measurement and payment**

2.1 The rate includes the cost of tools, centering and labour required for dismantling at any existing surface of the wall.

2.3 The rate shall be for a unit of per no.

**13.17 Dismantling existing plain or reinforced concrete by Vibration free cutting to shape and size for RCC wall thickness vary from (200 to 400) as per drawing using "Hydraulic Wall**



**saw system or wire saw system ” with complete mechanical, electrical and control system including site inspection, planning as per approved working method; executing work at site by authorized and trained applicator of the manufacturer of the above equipment, applicator guaranting successful execution of work, including all necessary tools and tackles; checking for safety of all working men and existing structures all complete as per direction of engineer-in-charge. The mode of measurement for Dismantling will be actual cross section of cut made by the hydraulic wall saw system. (Length x Thickness of piece which has been cut by blade). Rate shall also include lifting of concrete without effecting / disturbing the existing retaining wall and unloading the concrete piece near the edge Diaphragm wall / Retaining wall within the range of 100mtrs from the cutting area as per directions of engineer incharge. Minimum weight for lifting is 2.5 Ton.**

1. The rate shall include all equipment, machine tools, labour, manpower, consumable materials, safety appliances, transporatation, placing concrete cut slab near the edge of Diaphragm Wall / Retaining Wall as directed by Engineer in Charge, electricity, water supply etc.
2. Prior approval is must before starting the cutting work.
3. Mode of measurement is actual size of piece (Length x Thickness of piece which has been cut by blade).
4. **The unit rate is in Sqmt.**

**13.18 Disposal of dismantled/ cutout concrete portion / waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, with all ead and all lifts involved. Dismantled/cutout concrete portion/waste material is property of SRFDCL.**

1. The rate shall include all equipment, machine tools, labour, manpower, consumable materials, safety appliances, transporatation, disposal of concrete to the un objectble places as directed by Engineer In Charge, all lead and lift, electricity, water supply etc.
2. Prior approval is must before starting the cutting work.
3. **The unit rate is in Cum.**

**13.19 Dismantling of structure. The contractor rate includes all necessary machinery, labour for dismantling, constructing of ring bund, shoring, strutting, dewatering, finishing the broken edges, etc. complete as instructed by engineer in charge including disposing of dismantled material with all lead and lift.**

#### **1. PCC**

#### **Workmanship**

- 1.1 The relevant specifications of item 13.01.a shall be followed except that the reinforced cement concrete work is to be demolished instead of lime concrete.

### **3.0 Mode of measurement & payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed.
- 2.3 The rate shall be for a unit of one cubic meter.

### **13.20 RCC Works.**

#### **3.0 Workmanship**

- 1.1 The relevant specifications of items no. 13.01.a shall be followed except that demolition of RCC Work is to be done.

- 1.2 Where ever necessary while breaking concrete for RCC slabs, a complete centering should be done below, as if a new slab is to be cast. Breaking is being done from upper level. The centering should be strong to withstand impact and vibration while working with breaker. Sometimes there is a temptation to work from one edge and proceed towards the other edge, working on the reinforcement jail, this would result into avoidance of centering with another objective of dropping the debris to the lower level without involving extra labor. In the distressed structure, it cannot be relied on reinforcement to carry load of men and machinery. Corroded steel might give way any time. If fresh slab is not to be cast at the same location, reinforcement is cut off after removal of concrete.

- 1.3 While breaking concrete for RCC beams, care should be taken to support slabs on both sides of the beam. If beam is to be retrofitted after partial removal of concrete, all superimposed loads should be relieved and adequate props be placed at selected locations below the beam too. In case of partial precise demolition of beams, manual breaking might be advantageous.

- 1.4 Column demolition is normally partial only. Before executing demolition of column, adequate props have to be provided to transfer of loads from the uppermost level up to the working level. Damaged concrete should be removed all round including the one behind the corroded bars, very carefully, preferably manually.

#### **4.0 Mode of Measurement and payment**

- 2.1 The relevant specifications of items No. 13.01.a shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.

The rate shall be for a unit of one cubic meter

### **13.21. Brick work**

#### **Workmanship**

- 1.1 The relevant specifications of item no. 13.01.a shall be followed except demolition of brick or stone masonry in cement mortar is to be done.

### **3.0 Mode of measurement and payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic meters. All copings, corbels, cornices and other projections shall be included with the wall measurements.
- 2.5 In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift. Ashlar face stones dressed stone etc. if required to be taken down intact shall be dismantled and measured separately in cubic meters.
- 2.6 The rate is exclusive of cleaning of bricks and stones. Honey comb works and hollow block walling shall be measured as solid.
- 2.7 The rate shall be for a unit of one cubic meter.

### **13.22 Dismantling steel work**

#### **3.0 Materials**

- 1.1 The relevant specifications of item no. 13.01.a shall be followed except that the dismantling of steel works shall be carried out.

#### **4.0 Mode of measurement and payment**

- 2.1 The relevant specifications of item No. 13.01.a shall be followed.
- 2.7 The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.
- 2.8 Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.
- 2.9 In farmed steel gate, the weight of any covering materials of filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.
- 2.10 The rate includes stacking the materials as and where directed with all leads and lifts.
- 2.11 The rate shall be for a unit of one kg

**CW 15.00****General Development and Road works**

**15.01. a Earth work for embankment, road by selected yellow earth including breaking clods dressing with all lead and lift and including watering, rolling, and consolidation of sub-grade in layers of not exceeding 250 mm in loose thickness at O.M.C. to required dry density including filling the depressions which occur during the process , rolling using power roller of 8 T to 10 T / vibratory roller of required capacity as directed by the engineer-in-charge. Consolidated measurements shall be considered. Rolling and consolidation shall not be paid separately.**

**15.01. a.1 With available excavated earth**

**15.01. a.2 With Earth brought from outside**

1.0 The land width on which the earth work is to be done shall be cleared of loose, stones, vegetation, bushes, stumps and all other objectionable materials. Useful materials shall be arranged in convenient stacks along the road boundary or as directed at places with in the site. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost at non objectionable site without causing any nuisance, inconvenience or damage to the works property or people in the cases the materials shall be disposed off in a neat manner.

2.0 After clearing the site the alignment of the road shall be properly set out true to line, curves slopes grade and sections as shown on the plan or directed by the engineer-in – charge. The contractor shall provide all labors and materials such as lime, strings, pegs, nails, bamboo's, stone, mortar, concrete, etc. required for setting out establishing. Bench marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms profiles alignments and other marks as along as they are required for the work in the opinion of the engineer-in-charge.

3.0 When an existing embankment is to be widened continuous, horizontal benches, each at least 0.3-meter-wide shall be cut in to existing slope for ensuring adequate bond with the fresh embankment where the width of the widened portions if sufficient to permit the use of usual rollers compaction shall be carried out with the help of tandem/sheep's foot rollers, hand rollers mechanical tempers or other approved plant. The dumping from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

4.0 The soil to be used for embankment shall be free from tress, stumps roots rubbish or any other objectionable materials. Only materials considered suitable by the engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed off as directed by him. The selection of the materials to be used in the construction of embarked shall consist of earth available from road –side borrow

pits on either side with lead and all lifts and with in land width in the manner specified in para 12 below./ the road if any required for the purpose of haulage of earth by men, animals or vehicles will be constructed (if not existing) and maintained by the contractor at his own cost he materials satisfying the density requirements given in the table shall be employed for embankment construction.

Type of work	Laboratory Dry Density When tested as per IS : 2720 (Pt. VIII)
- Embankment up to 3 meter height	Not less than 1.44gm/cc
- Embankment exceeding 3 meter height subject to long period of inundation	Not less than 1.52 gm/cc
- Top 0.5 meter of embankment below the sub grade level and shoulder [Where earth shoulder are specified]	Not less than 1.65 gm/cc

Field density shall be percentage of laboratory density as recommended by approved laboratory.

- 5.0 Contractor will have to make his own arrangement to get borrow area for borrowing earth of the approved quantity even by making temporary arrangement with the private land owners.
- 6.0 Embankment shall be constructed in uniform layers exceeding 250mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment. The consolidation including watering and rolling of earthwork shall be carried out by the contractor. The operation of laying the successive layer of earth shall have to be suitably synchronized with the consolidation work if the soil as delivered to the road bed is too wet it shall be dried by exposure to the sun till the moisture content is acceptable for compaction. All clods of hard lumps of earth shall be broken to have maximum size of 15 cm. when being placed in the embankment and maximum of size 5 cm when being placed in the top 45 cm of the embankment. The work to next layer shall be allowed only after the first layer below it has been thoroughly compacted to the density specified.
- 7.0 Where an embankment is to be placed on sloping ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with existing of trenches or broken up in such manner that the new material shall have perfect bond with the existing surface where the embankment is to be placed over an existing road surface the surface shall be scarified to minimum depth of a 5 cm so as

provide over an existing road surface the surface shall be scarified to minimum dept of 5 cm so as to provide ample bond between the old and new material. However when the embankment is to placed over an old concrete pavement and lies with in 1 meter of new sub grade level the pavement shall be broken up in pieces not to exceed 0.1 m and may be left under the new embankment in the existing road surface is of granular or bituminous type and lies with in mt of the new sub grade level the same be scarified granular or bituminous type and lies with 1mtr of the new sub grade level the same shall be scarified to a depth of minimum 50 mm as to provide ample bona between the old and the new material.

- 8.0 To avoid interface with the construction of abutment wing walls of curvets bridge structures the contractor shall at point to be determined by the engineer in charge suspend work on embankments forming approaches to such structures until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the bridge work unless directed otherwise the filling ground culverts bridges and other structures up to a distance of twice the height of the embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given by the engineer in charge but in any case not until the concreter masonry has been in position for 14 days the embankment shall be brought up simultaneously in equal layers on each side of the structures to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the engineer in charge where the provision of any filter medium is specified behind the abutment the same shall be laid inlayers simultaneously with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item where it may be impracticable to use power rollers or other heavy equipment, the compaction shall be carried out by mechanical tempers or other methods approved by the engineer in charge care shall be taken to see that the compaction plant does not hit or come too close to any structural member so as to cause any damage to them.
- 9.0 The embankment shall be finished in conformity with alignment levels cross sections and dimension shown on the plans or as directed by engineer in charge where the alignment of the roads in a curve the top of the embankment shall be formed with super elevation and the increased width shown on the drawings for as the engineer in charge finishing operation shall include the work of shaping and dressing the shoulders road bed and the side slopes to conform the cross section.
- 10.0 The consolidation of earth work including rolling and watering at O.M.C as per laboratory requirements shall be carried out by contractor, however the contractor shall give full co operation and shall be the charges for labors and collections of samples for

testing at the approved laboratory. When density measurements reveal any soft area as in the embankment the engineer in charge shall direct that areas shall be compacted further if inspire of that specified compaction is not achieved the materials in the soft areas shall be removed as directed and replaced by the approved materials.

- 11.0 **The earth work measurements shall be paid on cross sectional measurements and computing the volumes of earth works in cubic meters by average method.** The contractor shall sign day to day leveling work and also original cross section longitudinal section etc in token of his acceptance. The working sections both longitudinal and cross of the ground shall be taken by the engineer in charge before the actual work is started, the contracted or his authorized representative shall attend day to day leveling work and sign with date the field book daily in token of his acceptance if there is any disagreement the contractor shall further work once the work is started no – cognizance of any complaint will be taken merely not signing of level book shall not be deemed as disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sectioned before starting further work once the work is started no cognizance of any compliment will be taken. Merely not signing of level book shall not be deemed as disagreement. The engineer in charge shall also verify leveling work to the extend of 5% before commencement of earth work and on finalization. The contractor shall maintain the embankment by filling in ruts rain cuts depression. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc in any that might have taken place at the time of taking the final measurements of this item.
- 12.0 If usable approved materials are available with in the land width of road the same shall be permitted for use in the road embankment subject to the following conditions.
1. **The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water interrupted by such gutter**
  2. The width of the drain shall be restricted to 1.5 mtrs only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.
  3. If there is top layer of black cotton or other objectionable soils the same be removed and disposed off else where and usable materials found at the lower level will only be used in the earthen embankment if the contractor chooses to utilize this material.
  4. The drain should be aligned along the boundary of the land width of the road No pit other than this drain shall be dug with in 5 meters of the toe to the final section of the road embankment.
  5. No borrow pit shall be allowed in the length in which earth obtained from cutting is specified to be used in embankments.

- 13.0 **Mode of Measurement and Payment: The rate shall be for an unit of cum.** The rate of earth work includes clearing jungles dog belling profiles erecting necessary pillars for stones for benches marks for leveling purpose excavating earth from areas breaking clods conveying and spreading earth in layers with all lead and lift finishing the entire embankment, including watering, rolling, and consolidation of sub-grade in layers of not exceeding 250 mm in loose thickness at O.M.C. to required dry density including filling the depressing which occur during the process using power roller of 8 T to 10 T / vibratory roller of required capacity and incidentals necessary to complete the work to the specification. The contract unit rate includes cost of mechanical roller required for consolidation including all labour equipments fuel hire charges tolls and incidentals necessary.

The cutting stuff of cutting in ordinary soil soft murrum soft rock hard murrum and hard rock shall be utilized in embankment construction under this item for all lead and lift. No payment shall be made under this item for the cutting stuff (excavated earth) used in the embankment but labour for cutting will be paid as per specifications in that particular item and only balance quantity of earthwork brought from borrow areas will be paid in this item.

#### **Rolling and Watering**

- 14.0 For spreading materials in layers and bringing the appropriate moisture content the embankment materials shall be spread uniformly over the entire width of the embankment in layers not exceeding 250 mm in loose thickness successive layers of embankment shall not be placed until under construction has been thoroughly compacted to the requirements set down here under
- a. Moisture content of the materials shall be checked at the source of supply and if found less than that specified for compaction the same shall be made good either at the sources or after spreading the soil in loses thickness for compaction. In the latter case water shall be sprinkled directly from a houseline or form a truck mounted water tank and flooding shall not be permitted under any circumstances
  - b. If the materials delivered to the road bed is too wet dried by evaporation and exposure to the sun till the moisture content is brought down to acceptable standard for compaction. Should circumstances arise where owing to wet weather the moisture content can not be reduced to the required level by the above procedure work of compaction shall be suspended.
  - c. Moisture content of each layer of soil shall be checked in accordance with IST 2720 (Part-II) and unless otherwise mentioned shall be so adjusted making due allowance for evaporation losses that at the time of the compaction it is in the range if 1 percent to 2 percent below the optimum moisture content determined in accordance with ISI (Part-VII) highly expansive clays shall however be compacted at 2 to 4 percent above the optimum moisture content.



- d. After adding the required amount of water the soil shall be processed by means of harrow rotary mixers or as otherwise approved until the layer is uniformly wet.
- e. Clods or hard lump of earth shall be broken to have maximum size of 150mm when being placed in the lower layers of the embankment and a maximum size 60mm when placed in the top 0.5-meter portion of the embankment below the sub grade.
- f. Hauling equipment shall be despatched uniformly over entire surface of the previously constructed layer to minimize cutting of uneven compaction
- g. Where the embankment is to be constructed on low area ground that will not support the weight of trucks or other hauling equipment the lower part of the fill should be conducted by dumping successive loads in a uniformly disturbed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers.

#### 15.0 COMPACTION

Only compacting equipment approved by the engineer in charge shall be employed to compact the materials. The contractor shall demonstrate the efficiency of the plants he intends to use for carrying out compaction trails.

Each layer of the materials shall be thoroughly compacted to the densities specified in Table 1.2 is compaction requirements for embankment.

Sr	Type of Work/ Materials	Field dry density as percentage of maximum laboratory dry density as per IS: 2720 (Part-VII)
1	Top 0.5 meter portion of embankment below sub grade level and shoulders	Not Less than 100
2	Other portion of Embankment	Not Less than 95
3	Highly Expensive Class	85 to 90

Subsequent layers shall be placed only after finished layer has been tested according to M.O.S.T specification clause 902 and accepted by the Engineer In charge.

When density measurement reveals any soft areas in the embankment further compaction shall be carried out as directed by the Engineer in charge. If inside of that the specified compaction is not achieved, the materials and compacted to the density requirement to the satisfaction of the Engineer – in – charge.

Consolidation of earth embankment construction shall be measured by taking cross section at intervals in the original position before the work starts and after its completion and computing of the volume of earthwork in cubicmeters by the method of average and areas.

**15.01.b Earth work for filling the plot by selected earth including breaking clods dressing with all lead and lift in layers not exceeding 250 mm in loose thickness (excluding watering, rolling, and consolidation at each layer) as directed by engineer-in-charge. Rolling and consolidation shall be done only once after achieving the required final formation level as per drawing.**

**15.01 b1 With available excavated earth**

**15.01.b 2 With Earth brought from outside**

- 1.0 The land on which the earth work is to be done shall be cleared of all trees loose stones vegetation bushes stumps and all other objectionable materials. Useful materials shall be arranged in convenient stacks as directed at places with in 50 meters lead. Unsuitable materials shall be burnt or otherwise disposed off by the contractor at this own cost without causing any nuisance in convenience or damage to the works property or people in the neighborhood in all cases the materials shall be disposed off in a neat manner.
- 2.0 After clearing the site, the alignment of the plot shall be properly set out true to line curves slopes grades and sections as shown on the plan or directed by the engineer in charge. The contractor shall provide all labours and materials such as lime strings pegs nails bamboos stone mortar concrete etc required for setting out establishing bench marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms profiles alignments and other marks as long as they are required for the work in the opinion of the engineer in charge.
- 3.0 The soil to be used for plot shall be free stumps roots rubbish or any other objectionable materials only materials considered suitable other disposed off as directed by him the selection of the materials to be used in the construction of plot shall consists of earth available from road side borrow pits on either side with all lead and all lifts and with in land width in the manner specified in Para 11 below.
- 4.0 Contractor will have to make its own arrangement to get borrow area for borrowing earth of the quantity even by making temporary arrangement with the private land owners.
- 5.0 The plot shall be constructed in uniform layers not exceeding 250 mm in loose thickness. The soil shall be spread uniformly over the entire width of the plot. Unless otherwise directed by the engineer in charge. All clods of hard lump of the earth shall be broken to have maximum size of 15 cm. when being placed in the plot and a maximum of size 5 cm when being placed in the top 45cm of the plot. The work of next layer shall be allowed only after first layer below it has been thoroughly compacted.
- 6.0 The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earth works in cubic meters by average area method. The

contractor shall sign day to day leveling work and also original cross sections longitudinal section etc in token of his acceptance the working sections both longitudinal and across of the ground shall be taken by the engineer in charge before the actual work has started. The contractor or his authorized representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement, the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint will be taken Merely not signing of level book shall not be deemed as disagreement. The engineer-in-charge shall also verify leveling work to the extent of 5% before commencement of earth work and on finalization. The contractor shall maintain the embankment by filling in ruts, rain cuts, depression due to shrinkage etc. to proper formation and grade till this item is finally measured. **The measurements shall be taken on compacted earth work Deduction of 15% for shrinkage shall be made from gross measured quantity if measured before first monsoon and 10% if measured after one or more monsoon have been passed over the earth plot.** However, the contractor shall have to bear loss of deformations etc. if any due to all settlements as well as other type of deformations etc. if any, which might have taken place at the time of taking final measurement of the item.

- 11.0 The material to be used for the plot to be allowed only in the following conditions.
- (i) If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used, if the contractor chooses to utilize this material.
- 12.0 The rate of earthwork includes clearing jungles dog belling fixing profiles erecting necessary pillars for stones for bench marks for leveling purpose excavating earth from borrow areas breaking clods conveying and spreading earth in layers with all lead and lift finishing the entire plot and incidentals necessary to complete the work to the specification. The cutting stuff of cutting in ordinary soil soft murrum soft rock hard murrum and hard rock shall be utilized in plot construction under this item with in the lead specified in the particular item no payment shall be made under this item for the cutting stuff used in plot and only balance quantity of earthwork brought from borrow areas will be paid in this item.
- 13.0 Item shall be measured and paid in cum.
- 15.01.c Earth work for filling the plot, embankment, road by selected earth including breaking clods dressing with all lead and lift and including watering, rolling, and consolidation of sub-grade in layers not exceeding 250 mm in loose thickness including filling the depressions which occur during the process, rolling using power roller of 8 T to 10 T /**

**vibratory rollers of required capacity as directed by the engineer-in-charge. as directed by engineer-in-charge.**

**15.01 c1 with available excavated earth**

**15.01.c 2 With Earth brought from outside**

Relevant specifications of item no. 15.01.a shall be followed except filling shall be done without OMC.

**15.02 Box cutting the road surface, to proper slope and camber, for making a base for road work, including rolling, removing the excavated stuff and depositing on road side etc. complete, as directed, upto 50 m. lead as directed by engineer-in-charge.**

- 1.0 Specification no 162 and 553 of P.W.D Hand volume II and the following additional specification shall be applicable here.
- 2.0 Cutting shall be done in proper grade & camber as per measurement given. Care must be taken the tall slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If the extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the engineer in charge (with out extra cost) box cutting for soling and metalling in required width the depth shall be done.
- 3.0 Cutting shall be done in proper grade & camber as per measurement given. Care must be taken the tall slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If the extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the engineer in charge (with out extra cost) box cutting for soling and metalling in required width the depth shall be done.
- 4.0 The stuff received from the cutting shall be utilized for filling cuts and correcting side slopes of bank with all lead and lift as directed. Useful stuff shall be carefully stacked separately as directed
- 5.0 The measurement shall be taken as per cross section measurement of the cutting based on length breadth depth measurement with tape at every 25 meters' interval.
- 6.0 The item shall be measured and paid on cum.

**15.03 Earth work in cutting all sorts of soil & soft murrum for general development work including conveying and putting the stuff road embankment/ plot for all leads and lifts within the site as directed by engineer-in-charge (without rolling).**

- 1.0 The Land width required for the roadways, gutter side slopes and catch water gutter shall be cleared of all trees having a girth of 30 cms and loose stones vegetation bushes stumps and all other objectionable material. The roots of trees and stumps shall be removed to a depth of 30 cms below the grade formation and slopes and excavation filled with excavated materials and compacted. Useful materials shall be arranged in convenient stacks along boundary or as directed at places within site. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance in convenience or damage to the work, property or people in the neighborhood. If the materials are to be disposed off outside the road land necessary permission from the private land owners shall be taken by contractor and royalty etc if any paid by him without claiming compensations. In all cases, the materials shall be disposed off in a neat manner.
- 2.0 After clearing the site the alignment of the road shall be properly set out true to lines curves slopes grades and sections as shown on the plans or directed by the engineer in charge. The contractor shall provide all labour and materials such as lime strings pegs nails bamboos stones mortar concrete etc required for setting out alignment establishing bench marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms profiles alignments and other stakes and marks as long as they are required for the work in the opinion of the engineer if the contractor defaults in this respect even after the direction by the engineer within the specified time they may be restored by the engineer at the levels etc. if there is any disagreement the contractor shall inform of it in writing to the officer concerned with the specific reference to the sections before starting further work. Once the work has started. No recognition of any complaint shall be taken. Merely not signing of the book not be deemed as disagreement.
- 3.0 Profiles of the section including the road side gutters to be excavated shall be laid at suitable intervals of 10m to 50m or other intervals as directed by engineer to conform to the curved or straight alignment sections grades and side slopes. The lines out shall be clearly marked and profiles of embankments where excavated materials are to be used shall be set up with the toe line marked and profiles of embankments where excavated materials are to be used shall be set up with the toe line marked marked on each side. The road way section shall first be excavated with vertical side for each lift and the sides slopes for that lift shall be excavated in steps these steps shall be smoothed to the required slope when the excavation reaches the road formation. The contractor shall on no account excavate beyond slopes or below the specified grades unless so directed by the engineer in writing in excavation is done below the specified level or outside the section. It shall not be paid for and the contractor shall be required to fill up at his own cost such extra excavation in the road portion with approved materials of the embankment grade in layers watered and fully compacted to attain maximum density laid down for the embankment in its relevant item. The engineer may

require measurement ridges and dead man to be left at specified intervals or places and kept intact till ordered to be removed for the purpose of check measurements. The excavation shall be finished neatly smoothly and evenly to the correct lines curves grades if loose shall be scarified watered and compacted to the same density as the embankment the sections side slopes and catch water gutter shall be maintained by the contractor at his own cost in such way that the information and gutters will be drainage at his own cost. If it is necessary in the execution of the work to interrupt existing surface drainage, irrigation channels at his own cost if it is necessary in the execution of the work to interrupt existing surface drainage, irrigation channels sewers or under drainage temporary arrangements shall be provided till such time as is necessary. The contractor at his own cost make the existing at his own cost road side gutters shall be excavated to the specified sections and shall be measured along with the main cutting in cubic meters.

- 4.0 The slides occur in the cutting they shall be removed as ordered by the engineer. If finished slopes slide into the road ways before the final acceptance of the work, such slides shall be removed by the contractor and shall be paid for at the contract rate for the class of excavation involved provided the slides shall conform to its conditions at the time of removal and payment made accordingly regardless of its prior condition. Care shall be taken to see that excavation is arranged in a safe way so there will be no risk to the workmen by slides falling materials boundless and collapsing sides etc.
- 5.0 If there is a traffic nearby or if there are towns and villages in the neighborhood barricades and or traffic signals shall be provided day and night for the duration of the work in such way as to prevent accidents warning signals shall be displayed at 7 mtr from the danger point on both sides giving sufficient warning. If necessary signalers shall be stationed at each end to regulate traffic where it is heavy. Measures shall be taken to see that the excavation does not affect or damage adjoining structures or property if there is a damage to property injury to workers the members of the public animals etc due to the negligence of the contractor he will be responsible and liable to all the consequences including compensation.
- 6.0 When the useful excavated materials is to be used in embankment or plot with in a lead of 200 meters and all lift it shall be directly deposited at the required location in specified layers. No handling or conveyance charges shall be paid if the materials is temporarily deposited elsewhere and subsequently conveyed to site of deposition. The sequence of operations at convenient places without interfering with the drainage in any way. The contractors shall make his own arrangements for the stacking of his materials not required for use on embankment or unsuitable materials may be used on his own to uniformly widen embankment to flatten slopes and to fill low places in the road land if so permitted by the engineer material not required for any use what so ever may be disposed off by the contractor at his own cost in a manner approved by the

engineer. The excavated materials shall not be deposited within 3m from the top edge of slope or toe of the bank. The lead shall be measured from the junction point of cutting and embankment up to 200 mt on either side.

7.0 If the contractor does not wish the quantity of cutting within the specified lead for any reason, then he may do the embankment work with the earth from other sources (except borrow pits in the length of the road where cutting stuff is to be utilized) but in that case the full or part quantity of acceptable quality stuff for which payment is made or to be made will be deducted from the net quantity of the earth work in the embankment arrived at within the change measured as above.

8.0 **The contract rate shall be unit of one cubic meter** limited to the dimensions shown on the plans or as directed by the engineer excavation shall be measured in its original positions by taking cross sections before the work starts and after it is entirely completed. The quantity shall be worked by the average and area method when the classification of the strata changes the contractor shall bring this notice to the engineer, who will then verify and if necessary take levels for the changed strata for purpose of measurement.

**15.04. a Extra for disposing of the surplus excavated material on site, including loading at site, transporting & disposal, unloading, spreading, sorting, stacking and dressing etc. complete as directed by the engineer-in-charge**

**15.04.a.1 Within a lead of 50 m to 500 m**

**15.04.a.2 Within a lead of 500m to 1000m**

**15.04.a.3 Outside the plot area at no objectionable place (site shall be selected by contractor)**

**1.0 General:**

1.3 The distance for lead shall be as per the item description.

1.2 Where the excavated material is directed to be used in the construction of the works for general grading, plinth filling or embankments, the operations shall be arranged in such a manner that the capacity for cutting, haulage and compaction are nearly the same.

1.3 All hard materials such as hard murrum, rubble etc. not intended for filling in foundations, plinth or embankments shall be stacked neatly for future use as directed by the Engineer. The contractor on his own risk shall dispose of unsuitable or surplus materials not intended for use in part of the works or for reuse outside the work site.

1.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, riprap with regular slopes within the lead specified and levelling. As a rule, all softer material shall be laid along the centre of the heaps, the harder and more weather



resisting materials forming the casing on the sides and the top. Excavated soft rock or hard rock shall be stacked separately.

**2.0 Workmanship:**

1.4 The surplus excavated earth shall be disposed off as and when directed by the Engineer-in-charge. In case the excavated earth is to be stacked inside the plot, the location of the stack shall be as directed by engineer in charge. If earth is to be disposed outside the plot, non-objectionable site shall be selected by the contractor.

1.5 The disposal of the stuff includes loading the earth in vehicle, conveyance to the specified site, unloading and spreading and compacting the same.

1.6 The Contractor should contact the Engineer-In-Charge before disposing the material.

**3.0 Mode of measurements and payment:**

- a. The actual measurements of the disposed earth shall be calculated by taking actual levels of the original ground before start of the work after site clearance and after compaction of the fill as specified. Quantity of the earth so computed shall be reduced by 10% in case of consolidated fills, 5% in case of consolidation is done by heavy equipment. No deduction will be done in case of consolidation heavy mechanical machinery at optimum moisture content. The quantity of the earth worked out for interim payment by taking lorry measurements; have to be reduced by 20%.
- b. The rate includes for spreading, dressing etc. complete at the specified site and shall be for a unit of one cum.
- c. The Final quantity of the transported earth shall be worked out after overall reconciliation of excavation, filling and disposing of the earth for whole site.

**15.05 Providing and laying water bound macadam of crushed / broken stone aggregate of size 40 to 90 mm including spreading the same in required grade and camber in one or more layer as specified, filling the hollows with smaller size stone aggregates, spauls, spreading good quality murrum to fill up the interstices and voids to make plain surface, supplying and spreading of blindage (murrum/selected earth), profusely watering including consolidating by power driven static roller of 8 to 10 T capacity or vibratory roller of required capacity etc. complete as directed by engineer-in-charge.**

**15.05.1 Compacted thickness of 150 mm in one layer**

**15.05.2 Compacted thickness of 230 mm in two layers of each 115mm compacted thickness**

**1.0 Material**

**1.1 Coarse aggregates**

1.1.1 General Requirements



The coarse aggregates shall be stone metal obtained from quarries approved by the Executive Engineer prior to collection. The metals shall be of approved quality with all leads and lifts. The metal shall be obtained from hard, tough, sound, durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round, elongated or flaky materials shall be rejected. No round or oblong pebbles or angular chips larger or smaller than specified size shall be allowed. The size of metal shall be 40 mm to 63 mm and shall be crushed/hand broken. All unsound weathered or disintegrated tone obtained from the upper surface layer of the quarry or other layers & boulders shall be rejected.

#### 1.1.2 Physical Requirements

The aggregates shall conform to the physical requirements as indicated in the Table No.1 hereafter.

Table No.1:

Physical requirements of Coarse Aggregates for Water Bound Macadam

Sr. No.	Type of Construction	Test	Test Method	Requirement
1.	Sub Base	(a) Lose Angeles Abrasion value*	IS:2386 (Part IV)	50% (Max.)
		Or Aggregate Impact Value	IS:2386 (Part IV) or IS:5640 **	40% (Max.)
2.	Base	(a) Lose Angeles Abrasion value*	IS:2386 (Part IV)	50% (Max.)
		Or Aggregate Impact Value	IS:2386 (Part IV) or IS: 5640**	40% (Max.)
		(b) Flakiness Index	IS:2386 (Part I)	15% (Max.)

\* Aggregates may satisfy requirements of either of the two test.

\*\* Aggregates like bricks, metal, kankar, laterite etc. which get softened in presence of water, shall be tested for impact value under wet condition in accordance with IS : 5640.

#### 1.1.3 Grading requirement

1.1.3.1 The coarse aggregates shall conform to the grading requirement as indicated in Table No.2 below:

Table No.2

### Grading Requirements of Coarse Aggregates

Grading No.	Size range	Sieve Designation	Percent by weight
2	63 mm to 40 mm	80	100
		63	85-100
		40	0-15

## 2.0 Screenings/approved quality of murrum/gritty materials

Screenings/murrum/gritty materials to fill voids in the coarse aggregate and to act as binding materials shall generally consist of predominantly non-plastic material such as murrum or gravel (other than rounded river bome material) provided the liquid limit and plasticity index of the material is below 20 & 6 respectively & fraction passing 75-micron sieve does not exceed 10 percent.

2.2.1 As far as possible, screening/murrum/gitty materials shall conform to the gradings set forth in Table No.3 below

Table No.3:

Grading for Screenings/approved quality of murrum/gritty materials

Grading Classification	Size of Screenings	Sieve Designation	Percent by weight passing the Sieve
A	12.5mm	12.5 mm	100
		10.0 mm	90-100
		4.75 mm	10-30
		150 microns	0-8
B	10 mm	10 mm	100
		4.75	85-100
		150 mm	10-30

## 2.0 Construction Process

### 3.1 Preparation of base

3.1.1 The sub grade/sub-base/base to receive the water bound macadam course, shall be prepared to the specified grade and camber and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm. Where water bound macadam is to be laid over an existing black topped surface, 50 mm x 50 mm furrows shall be cut at an angle of 45 degrees to the road at 1 meter intervals in the latter before laying the coarse aggregate.

### **3.2 Spreading coarse aggregate**

- 3.2.1 The coarse aggregates shall be spread uniformly upon the prepared base in such quantities that the thickness of the compacted layer is 100 mm for grading 1 and 75-100 mm for grading 2 and 3 as specified.
- 3.2.2 The spreading shall be done from stock piles along the side of the roadway or directly from vehicles. In no case shall the aggregate be dumped in heaps directly on the surface prepared to receive the aggregate nor shall hauling over uncompacted or partially compacted base be permitted.
- 3.2.3 The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. No segregation of large or fine particles shall be allowed and the course aggregate as may be required. No segregation of large or fine particles shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pockets of fine material.
- 3.2.4 The coarse aggregate shall not normally be spread more than 3 days in advance of the subsequent construction operations.

### **3.3 Rolling**

- 3.3.1 Immediately following the spreading of the coarse aggregate rolling shall be started with three wheeled power rollers of 6 to 10 tonne capacity or tandem or vibratory rollers of approved type. The weight of the roller shall depend upon the type of the aggregate and as may be indicated by the Engineer-in-charge.
- 3.3.2 Except on super elevated portions where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the centre. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to the centre line of the road, in successive passes uniformly lapping preceding tracks by at least one half widths.
- 3.3.3 Rolling shall continue until the aggregate are thoroughly keyed and the creeping of aggregates ahead of roller is longer visible. During rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the sub grade or sub- base course.
- 3.3.4 The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding and removing necessary amounts of aggregates and re-rolling until the entire surface conforms to desired number and grade. In no case shall the use of screenings be permitted to make up depressions.

### **3.4 Application of screenings/murum/gritty material**

- 3.4.1 After the coarse aggregate has been rolled to Clause 3.3. screenings/murrum/gritty material to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry rolling shall be done while the screenings/murrum/gritty material are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregate. The screenings/murrum/gritty material shall not be dumped in piles but spread uniformly in successive thin layers either by the spreading motion of hand shovels or by mechanical spreaders, or directly from trucks. Trucks operation for spreading the screenings / murrum / gritty material shall be driven as not to disturb the coarse aggregate.
- 3.4.2 The screenings/approved quality murrum/gritty material shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand-brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. These operations shall until no more screenings can be forced into the voids of the coarse aggregate.
- 3.4.3 The spreading, rolling and brooming of screening/murrum/gritty material shall be out in only such lengths of the road which could be complete within one day's operation.

### **3.5 Sprinkling and grouting**

- 3.5.1 After the screenings / murrum / gritty material has been applied the surface shall be copiously sprinkled with water, swept and rolled. Hand brooms shall be used to sweep the wet screenings/murrum/gritty material into void and to distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued with additional screenings applied as necessary, until the coarse aggregate has been thoroughly well-bonded and firmly set in full depth and grout has been formed of screenings/murrum/gritty material. Care shall be taken to see that the base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

### **3.6 Setting and Drying**

- 3.6.1 After the final compaction of water bound macadam course, the road shall be allowed to dry overnight. Next morning hungry spots shall be filled with screenings / murrum / gritty material as directed slightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer-in-charge shall have the discretion to stop having traffic from using the completed water bound macadam course if in his opinion it would cause excessive form to the surface.

### **3.0 Surface Finish**

The surface finish of construction shall conform to the following requirements.

4.1 General

4.1.1 All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-charge subject to the permitted tolerances described hereinafter.

4.2 Horizontal Alignments

4.2.1 Horizontal alignments shall be reckoned with respect to the centre line of the carriage way as shown on the drawings. The edges of the carriage way as constructed shall be correct within a tolerance of  $\pm 25$  mm therefore. The corresponding tolerance for edges the roadway and lower layers of payments shall  $\pm 40$  mm

4.3 Longitudinal profile

4.3.1 The levels of the sub grade and different payment course as constructed shall not vary from those calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer-in-charge, beyond the tolerances mentioned below:

Sub grade	$\pm 25$ mm
Sub-base	$\pm 20$ mm
Base course	$\pm 15$ mm
Wearing course	$\pm 10$ mm

provided, however, that the negative tolerance for wearing coarse shall not permitted in conjunction with the positive tolerance for base course if the thickness of former is thereby reduced by more than 6 mm.

4.4 Surface Regularity

4.4.1 The surface regularity of completed sub-base course and wearing surface in the longitudinal and transverse directions shall be within the tolerance indicated in Table No.4 below

Table No.4: Permitted tolerance of surface Regularity for payment course

Sr. No.	Type of Construction	Longitudinal Profile with 3 metre straight edge		Cross Profile
		Maximum permissible undulation mm	Maximum number of undulations permitted in any 300 m. length exceeding : mm	
1	2	3	4	5
1.	Water Bound Macadam with normal size metal	12	30	8

(20-50 mm and 40-63 mm size)

4.4.2 The longitudinal profile shall be checked with a 3-metre-long straight edge at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set of three cambers at intervals of 10 metre.

4.5 Rectification

4.5.1 Where the surface irregularly of sub grade and the various pavement course fall outside the specified tolerances, the shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge.

4.5.2 When the surface is high or low, the top 75 mm shall be scarified, reshaped with added material as necessary and recompactd as per the specification of W.B.M. The area treated at a place shall not be less than 5 meters long and 2 metres wide.

4.0 Quality Control tests during Construction:

5.1 General

5.1.1 The materials supplied and the works carried-out by the contractor shall conform to the specification prescribed in the preceeding Clauses.

For ensuring the requisite quality of Construction, the materials and works shall be subjected to quality control test, as describe hereinafter, by the Engineer-in-charge. The testing frequencies set forth are desirable minimum and the Engineer-in-charge shall have the full authority to carry out tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specifications.

5.1.2 Test procedures for the various quality control tests are indicated in the sections of the specifications or for certain test within this section. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent engineering practice to the directions of the Engineer-in-charge.

**5.2 Test on Sub-bases & Bases:**

5.2.1 The tests and their frequencies for W.B.M. types of bases & sub-bases shall be as given in Table No.5 below:

Table No.5

Control tests & their frequency for sub-base & bases of water bound macadam

Sr. No.	Type of Construction	Test	Frequency
1.	Water Bound Macadam	(i) Agregate impact value (ii) Grading	One test per 1200 cu.m. One test per 100 cu.m.

(iii) Flakiness index	One test per 200 cu.m.
(iv) Atterberg limit	One test per 25 cu.m. of materials for screenings

### 5.2.2 Compaction Control

Control shall be exercised by tacking at least one measurement of density for each 1000 square metres of compacted area, or closer as required to yield the minimum number of test results for evaluating a day's work on statistical basis. The determination of density shall be in accordance with IS 2720 (Part XX VIII). Test locations shall not be based on the results of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over materials and the method of compaction is being exercised, if considerable variation is observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. the acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc.

## 5.0 Arrangement of Traffic during Construction:

### 6.1 General

6.1.1 The contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all work involving improvements to the existing highway the contractor shall, in accordance with the directives of the Engineer-in-charge, provided and maintain, during the execution of the work, a passage for traffic along a part of the existing way under improvement, or along a temporary diversion constructed close to the highway.

### 6.2 Passage of traffic along a part of the Existing Carriage Way Improvement

6.2.1 This method shall be adopted where, in the opinion of the Engineer-in-charge, the improvement works, namely widening of the existing pavement or reconstruction/repairs to cross-drainage works, could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part. The road shoulder shall be dressed and brought in line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where works is in progress in continuous long stretches, passing places, at least 20-metre-long 6-metre-wide, inclusive of the width of the existing carriage way shall be provided at half to one kilometer intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge.

### 6.3 Passage of traffic along a Temporary Diversion

6.3.1 If in the opinion of the Engineer-in-charge it is not possible to pass the traffic on part width of the carriage way for any reason, a temporary diversion close to the highway shall be constructed as directed. It shall be paved with locally available materials such as hard murrum, gravel, brick or stone metal to the specified thickness and provided with bituminous surfacing, where directed. In all case, the alignment, gradients and surface type of the diversion, including its junctions, shall be approved by the Engineer-in-charge before the highway is detoured and closed to traffic. At cross drainage points, the contractor shall provide temporary crossings for the diversion according to the designs approved by the Engineer-in-charge.

#### **6.4 Traffic Safety and control**

6.4.1 The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

6.4.2 The barricades erected on either side of the carriage/portion of the carriage way closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept throughout from sunset to sunrise.

6.4.3 At the point where traffic is to deviate from its normal path whether on temporary diversion or part width of the carriage way the channel for traffic shall be clearly marked with the aid of pavement markings painted drums or a similar device to the directions of the Engineer-in-charge. At night the passage shall be delineated with lanterns or other suitable light source

6.4.4 One-way traffic operation shall be established wherever the traffic is to be passed over part of the carriage way inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours for regulation of traffic. The flagmen shall be equipped with red and green flags and lantern /lights.

6.4.5 On both sides, suitable regulatory/warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be up put one close to the point where transition of carriage way begins and the other 120 metres away. The signs shall be of approved design and of refractory type if so directed.

#### **6.5 Maintenance of Diversion and traffic control Devices**

6.5.1 Signs, lights, barrier and other traffic control devices, as well as the riding surface of diversions shall be maintained in satisfactory conditions till such time are required as directed by the Engineer-in-charge. The temporary travel way shall be kept free of dust



by frequent application of water if necessary.

## **6.6 Measurements for payment of traffic Arrangement**

- 6.6.1 All arrangements for traffic during construction including maintenance these off but excluding initial dressing and/or extra treatment of the shoulders and construction of temporary diversions shall be considered as incidental to the works and Contractor responsibility

## **6.0 Mode of Measurement and Payment**

- 7.1 Water bound macadam shall be measured as finished work in position is cubic metres. The finished thickness of sub-base and base courses to be paid on volume basis shall be computed in the following manner.
- 7.2 Levels shall be taken before and after construction, at a grid of points 10 metres centre to centre longitudinally in straight teaches but 5 metres at curves. Normally, on two-lane roads the levels shall be taken at four positions transversely, at 0.75 and 2.75 metres from either edge of the carriage way and on single lane roads these shall be taken at two positions transversely being at 1.25 metre from either edge of the carriage way.
- 7.3 Suitable reference for the transverse grid line should be left in the form of embedded bricks on either ends or by the other means so that it is possible to locate the grid points for level measurements after each successive course is laid.
- 7.4 For pavements courses laid only over widening portion, at least one line of levels shall be taken on each strip of widening or more depending on the width of widening as decided by the Engineer-in-charge, notwithstanding the above, if the need may arise particularly in the case of estimation of the volume of the material for leveling course. The average thickness of the pavement source in any area shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that areas, provided that thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer-in-charge.
- 7.5 As supplement to level measurement, the Engineer-in-charge shall have the portion to cut cores/holes to check on the depth of construction.
- 7.6 The contractor shall sign day to day leveling work and also original cross section, longitudinal section in token of his acceptance etc. The working sections both longitudinal and cross of the sub- grade shall be taken by the Engineer-in-charge before the actual W.B.M. work is started. The contractor or his authorized representative shall attend day to day leveling work and sign with date the field book daily in token of his acceptance. If there is any disagreement the contractor shall inform of it in writing to the office concerned with specific reference to the sections before starting further work. Once the work is started no cognizance of any complaint taken. Merely not signing of

the level book shall not be deemed as disagreement. The Engineer in charge shall also verify leveling work to the extent of 5 percent before commencement of WBM. WBM shall be maintained by the contractor to proper formation and grade till this item is finally measured and accepted by the Department. The measurement shall be taken on compacted WBM.

- 7.7 Any crack formation of screenings observed in between any layer of WBM work shall be deducted from the measurements so taken and net quantity of WBM work shall be considered for payment

**7.0 Rate**

- 8.1 The contract unit rate for water bound macadam sub-base/base course shall be payment in full for carrying out the required operations including full compensation for all components listed below:

8.2 Making arrangements for traffic to Clause-6

8.3 Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts.

8.4 All labour, tool, equipment and incidentals to complete the work to the specifications and carrying out the work in part widths of roadway where directed.

**15.06.a. Supplying and stacking of following material on site including filling the boxes with all leads and lifts etc. complete on site of work as directed by engineer-in-charge.**

**15.06.a.1 Hard Murrum**

**15.06.a.2 Sand**

**15.06.a.3 Non cohesive yellow Earth**

1.0 The materials for the purpose shall be of approved quality. Any materials which is found inferior shall be rejected and the contractor shall remove such rejected materials from the site at his own cost. The material shall be approved by the engineer-in-charge

2.0 The material shall be got approved by engineer-in-charge prior to collection of site. It shall be free from all rubbish, dust and any organic materials as well as clods of black cotton soils. Materials shall not be allowed to be collected from within the road boundary. Material is to be used as crust and for side shoulders shall be as per C.B. R. report and that to be use bindage in W.B.M. road construction shall have PI value of less than 6 as per determined in accordance with IS 2720 (Part V). The material to be used should be got tested prior to its use in road construction. Testing charges shall be borne by the contractor.

- 3.0 River or nala or sea sand required for the work shall be clear, sound, properly graded, free from organic materials silt clay etc. and shall got approved by engineer-in-charge. The sand shall be well graded. The material shall be on cum basis.
  - 4.0 Stacking shall be done by filling in standard steel boxes of 2m X 1.5m X 0.5m size. No deduction of voids shall be made from the grade measurements. Where any doubt exists as to whether the quantity of stacks of murrum in hectometer is not confirming with the cubic content of standard pharas (2m X 1.5m X 0.5m) the same shall be got corrected by the contractor, if so ordered by the engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of the material in any stack in a particular hectometer is found to be less than the standard measurements viz., 1.5 cmt the entire collection in the hectometer shall be paid on the basis of the quantity so found. Regular stacks shall be carried out in 2 Km length before spreading. The collection shall always, be commenced at one end of the KM and be carried continuously toward the other end unless the engineer-in-charge shall direct otherwise.
  - 5.0 For road work completed stacking of the murrum as per requirement shall be carried out in 2 km length before spreading. The collection shall always be commenced at one end of the km and be carried out continuously toward the other end unless the engineer in-charge shall direct otherwise.
  - 6.0 The payment shall be made on the cum basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials are collected, measured. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.
  - 7.0 The rate includes the cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipments and other incidental expense.
  - 8.0 The rates quoted above are inclusive of all shall such tools, duties, fees, royalties, taxes etc.
  - 9.0 The measurements shall be taken on cum basis.
- 15.06.b Supplying and stacking of hand broken stone coarse aggregate chippings etc. of size 25mm to 90mm nominal size free of disintegrated pieces, deteriorous and organic matter including filling boxes with all lead and lift etc. complete for Warer Bound Macadam surfce as directed by engineer-in-charge.**
- 1.0 The stone metal shall be obtained from quarries approved by the Engineer-in-charge prior to collections. The metal shall be of approved quality with all leads and lift. The metal shall be obtained from hard tough, sound durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round, elongated or flaky materials shall be allowed. The size of metal shall be 25 mm to 90 mm and shall be hand broken.

All unsound weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layers of boulders shall be rejected.

- 2.0 The samples of metal collected from approved quarries shall be got tested at laboratory as may be directed to the contractor at his own cost. The test results shall conform to the standard requirements laid down for metal to be used for S.B.M. work.
- 3.0 The physical requirement for standard size metal shall conform to the test indicated in the Table below

Type of Const.	Test	Test Method	Requirement
Base	(a) Los Angeles Abrasion Value	IS 2386 Part IV	50% (Maximum)
	Aggregate Impact value	IS 2386 Part-IV or	40% (Maximum)
		IS 5640	15% (Maximum)
	(b) Flakiness Index	IS 2386 Part-I	

Frequency of tests shall be as per Ministry of surface Transport specifications

- 4.0 The grading requirements of the metal to be used for W.B.M. shall be as under

Sr.No.	Size Range	Sieve designation	Percentage by weight Passing through the sieve
1.	25 mm to 90 mm	100 mm	100
		90 mm	90-100
		50 mm	40-60
		25 mm	0-10
		20 mm	0-5

The size of metal for W.B.M. shall be 25 mm to 90 mm. wherein tolerance limits for even of shall be up to 10% and that for lower size should be up to 10%.

- 5.0 Wherever any doubt exists as to whether the above requirements are satisfied, in whole or any part of the collection, metal shall be got screened by the contractor at his own cost, if so ordered by Engineer-in-charge.
- 6.0 Stacking shall be done by filling in the standard steel boxes of 2 m x 1.5 m x 0.5 m size. No deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of stacks of metal in any hectometer is not confirming with the cubical content of the standard pharas (2 m x 1.5 m x 0.5 m) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular Hectometer shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge. Collection of metal shall be completed in two hectometers wise as per the final requirement and measurement shall

be recorded two hectometer-wise Until the quantity of metal as per the final requirement is not collected in any two consecutive HM. And std. boxes are not filled in completely in two hectometers, measurements shall not be recorded and payments shall not be done.

- 7.0 For road work complete staking of metal as per requirement shall be carried out in 2 Km. length before spreading. The collection shall always, commence at one end of the Km. and be carried continuously towards the other end unless the Engineer-in-charge shall direct otherwise.
- 8.0 The payment shall be on cubic metre basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials shall not measured. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.
- 9.0 The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses. The rates quoted are inclusive of all such tools, duties, fees, royalties, taxes, etc.. as directed by engineer-in-charge.

**15.06.c Supplying and stacking of quarry spauls (wastage) materials at site including filling the boxes with all leads and lifts as directed by engineer-in-charge.**

- 1.0 The quarry spauls shall be approved quarry as approved by the Engineer in charge prior to collection, filling of boxes, shall not be allowed till the metal is broken to the specified site.
- 2.0 The quarry spauls shall be as uniform in size as possible. The quarry spaul shall be hard, tough, solid, durable of black trap quarry of close texture, free from decay and weathering. The stone shall be angular and roughly cubical in shape and round elongated or flaky materials shall be rejected. No sound or long rubble or angular chips smaller than specified size shall be allowed.
- 3.0 All unsound, weathered or disintegrated stone obtained from the under surface layer of the quarry or other layers of boulders shall be rejected.
- 4.0 Wherever any doubt as to whether above requirements are satisfied in whole or part of the collection it shall be got screened by the Contractor if so ordered by the Engineer in charge and for which no extra payment shall be claimed by the contractor.
- 5.0 Any collection which does not fully satisfy the above requirements is liable to be rejected all together.
- 6.0 Stacking shall be made by the Contractor by steel pharas of 2 m x 1.5 m x 0.5 m and no deduction of voids shall be made from the gross measurements.

- 7.0 Regular stacks shall be made by the contractor on a fairly level ground. All the stack shall be marked by white wash immediately on being measured and recorded by the Engineer-in-charge.
- 8.0 The rate includes blasting the rock, if any, breaking the quarry spauls, stacking measuring in pharas etc. complete as directed by the engineer in charge.
- 9.0 Stacks shall as per actual requirements and any materials in excess shall have to be transported by the contractor at the places directed by the Engineer in charge at the risk and cost of the contractor.
- 10.0 While stacking materials the depositing should commence at one end of the K.M. and carried continuously towards the other end unless the Engineer in charge shall direct otherwise and as rule measurements shall be taken after every half kilometer or Km. has been fully collected. Any fraction of these distances shall not be measured up.
- 11.0 The measurements shall be recorded in on Cum. basis & shall be paid accordingly.

**15.06.d Supplying and stacking of rubbles of 150 to 230mm size of hard stone on road side with all leads and lifts as directed by engineer-in-charge.**

- 1.0 The rubble stones shall be black in colour, shall be hard, tough, sound durable and of close texture, free from cracks and it shall be obtained from the approved quarries.
- 2.0 The rubble obtained from the top surface of the quarry is soft one and hence such soft variety shall not be accepted. All unsound weathered or disintegrated stones obtained from the upper portion of the quarry shall be rejected.
- 3.0 The quarry shall be well protected shall be dug by removing all the katcha and weathered stuff till approved quality of materials is available.
- 4.0 The length and breadth shall not exceed 1/f (1, 2) times the thickness of the stones.
- 5.0 The rubble stacks shall be made on a fairly level ground and stacks shall be so made that rubble stones are stacked as close as possible so as to leave no excessive voids and no hollows are left out.
- 6.0 The tendency to prepare the stacks by keeping excessive voids or keeping hollow places shall not be tolerated.
- 7.0 The stacks shall be uniform in length and breadth and top portion shall be in level height at any point is uniform.
- 8.0 All the stacks shall be of standard dimensions. Deduction for voids shall not be made.
- 9.0 The rubble shall be got approved by the Engineer-in-charge, prior to collection on site or otherwise it is liable to rejection for which no claim shall be entertained.

- 10.0 The contractor shall maintain all stacks in regular and proper sizes till the whole material is collected.
- 11.0 The rubble shall be stacked in quantities as per hectometer wise requirement as directed by the engineer-in-charge.
- 12.0 The measurement shall be done in cum.
- 13.0 Stacks shall be made as per actual requirements and any material in excess shall have to be transported by the contractor at the places directed by the Engineer in charge at the risk and cost of the contractor.

**15.07. a Spreading the soft murrum / murrum / sand / yellow earth / bindage or road crust filling the gaps in metal and leveling to camber and gradient as per drawing and as directed by engineer-in-charge**

Spreading of material shall be started after the full supply in a particular K.M. is collected, measured and recorded in the measurement books. Permission of the Engineer-in-charge shall be obtained before spreading. It shall be seen that the formation is dressed to the required camber and grade. If the murrum is to be spread over the metaled surface than the spreading shall be uniform and as it has to act as binding surface, it shall be used for filling the interstices of metal and forming a smooth running surface as far as possible. Murrum blindage shall be specified as blindage shall be spread evenly with a twisting motion of the baskets. No more Murrum shall be used then specified as blindage. The rate is for gross measurements and no deduction of voids shall be made. The murrum is to be spread over earthen embankment as a sub-base or for side shoulders or as blindage, it shall be spread in a manner as directed by the Engineer-in-charge and as per required width and thickness. Contractor shall make good all unevenness, depression, projections etc., during consolidation work. Rate of this item includes all these operations except consolidation. The payment shall be made on cum basis.

**15.07.b.1 Spreading the stone aggregates of 25mm to 90mm for soiling and water bound macadam surface manually including filling the interstices to required camber and gradient as directed by engineer-in-charge.**

- 1.0 Metal shall not be spread without permission of the Engineer-in-charge. Metal should be spread under careful supervision by trained coolies. Contractor shall see that uniform spreading as per collection of metal is done. The contractor shall spread the metal fully from the stacks without keeping any balance unless directed by the Engineer-in-charge to keep some stack in balance for making good unevenness or depressions during rolling works, to ensure that the materials is spread to the required thickness, the road surface shall be marked out in to length over which the contents of heaps are to be spread. The bounds of earth or murrum (one on either side) shall be laid with a distance between

them equal to the width of road to be metaled and shall be enough to prevent the loose metal from spreading during consolidation as well as to retain water used for consolidation.

- 1.2 The metal (including old metal) shall be screened and rubbish, dust, grass shall be removed and spread evenly on the prepared surface in grade and camber by using camber board etc. so as to ensure that the surface is true to camber and grade. At least two camber by using camber boards shall be in use at site. The surface shall be checked at every 50 ft. by means of template while the correctness of the camber in between shall be tested by string and corrected as required. Between the straight lengths and the curves in camber of road to super elevation shall be made very gradually as may be directed by the Engineer-in-charge.
- 1.3 The spreading of metal shall proceed only 200 mt. (max.) advance of the rolling operations. The collection and spreading of the metal shall not be carried out in one and the same kilometer.
- 1.4 At the time of rolling all surface irregularities, hollows, depressions, humps etc. shall be straight. The spreading of metal in required layer shall be done by the contractor. The rate for this item shall be paid on cum basis and includes all the above operations with all lead and lift except consolidation

**15.07.b.2 Spreading the stone aggregates of 25mm to 90mm for soiling and water bound macadam surface including filling the interstices to required camber and gradient by paver finisher as directed by engineer-in-charge.**

Relevant specifications of item no. 15.07.b.1 shall be followed except the metal or stone aggregate shall be spread by paver finisher and not manually. The rate includes the labour charges for the execution of the work, operating and hires charges of paver finisher. The contractor shall have to make its own arrangement for procuring appropriate paver.

**15.07.c Spreading quarry spauls in grade and camber complete as per drawing and as directed by engineer-in-charge.**

- 1.0 The quarry spauls shall only be allowed to be spread after the permission of the engineer-in-charge.
- 2.0 The permission for spreading the metal shall be given by the Engineer-in-charge if
  - (i) The full quantity of a particular metal (kilometer) is completely collected.
  - (ii) The collection of metal is also completed in the adjoining two miles (Kilometers)
  - (iii) The measurements are recorded in the Measurement book.
- 3.0 Quarry Spauls shall if required, be screened, if containing rubbish dust, grass etc. it shall than be filled in basket & conveyed where required and spread evenly on the prepared



surface be given twisting motion to the basket at the time of spreading. The surface shall than (15 m) by means of templates and strings as well as with camber boards and spirit level.

- 4.0 Between the straight length and curves and at the meeting points of the convex and concave portions of the reverse curves, the change in camber of the road, due to super elevations shall be made as well as with camber boards and spirit level.
- 5.0 At the time of spreading Quarry spauls a small quantity (about 4 to 5 percent) of metal as directed shall be retained at the first instance. It shall be spread later on after partial consolidated as required to rectify the camber and to fill up the hollows if any. No extra amount shall be paid for this.
- 6.0 Measurements shall be paid as per the measurements of collection less the quantity remained to be spread and on cubic meter basis.
- 7.0 The rate includes the cost of screening the quarry spauls if any spreading, sectioning, with template and adding reserved quota of metal, while rolling is in progress for making good hollows and camber
- 8.0 The surface shall be brought to the required camber which shall be checked at every 50 ft. (15 M.) by means off template of while the necessary of the in between shall tested by strings and corrected as required.
- 10.0 The centre line shall first be marked in the sub grade which is properly consolidated and has uniform camber and grade as required.
- 11.0 The Quarry spauls shall be laid for a small length on 25 ft. (8 M.) and then the edge stones shall be laid.
- 12.0 Pegs shall be driven on either side of the road and joined with strings true and parallel with a distance between they equal to the width be laid with oversize metal similarly.
- 13.0 The Quarry spauls shall be laid as close as possible so as too leave minimum possible interstices and voids.
- 14.0 Before rolling is allowed on soiling the slide berms shall be filled up to the top of the soiling and at least 3' (1 m.) on either side so as to prevent metal layer getting disturbed at times during rolling. The rate is inclusive of all the labour charges involved in the operations as stated above.
- 15.08.a Rolling and consolidating water bound macadam surface (except laterite and kankar) including watering not exceeding 150mm thickness (main layer including binding material) including filling in depression which occur during the process with power roller of capacity 8 to 12 Tonn as directed by engineer-in-charge. (Item shall be operated where rolling & consolidation is not specified in item description)**

#### **1.0 Material and Workmanship**

- 1.1 Immediately after the spreading of the coarse aggregate, rolling shall be started with three wheeled power roller 8 to 12-ton capacity or tandem roller or equivalent vibrator roller. The weight of the roller shall depend upon the type of the aggregate and as indicated by the Architect and Engineer-in-charge.
  - 1.2 Except on super elevated portions where the rolling shall proceed from inner edge to outer, rolling shall begin from the edges gradually progressing towards the center. First the edges shall be compacted with roller running forward and backward. The roller shall then move inward parallel to the center line of the road, in successive passes uniformly lapping preceding tracks by at least one half way width.
  - 1.3 Rolling shall continue until the aggregate is thoroughly keyed and the creeping of the aggregate ahead of the roller is no longer visible. During rolling slight sprinkling of water may be done. If necessary, rolling shall not be done. When the sub-grade is soft or yielding or when it causes a wave like motion in the sub-grade or sub-base course.
  - 1.4 The roller surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate and rerolling until the entire surface conforms to desired camber and grade. In no case shall be use of screening be permitted to make up depressions.
  - 1.5 The blindage material where it is required to be used shall be applied, successfully in two or more thin layers at a slow and uniform rate. After each application, the surface shall be continuously sprinkled with water, the resulting slurry shall be swept in with hand brooms or mechanical brooms to fill the voids properly and rolled, during which water shall be applied to the wheels of the rollers if necessary to wash down the binding materials sticking to them. These operations shall continue until the resulting slurry after filling of voids, forms a wave ahead of the wheels of the moving roller.
  - 1.6 After the final compaction of water bound macadam course, the road shall be allowed to dry overnight. Next morning hungry spots shall be filled with screening of binding materials as directed, lightly sprinkled with water if necessary, and rolled. No traffic shall be allowed on the road until the macadam has set. The Architect and Engineer-in-charge shall have the discretion to stop hauling traffic from using the completed water bound macadam course if in his opinion it would cause excessive damage to the surface.
  - 1.7 Payment will be made on sqm basis of the finished work and shall include of watering, rent of mechanically driven roller, cost of fuel, wages of drivers and cleaners, earthen and murrum bound etc. as required to complete the operation as directed by engineer in charge.
- 15.08.b Rolling and watering of earth work with power roller including filling in depression which occur during the process (Item shall be operated where rolling & consolidation is not specified in item description)**

Relevant specifications of item no. 15.08.a shall be followed except the rolling is to be carried out on earth.

**15.09 Providing and laying 230mm thick rubble soiling in a compact manner for road subbase, using 150mm to 230 mm. cut size stones, covering and leveling the surface with a layer of murrum after filling the voids with smaller sized stones or stone chips, including watering, consolidating with power driven static roller of 8 T to 10 T capacity or vibratory roller as directed by engineer-in-charge.**

## **1.0 Materials**

### **1.1 Murrum**

Murrum or the selected earth shall be brought from outside, as indicated in the item. The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case, Black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones, or brick bats. The clods shall be broken to a size of 50 mm. or less. It shall be of good binding quality and of approved quality obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of cal carious origin. Contractor shall make his own arrangement, at his own cost, for land for borrowing selected earth. The staking of the material shall be done as directed by Engineer-in-charge, in such a way as not to interfere with any constructional activities and in proper stacks.

The size of murrum shall not be more than 20 mm. and shall be approved by the Engineer-in-charge

### **1.2 Stones**

1.2.1 The stone shall be of specified variety such as Granite/Trap Stone/Quartz or any other type of good hard stones.

The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with IS : 1124. The minimum crushing strength of the stone shall be 200 Kg/cm<sup>2</sup>. unless otherwise specified.

1.2.2 The samples of the stone to be used shall be got approved before the work is started.

1.2.3 The Khanki facing stone shall be dressed by chisel as specified in the item for Khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on

face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

- 1.2.4 Rubble stones 150 mm. to 230 mm. size shall be collected by the Contractor to the site of work. Stacking shall be done in systematic way so as to allow easy inspection and in such a place as will not cause any loss. The rubble shall be collected from approved quarry.
- 1.2.5 The control on quality of material shall be exercised by the Engineer by carrying out the required tests at the frequencies as per IS norms from time to time as directed by the Engineer-in-charge.
- 1.2.6 The sample of the rubble collected shall be got tested. The cost of the same shall be born by the Contractor.
- 1.2.7 Materials for the purpose shall be of approved quality. Any material which is found of inferior quality shall be rejected and the Contractor shall remove such rejected material from the site at his own cost immediately.
- 1.2.8 The materials shall be got approved by Engineer-in-charge prior to collection on site. It shall be free from all rubbish, dust and any organic materials as well as clods of black cotton soil. Material shall not be allowed to be collected within the road boundary. Material to be used as crust and for side shoulders shall have a C.R.B.I's report and that to be used as blindage in W.B.M. road construction shall have P.I. Value of less than 6, as determined in accordance with IS:2720 (Part-V). The material to be used should be got tested prior to use in road construction. Testing charges shall be borne by the Contractor.

## **2.0 Workmanship**

- 2.1 The first layer of stone, of average size 150 to 230 mm. shall be laid in roads, paving etc. Thereafter, the voids between the stones laid in the first layer shall be filled by hand packing the stones of smaller size or stone chips of the same stones, as directed. The voids shall be filled with largest possible stones. The layers then shall be rammed well and consolidated.
- 2.2 The surface of the stone layer then shall be covered and leveled with a layer of murrum. This then shall be watered and well consolidated using power driven rammers or rollers as directed. The consolidated thickness of the above layers totally should be average 230 mm thick.
- 2.3 Collection of the materials shall be completed in whole, campus wise, as per the final requirement and measurement shall be recorded. Until the quantity of materials as per the final requirement is not collected work shall not be started and payment shall not be done.

- 2.4 Stacking of material as per requirement shall be carried out. The collection shall always commence at one end of the road and carried out continuously towards the other end unless the Architect and Engineer-in-charge shall direct otherwise.
- 2.5 It shall be spread evenly on the prepared surface in required grade and camber by using camber boards etc. so as to ensure that the surface is in true camber and grade. At least two camber boards shall be in use on site. The surface shall be checked at every 50 ft. by means of templates, while the correctness of the camber in between shall be tested by strings and corrected as required. Between the straight lengths and the curves and the meeting points of the convex and concave portions of reverse curves the change in camber of the road and super elevation shall be made very gradually as directed by the Architect and Engineer-in-charge.
- 2.6 Rubble shall not be spread without permission of the Architect and Engineer-in-charge. Rubble should be spread under careful supervision and by trained collies only. Contractor shall see that uniform spreading as per collection of rubble is done. The Contractor shall spread the rubble fully from the stacks without keeping any balance unless directed by the Architect and Engineer-in-charge to keep some stacks in balance for making unevenness or depressions good during rolling work.
- 2.7 To ensure that the materials are spread to the required thickness, the road surface shall be marked out on to the length over which the contents of stacks are to be spread. The bounds of earth or murrum (one on either side) shall be made along the outer edge of soiling simultaneously with spreading of rubble. These bounds shall be laid with a distance equal to the width of the road to be metalled and shall be enough to prevent the loose rubble from spreading out during consolidation and to retain water used for consolidation as well.
- 2.8 At the time of rolling, all surface irregularities hollows, depressions, humps, shall be set right.

### **3.0 Mode of Measurement and Payment**

- 3.1 Payment shall be made on m<sup>3</sup> basis after deduction for voids at 75% of the recorded measurements, at 75% of the rate quoted by the Contractor and remaining 25% shall only be released after the spreading of rubble and murrum in layer wise is completed as directed by the Architect and Engineer-in-charge or as per the actual work done.
- 3.2 The rate includes the cost of collecting, carting stones and murrum, with all leads, lifts and labour for laying, hand packing and consolidating the same for roads, paving, etc.
- 3.3 The contract unit rate for collecting, carting and stacking shall include:
1. Obtaining rubble from quarry as approved by the Engineer-in-charge.
  2. Transporting at site.

3. Storing, stacking and protecting.
  4. Keeping record of supply and use.
  5. Testing the samples in the approved laboratory.
- 3.4 The rate includes digging the murrum, supplying, conveying with all lead and lift on the road side and stacking the same in regular stacks of the required dimensions, spreading, etc. complete. Material shall be collected in required quantity at any stage of work.
- 3.5 The rate shall be for a unit of one cum and includes all the above operations with all lead and lift except consolidation.
- 15.10 Supplying and laying of metal 125 mm thick in compact manner in two layers of 75 mm and 50 mm each, using 40 mm down machine cut graded aggregate in required camber and slope as per drawing, including providing and spreading murrum in first layer and in second layer bitumen for semi grouting at 1.5 kg/sqm. Providing and spreading the kapchi/Grit at the rate of 0.013 cum / sqm with rolling with 8 to 10 T roller etc. completely as directed by engineer-in-charge.**
- 1.0 Material:**
- 1.1 The metal shall be screened of any rubbish, dust or grass. Then metal shall be laid uniformly in two layers of 75mm and 50 mm each, to the required grade and camber as directed by the Engineer in charge.
  - 1.2 Laying of metal shall be started after the consolidating soling layers prepared perfectly to the proper line level and camber.
  - 1.3 Where camber of soling is found doubtful it shall be corrected prior to spreading metal.
  - 1.4 Metal filled on the basket shall be spread evenly if required number of layer as directed.
  - 1.5 Metal shall be spread in proper grade and camber if required camber boards, shall be used so as to ensure the corrected surface. The surface shall be checked at every 15 mts. by means of template and string for correctness of the camber.
  - 1.6 The consolidation of metal shall be done by the contractor with a minimum 8 to 10 T. roller. The contractor provides required number of labour and drive at the time of rolling to rectify the undulation that might have occurred during rolling.
  - 1.7 The contractors shall carryout grouting of the above said 75 mm thick metalling layer with murrum spreading and the second layer with bitumen as per item description. The contractor shall bring all the required equipment and materials as directed.
- 2.0 Workmanship**
- 2.1 Applying bitumen**
- Bitumen of 80/100 grade penetration of approved brand heated to a temperature of about 150°C. and shall be applied hot by means of a sprayer uniformly over the surface at the rate of 1.8 kg. /sqm up to the satisfaction of Engineer in charge.

**2.2 Binding the surface**

Immediately following the application of bitumen and while it is still hot key aggregate of 10 to 12mm size and of approved quality shall be evenly spread out at rate of 0.013 cum. per sq. mt. After spreading the chipping, the whole area shall be rolled over thoroughly with a 8 T to 10 T. roller It is important that the rolling should be done while the bitumen is still soft and it should be continued until the road sets and there is no settlement under the roller.

**2.3 Protection of pavement**

During the period between the initial compaction of coarse aggregate and compaction of the seal coat the surface course shall be protected form all traffic other than essential to its construction, till the final compaction level is attained.

2.4 Same procedure shall be followed for the second layer also.

**3.0 Mode of Measurement and Payment**

3.1 All above operation shall be carried by the contractor using his equipments and material including fuel or wood required for burning etc. and as directed up to the entire satisfaction of Engineer in charge. The mode of payment for this item shall be on cum. basis.

**15.11 Providing and filling 25 mm. thick premoulded expansion joint as per drawing etc. complete as directed by engineer-in-charge**

**1.0 Materials**

1.1 Silicone sealant shall be of GE(Silpruf), WECKER or equivalent and shall be used of 300 ml packing cartridge directly available from company.

**2.0 Workmanship**

2.1 Silicone sealant shall be provided as and where directed as per detail drawing and design. Before applying the sealant, the surface shall be properly cleaned, dried and free from any loose materials. It shall be applied with cartridge.

2.2 The joint shall be cleaned and made dry completely. All loose material such as sand, concrete, dust, etc. shall be removed. Best quality back up material shall be used to bring the width and depth of the joint to the required dimensions.

2.3 Silicone sealant of required quality shall be used. The colour of the sealant shall be grey, white, black or transparent. Silicone sealant shall be filled in the joints to the required depth. The filled sealant shall be pressed and fixed by required instruments till air trapped is removed. The top surface shall be smooth and levelled. Required depth and width ratio shall be as per the manufacture's specification. Polypropylene bond breaker tape shall be

provided at the base of the expansion joint which will allow two sided adhesions. This will allow silicone sealant to stretch freely with the joint.

- 2.5 The work shall be carried out in the best workmanship as directed by the engineer-in-charge in true line and level for all levels, all heights and any position.
- 2.6 The reconciliation of the cartridges shall be done at site. The no. of cartridges used at site shall be recorded.

**3.0 Mode of Measurements and Payment:**

- 3.4 The item will be measured and paid in terms of no. of cartridges consumed as per actual work done. Wastage shall not be measured and paid for.
- 3.5 Contractor has to maintain the day to day register of filled cartridges supplied, consumed and empty cartridges at site. The procedure of the records shall be as established by the client and engineer-in-charge.

**15.12 Supplying, stacking and heating 60/70 or 80/100 asphalt at 350 F temperature including grouting at the rate of 3 kg/m<sup>2</sup> as per direction of Engineer-in-charge.**

- 1.0 Bitumen shall be procured directly from refinery by the Contractor. The Contractor shall make adequate arrangements for storing bulk asphalt at plant site. The contractor will produce in original the bill of Refinery, all the gate passes issued by the refinery and the number of transport tanker. The contractor will also produce the Test Certificate regarding the grade of asphalt issued by Refinery. The engineer-in-charge does not undertake to furnish "P" from (regarding Sales Tax Concessions) for purchase of asphalt.
- 2.0 On receipt and storage of bitumen. The bitumen shall be got tested in the approved laboratory. The frequency of test is specified in Para 5.
- 3.0 The Contractor will establish on site of work site laboratory in area not less than 25 sq.m with pucca construction and supplied with instruments to enable to carry out the following tests.
  - (i) Penetration test as per I.S. 1203
  - (ii) Softing point test as per I.S. 1204
  - (iii) Ductility test as per I.S. 1208
  - (iv) Viscosity test as per I.S. 1205
  - (v) Specification Gravity test as for I.S. 1202

The above instruments should be certified as per I.S. standard; the same should be regularly calibrated and should be maintained in efficiency condition.

- 4.0 The Registers for use, temperature and other quality requirements of bitumen will be maintained at Plant site. The registers will be printed and authorized for use by the Engineer-in-charge. The entries in the registers will be made by the engineer-in-charge and signed by the contractor or his authorized representative



**5.0 Frequency of Tests.**

As regards quality of binder, three tests of one sample per two tankers will be done on plant site. The tests will be carried out as Table 900.4 of Section 900 of M.O.S.T standard specifications. The frequency of use of specifications will be as under.

No of Tanker	No of Tests	No of Tanker	No of Tests
Upto 10	One	50 to 100	Four
11 to 20	Two	For further every 50 tanker	One
20 to 50	Three		

6.0 The rate shall be for a unit of one sqm.

**15.13 Supplying, stacking and spreading crushed stone aggregate chipping etc. of hard stone (kapachi and grit) of nominal size free of disintegrated pieces deleterious and organic matter at the rate of 1.5m<sup>3</sup> / 100 m<sup>2</sup> including filling the boxes with all lead and lift, rolling with 8T to 10 T roller etc complete as directed by engineer-in-charge.**

1.0 Stone chips shall consist of regular fragments of clean, hard, tough, and durable rock of uniform quality throughout. They shall be obtained by crushing rock, and shall be free of elongated and flaky pieces, soft and disintegrated materials, and vegetable or deleterious matter. They shall satisfy the quality requirements set forth as shown hereafter

Sr.no	Test	Test Method	Requirement
1.	Los Angeles Abrasion Value	IS : 2386 (Part IV)	35% Maximum
2.	Aggregate Impact Value	-do-	30% Maximum
3.	Flakness Index	IS: 2385 (Part I)	30% Maximum
4.	Stripping Value	IS : 6241	25% Maximum
5.	Water Absorption	IS : 2386 (Part III)	2% Maximum

2.0 Aggregate may satisfy requirement of either of the two tests

Size of Stone chips shall be as under

- a) Kapchi : 12 mm size : Passing 20 mm sieve and retained on 10 mm sieve
- b) Grit : 5 mm size : Passing 10 mm sieve and retained on 2.36 mm sieve

3.0 The samples of stones chips colleted from approved quarries shall be got tested at approved laboratory as may be directed to the contractor at his own cost. The result shall confirm to the standard requirement laid-down in Para (i) above. Collection of stone chips as per approved samples shall be allowed by the Engineer in charge. Testing charges shall be borne by the contractor. Payment at full rates for the stones chips shall not be made till the test results from the laboratory are received and found acceptable.

- 4.0 Stacking shall be done by filling in standard steel boxes of 2.0 m x 1.5 m x 0.5 m size which shall be supplied by the contractor. No deduction for voids shall be made from the gross measurement. Where any doubt exist as to whether the quantity of stacks in any hectometer is not confirming with the cubic content of the standard pharas (2.5 m x 1.5m x 0.5m) it shall be got corrected by the Contractor if so ordered by the Engineer in charge for which no extra payment shall be claimed by the contractor. If the quantity in any stack in a particular hectometer is found to be less than the standard measurements viz 1.5 cmt the entire collection in the hectometer shall be paid on the quantity of the smallest stack so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking shall be done in a manner as directed by the Engineer-in-charge
- 5.0 The collection shall always commence at one end of the Kilometer and be carried out continuously towards the other end, unless the Engineer-in-charge directs otherwise.
- 6.0 Control on quantity of material shall be exercised by the Engineer-in-charge by carrying out the following tests at the frequencies shown against each.

Sr. No	Type of Construction Material	Test Method	Requirement
1.	Grit/Kapchi for open graded Carpet and seal coat	(i) Aggregate impact value (ii) Flakiness Index of aggregate (iii) Stripping value & water absorption of aggregates  (iv) Grading of aggregates	One test per 100 cum One test per 100 cum Initially one set of 3 representative specimens for each source of supply subsequently when warranted by changes in the quality of aggregates. One test per 100 cum. Of aggregate

- 7.0 The payment shall be made on cubic meter basis without deduction for voids. The contractor shall be responsible for preserving the materials throughout the period the contract remains in force. The rate shall be inclusive of all labor, tools, equipment and other incidental expenses.

**15.14 Providing and laying 37 mm. thick consolidated carpet course by heating and mixing asphalt and aggregate with continuous batching hot mix plant, spreading the same by paver finisher machine using Black Trap Chips (stone aggregates) 12 mm. to 20 mm. size**

and sand in required proportion at a rate of 6m<sup>3</sup>/100m<sup>2</sup> of surface as per required gradation and asphalt 60/70 or 80/100 at a rate of 56 kg/m<sup>3</sup> of aggregates but not less than 3.60% by weight of mix and applying tack coat at a rate of 1.0 kg/m<sup>2</sup> on W.B.M. surface including scraping, brooming, transporting, spreading and consolidating with power roller of 8 to 10 ton so that the resulting surface is even, smooth and in perfect line and level to the satisfaction of Engineer-in-charge with all required tools, plant, machinery, labours, oil, kerosene, firewood etc. complete as directed by engineer-in-charge.

**1.0 Description:** This work shall consist of construction in a single course of 25 mm. thick open graded carpet on a previously prepared base to the requirements of this specifications.

**2.0 Materials:**

**2.1 Binder:** The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS: 73. The actual grade of the binder to be used shall be decided by the Architect and Engineer-in-charge.

**2.2 Coarse Aggregates:** The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free of disintegrated pieces, organic or other deleterious materials and matter and adherent coatings. The aggregate shall preferably be hygroscopic and of low porosity and shall satisfy the physical requirements set forth as under:

**2.2.1 Physical Requirement shall be as under:**

No.	Test	Test Method conform to	Requirements
1.	Los Angeles Abrasion Value *	IS: 2386	40% maximum
2.	Aggregate Impact Value *	IS: 2386	30% "
3.	Flakiness Index	IS: 2386	35% "
4.	Stripping Value	IS: 6241	25% "
5.	Water Absorption	IS: 2386 (Part-III)	02% "

**Note:** \* Aggregate may satisfy requirements of either of the two tests.

**2.2.2 Aggregate Gradation:** The mineral aggregates, including fine aggregate shall be so graded or combined as to conform to grading set forth in table below:

**Aggregate Gradation for Asphalt Carpet:**

Sieve Size	% by weight by passing the sieve
------------	----------------------------------

for 20 mm. thickness.

20.00 mm.	100
12.5 mm.	70 - 100
10.00 mm.	20 - 40
4.75 mm.	0 - 5
2.36 mm.	-

### 2.3 Proportioning of Materials:

- 2.3.1 The binder content for premixing shall be at a rate of 56 kg/m<sup>3</sup> of aggregates but in any case not less than 3.6 % by weight of the total mix.
- 2.3.2 The quantities of aggregates shall be sufficient to yield the specified thickness after compaction. The Contractor shall have the responsibility of ensuring proper proportioning of materials to have a homogeneous and uniform mix. A variation in binder content of  $\pm$  0.3 percent by weight of total mix shall however, be permissible in individual specimens taken for quality control tests vide MOST specification section 900.

### 2.4 Construction Operations:

- 2.4.1 **Weather and Seasonal Limitation:** Premixed carpet shall not be laid during rainy weather when the base course is damp or wet.
- 2.4.2 **Preparation of Base:** The base on which carpet is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross section in accordance with MOST specification clause 601 or as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.
- 2.4.3 **Tack Coat:**
- 2.4.3.1 It shall be applied after cleaning the surface properly and making it free from any foreign matter to achieve good adhesion between base course and subsequent layer.
- 2.4.3.2 **Application of Binder:** Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed to the base at the rate specified below. The rate of spread in terms of straight run bitumen shall be 0.5 kg/m<sup>2</sup> area for an existing bitumen treated surface and 1.0 kg/m<sup>2</sup> area for an untreated water bound macadam surface. The tack coat shall be applied just ahead of the on coming bituminous construction.
- 2.4.4 **Preparation of the Mix:** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality mix shall be used for preparing the mix. The plant should be continuous type having a co-ordinate set of essential units such as dryer for heating the aggregates, device for feeding the aggregates by weight or volume as per the

requirement, a binder heater and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder and aggregates.

## 2.5 **Technical Requirement of Hot Mix Plant:**

- 2.5.1 **Composition of Plant:** The hot mix plant shall conform generally to IS specifications no. IS:3066-1965 or as amended from time to time and shall be equipped with the following arrangements.
- 2.5.2 **Cold Aggregate Feeder:** The cold aggregate feeder shall have minimum three independent bins or compartments, each provided with accurate mechanically pre-determined rate of feeding the aggregates to cold elevator or to some intermediate conveyor or directly into the dryer. The feeder shall provide for the adjustment of total and proportional feed and shall be capable of being locked in any setting.
- 2.5.3 **Dryer:** The dryer shall be capable of continuously agitating the aggregates while heating to the desired temperature. At the discharge end of the dryer or any other suitable location, means shall be provided for ascertaining the temperature of the heated aggregate.
- 2.5.4 **Screening Unit and Gradation Control:** The dried aggregate shall be screened into in not less than three sizes. The plant shall include means for accurately proportioning each bin size of aggregate either by weight or volumetric measurement. When the gradation control is by volume, the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled, individual gate to form an orifice for proportioning the material drawn from each respective bin compartment. The orifice shall have positive mechanical adjustment and provided with a lock. Indicators shall be provided on each gate to show the opening in centimeters.
- 2.5.5 **Mixer Unit:** The plant shall include a mixer of an approved twin shaft pugmill type capable of producing a uniform mix. If not enclosed, the mixer box shall be equipped with a dust hood to prevent loss of fines.
- 2.5.6 **Mineral Filler Supply Unit:** There shall be an independent unit to feed mineral filler directly into the pugmill. The hopper to bin for mineral filler shall provide for the adjustment of proportion of the filler with the aggregate and bitumen feeds and shall be capable of being locked in any setting.
- 2.5.7 **Bitumen Heater:** A heating system for bitumen always with effective and positive control of temperature shall be provided to maintain proper temperature and for allowing continuous circulation between storage tank and proportioning units during the entire operating period. Suitable arrangements shall be provided for recording the temperature at the tank and in the circulating system.

- 2.5.8 **Synchronisation:** For synchronisation of aggregate bitumen and filler feeds satisfactory means shall be provided to afford positive inter-locking control between the flow of aggregate from the bins or compartment and flow of bitumen from the tank and flow of mineral filler.
- 2.6 The temperature of binder at the time of mixing shall be in the range of 150 C to 177 C and aggregates in the range of 155 C to 163 C. Provided also that at no time shall be difference in temperature between the aggregates and the binder exceed 14 C.
- 2.7 Mixing shall be through to ensure that a homogeneous mixture is obtained in which the particles of the mineral aggregates are coated uniformly.
- 2.8 The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer-in-charge.
- 2.9 **Spreading:** The mix transported from the hot mix plant the site, shall be spread by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix, true to specified grade, lines and cross sections. The temperature of mix at the time of laying shall be in the range of 121 C to 163 C.
- 2.10 Longitudinal joints and edges shall be constructed true to the delinquating lines parallel to the center line of the road. Longitudinal joints shall be off set by at least 150 mm. from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.
- 2.11 **Rolling:**
- 2.11.1 Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km/hour. The initial or break down rolling shall be with 8/10 ton three wheeled roller and the surface finished by final rolling with 8/10-ton tandem roller or suitable roller.
- 2.11.2 The'r wheels shall be kept damp with the water to prevent the mix from adhering to them but in no case shall fuel or lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the center except that on super elevated portions, it shall progress from the lower to upper edge parallel to the center line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimize the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the proceeding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

- 2.12 **Opening to Traffic:** Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.
- 2.13 **Surface Finish and Quality Control of Work:** The surface finish of construction shall conform to the requirements of MOST Specification clause 901. Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST specification clause 902.
- 2.14 **Arrangement for Traffic:** The provision of MOST Specification Clause 105 shall apply as regards the flow of traffic during construction.
- 3.0 Mode of Measurement and Payment:**
- 3.1 The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose, the Contractor shall have to install a weigh bridge of suitable capacity for the purpose of weighing of dumpers at suitable place at his cost as directed. Weight of empty dumpers and weight of loaded dumpers will be recorded in bound and numbered register on plant site.
- 3.2 The Client will feel free to get some loaded dumpers tested and checked at other weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.
- 3.3 For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of ton differs with the actual area of work done in the field. Then the reduction in or addition to payment shall have to be effected to the Contractor on pro-rata basis depending upon the area reduced or exceeded respectively.
- 3.4 Weight of mixed materials will be done in presence of a responsible person, not less than the rank of supervisor and the measurements shall be recorded by the Engineer-in-charge, if so authorized. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the Client's representative and signed by the Contractor. Proper gate pass system shall be established for the vehicles coming to the plant site and out going from the plant site. The location of the kilometer, hectometer and meter in which individual dumpers are unloaded be recorded carefully.
- 3.5 **Rate:** The contract rate for unit of one M ton of carpet shall be paid in full for carrying out the required operations including full compensation for all components.
- 15.15 Providing and laying 20 mm. thick consolidated seal coat over carpet by heating and mixing asphalt and aggregate with continuous batching hot mix plant, spreading the same by paver finisher machine using B.T. Chips (stone aggregates) 12 mm. to 20 mm. size and sand in required proportion at a rate of 4 m<sup>3</sup>/100 m<sup>2</sup> of surface as per required gradation and asphalt 60/70 or 80/100 at rate of 72 kg/m<sup>3</sup> of aggregates but not less than 4.50 % by weight of mix and flushing the sand at rate of 0.03 m<sup>3</sup>/10 m<sup>2</sup> including**

**scraping, brooming, transporting, spreading and consolidating with power roller of 8 to 10 ton so that the resulting surface is even, smooth and in perfect line and level to the satisfaction of Engineer-in-charge with all required tools, plant, machinery, labours, oil, kerosene, firewood etc. complete as directed by engineer-in-charge.**

**1.0 Description:** The relevant specification of item no. 15.14 shall be followed same except that the work shall be for 20 mm. thick seal coat instead of 37 mm. thick carpet.

**2.0 Materials**

**2.1 Fine aggregate:** The fine aggregates shall consist of crusher run screening and natural sand or a mixture of both. These shall be clean, hard durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

**2.2 Aggregate gradation:** The mineral aggregates, shall be so graded or combined as to confirm to the grading set forth in table below:

**2.3 Aggregates gradation for premix seal coat:**

Sieve Designation	Percentage passing by weight
12.5 mm.	-
10.00 mm.	100
4.75 mm.	40 - 85
2.35 mm.	5 - 20
75.00 Micron	0 - 4

**3.0 Mode of Measurement and Payment:**

**3.1** The payment shall be made on the tonnage basis of weight of mix of aggregates and bitumen. For this purpose, the Contractor shall have to install a weigh bridge of suitable capacity for the purpose of weighing of dumpers at suitable place at his own cost as directed. Weight of empty dumper and weight of loaded dumpers will be recorded in bound and numbered register on plant site.

**3.2** The Client shall feel free to get some loaded dumpers test checked at other weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

**3.3** For the purpose of application of tack coat of the theoretical area as per sanctioned estimate for basis of ton differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the Contractor in pro-rata basis depending upon the area reduced or exceeded respectively.



- 3.4 Weight of mix material will be done in presence of responsible person, not less than the rank of supervisor of and the measurements shall be recorded by the Engineer-in-charge, if so authorized. Record of each dumper will be maintained separately in bound and numbered register which will be the responsibility of Contractor. Proper gate pass system shall be established for the vehicles coming to the plant site and out going from the plant site. The location of the kilometer/hectometer and meter in which individual dumpers are unloaded will be recorded carefully.
- 3.5 **Rate:** The contract rate for unit of one M. Ton of seal coat shall be paid in full for carrying out the required operations including full compensation for all components listed in Most Specification Clause 503-B.

**SPECIAL CONDITION FOR BITUMINOUS SURFACE WORK WITH USE OF  
HOT MIX PLANT AND PAVER FINISHER**

1. The hot mix plant and accessories to be used for the work shall be in conformity with the specifications, prescribed vide Govt. of India, Ministry of Transport Circular No. RW/RMP/1613784, dt. 1.1.87. The plant shall be equipped with all units and accessories as per latest I.S 3066/1955, as amended from time to time. The Contractors will have to modify their plants suitably within a period of six months from the date of issue of latest I.S. specification or codes.
2. The work of laying aggregate mixed with bitumen shall start on site of work only after 8.00 hours in the morning and continue upto 17.00 hours in winter season and upto 18.30 hours in summer. No work shall be done except during the period mentioned above and also on Sunday and National Holidays viz. 26th January, 15th August and 2nd October.
3. Quantity of bituminous aggregate mix to be laid shall be restricted to 250 ton per day for 30/40 capacity plant and may be more or less depending upon the rates capacity of the plant.
4. The work of laying asphalt mix shall start latest within 60 days from the date of issue of work order and will be completed as per time limit. Reasons for delay instating of work after 60 days shall result in to sufficient cause for laving compensation for disproportionate progress. However, the period from 15th June to 15th October being monsoon shall not be counted for the purpose of disproportionate progress and consequent cause for levy of compensation. The Contractors shall commence the work of laying pavement on or before the last date of the period mentioned above, failing which he shall pay compensation not less than Rs. 500/- per day for every day that he shall delay the commencement of the work as above in accordance with clause-2 of the contract.
5. The Contractor shall invariably get the job mix formula for the mix approved by the Engineer-in-charge before starting the work

6. The item shall be measured and paid in MT.

**15.16 Providing and applying asphalt painting over the road surface by heating asphalt 60/70 or 80/100 at 350 F and spreading the same at the rate of 1.5 kg/m<sup>2</sup> including all labour for heating, brushing the road surface, brooming, laying the asphalt at uniform rate so as to have smooth finish surface and spreading sand over it at the rate of 0.5 m<sup>3</sup>/100 m<sup>2</sup> and rolling with 8 to 10 ton power driven roller as per direction of Engineer-in-charge.**

The relevant specification of item no. 15.14 shall be followed same except that the work shall be done for asphalt painting. The rate shall be for a unit of one sqm.

**15.17 Providing and laying cast in situ RCC M20 curbing of approximate size of 40cm height X 15cm wide, including necessary excavation in any type of soil & rock and backfilling, laying 75 mm thick PCC 1:5:10 (1 part cement : 5 parts sand : 10 parts stone aggregate 20/37 mm. down size), exposed shuttering, rendering, curing and filling bituminous mastic in expansion joints but excluding reinforcement as directed etc. complete as per the details and drawings and as directed by engineer-in-charge.**

#### **1.0 Material and Workmanship**

1.1 The relevant specifications of item no. 2.02 shall be followed except the item includes the excavation of the required size of pits true to line and level. The relevant specifications of item 1.01, 1.02 shall be followed for excavation work.

1.2 The pits shall be filled with a layer of 75mm thick PCC 1:5:10 (1 cement: 5 Sand: 10 20/37 mm. down graded stone aggregates). The curbs then shall be cast of 400 mm height X 200 mm thick of which 230mm shall be below road level in cement concrete M20 in true line and plumb. The relevant specifications of 2.01 shall be followed.

#### **2.0 Mode of Measurement & Payment**

2.1 The finished work shall be measured for the finished work in running meter.

2.2 The rate shall be inclusive of including necessary excavation in any type of soil & rock and backfilling, laying 75 mm thick PCC 1:5:10 (1-part cement: 5 parts sand: 10 parts stone aggregate 20/37 mm. down size), exposed shuttering, rendering, curing and filling bituminous mastic in expansion joints but excluding reinforcement.

**15.18 Providing and laying Precast RCC M20 curbing of approximate size of 60cm height x 40cm wide X 15cm thickness, including necessary excavation and backfilling, laying 75 mm thick PCC 1:5:10 (1-part cement: 5 parts sand: 10 parts stone aggregate 20/37 mm. down size), exposed shuttering, rendering, curing and filling bituminous mastic in expansion joints but excluding reinforcement as directed etc. complete as per the details and drawings and as directed by engineer-in-charge**

The relevant specifications of item no. 15.17 shall be followed except that precast curbs shall be used instead of cast-in-situ. The relevant specifications of item no. 2.09.a shall be followed for precast curbs.

**15.19 Providing and laying 100 mm thick metal soling in a compact manner for granular sub-base in single layer including supplying and spreading of large size machine cut stone aggregates 40 mm.and down size, spreading the same in required grade and camber in one or more layer. Filling the voids with good quality murrum to make plain surface, profusely watering including consolidating by power driven roller of 8 to 10 ton capacity in required camber, dry and wet rolling etc. complete as directed by engineer-in-charge**

The relevant specifications of item no. 15.05 shall be followed except the size of the aggregate should be 40 mm instead of 25 to 90 mm.

**15.20 Providing & marking 10/15 cms wide 2.5 mm thick thermoplastic patta of yellow or white on the road surface etc. comp. As. Directed. Rate includes brushing, brooming & cleaning and application of paint.**

**1.0 General:**

The colour, width, and layout of road markings shall be in accordance with IRC:35-1997(Code for practice for road marking with paints).

**2.0 Material & Workmanship:**

2.1 The readily available thermoplastic paint shall have used. It shall be a homogeneous compound of aggregate, Pigment, resin, & glass reflectorising beads. The compound shall have the following constituents (In percent by weight):

Component	White	Yellow
Binder	18.0 % min	18.0 % min
Glass beads	35.0 %	35.0 %
Titanium Dioxide	10 % min	-
Calcium Carbonate	25 %	25 %
Insert Fillers	12 %	12 %
Yellow Pigments	-	10 %

2.2 Colour:

The colour of the compound shall be white or yellow (IS colour no. 356) as specified or directed by the Engineer-In-Charge.

2.3 Laying

The Thermoplastic material shall readily get screeded/ extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness, which shall be continuous and uniform in shape having clear and sharp edges. The material upon heating to application temperature shall not exude fumes, which are toxic, obnoxious or injurious to person or property.

- 2.3.a Glass beads used should confirm to relevant IS codes or as directed by engineer in charge. It covers two types of glass beads viz. those which are the constituent of the basic thermoplastic compound (Type 1) & those which are to be sprayed on the surface (Type 2). The Gradation of Glass shall be as follows:

**Gradation Requirements for Glass Beads**

Sieve Size	Percent Retained	
	Type 1	Type 2
1.18 mm	0 to 3	-
850 micron	5 to 20	0 to 5
600 micron	-	5 to 20
425 micron	65 to 95	-
300 micron	-	30 to 75
180 micron	0 to 10	10 to 30
Below 180 micron	-	0 to 15

The glass Beads shall have a minimum 70 % true spheres. It should be having a refractive index of at least 1.50. They shall be free of hard lumps & cluster and shall dispense readily under an conditions suitable for paint stripping. They shall pass the free flow test.

- 2.3.b The material shall be screeded/Extruded on to the pavement in molten stage at a temperature of around 160-degree C by Thermoplastic applicator having control of temperature and material flow with a propelling device at a specified speed to make stripes in desired width and thickness and a dispensing device to drop on/ spray glass beads at a specified rate. No other means of laying will be followed. While on a cement concrete surface, a sealing primer recommended by the manufacturer shall be used before laying of the paint.

2.4 Application:

Marking shall be done by machine. If machine marking is not possible, approved manual methods shall be used with prior approval of Engineer- in- charge. The contractor shall maintain control over traffic while painting to cause minimum inconvenience to the traffic.

The material shall be applied hot by screeding or extrusion machine and should be applied at a temperature specified by the manufacturer.

All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, oil, grease and all other foreign matters before application of paint.

The material when formed into traffic stripes must be readily renewable by placing an overlay of new material directly over the old line. The new material shall so bond itself that no splitting or separation takes place.

The paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless otherwise specified. The glass beads shall be sprayed uniformly on to the hot layer of paint immediately. The Glass beads shall be applied at the rate of 250 gm/sqm area.

The minimum thickness specified is exclusive of surface applied glass beads.

The finished lines shall be free from ruggedness on sides and end and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform & free from streaks.

**3.0 Mode of measurement and payment**

- 3.1 Actual area painted will be considered.
- 3.2 Rate shall be of unit of one Square meter.

**15.21 Chharoo finish**

**Providing and laying brick bat chharoo and screed GSB respectively in (80:20) ratio over subbase including spreading in uniform layer of 200mm thickness consolidating with plate compactor or 10-ton roller watering and finishing in level and slope as shown in the drawing or as directed by engineer in charge.**

**1.0 Material**

- 1.1 The material shall be got approved prior to procurement from Architect/Engineer-In-Charge.

**2.0 Workmanship**

- 2.1 Brickbat chharu over sub base of BBCC or compacted earth including of spreading in uniform layer of 25 mm thickness, consolidating with plate compacter

**3.0 Mode of Measurement and Payment**

- 3.1 The item shall be measured and paid in sqm.

**15.22 Pitching with available stones within site in slope and floor as required according to site condition to stop erosion including filling in joints and pointing with cement mortar 1:6 as directed by engineer in charge. Rate includes dressing and cleaning of the existing surface.**

Work is to be carried out for pitching with available stones within site in slope and floor as required according to site condition to stop erosion including filling in joints and pointing with cement mortar 1:6 as directed by engineer in charge as per the best workmanship. Rate includes dressing and cleaning of the existing surface. Item is to be measured and paid in sqm.

**15.23 Providing & marking Zebra Crossing Straight and turning arrows and STOP or other letters with 2.5 mm thick thermoplastic paint of yellow or white on the road surface etc. comp. As. Directed. Rate includes brushing, brooming & cleaning and application of the paint. The rate includes repainting of worn out paint after a period of 2.5 years or as directed by engineer in charge.**

Relevant specifications of the item no. 15.20 shall be followed except that the application of the paint shall be for Zebra Crossing, Straight and turning arrows and STOP or other letters. The standard specifications of applications of paint shall be followed and rate shall be of unit of one square meter. Actual area of the painted surface will be considered for the measurement. Rate shall be for one sqm.

**15.24 Fixing granite cobbles curbing of size (300mm wide x 300 mm height x 150 mm thick) including necessary excavation and backfilling, laying 75 mm thick PCC 1:5:10 (1-part cement: 5 parts sand: 10 parts stone aggregate), filling in joints with rich CM etc. complete as per the details and drawings and as directed by engineer-in-charge. Rate is inclusive of Labour for fixing the granite, CM required for fixing the granite, filling the joints with CM, earth work and laying PCC etc. complete.**

**1.0 Material and Workmanship**

1.1 The relevant specifications of item no. 15. 17 shall be followed. The item includes the excavation of the required size of pits true to line and level. The relevant specifications of item 1.01 shall be followed for excavation work.

1.2 The pits shall be filled with a layer of 75mm thick PCC 1:5:10 (1 cement: 5 Sand: 10 stone aggregates). The curbs of size (300mm wide x 300 mm deep x 150 mm thick) in true line and plumb. Curbing will be 200 mm below ground level as directed by engineer in charge.

**2.0 Mode of Measurement & Payment**

2.1 The work shall be measured for the finished work in Rmt.

2.2 Rate is inclusive of labour for fixing the granite, CM required for fixing the granite, filling the joints with CM, earth work and laying PCC etc. complete.

2.3 The rate shall be for a unit of one running meter inclusive of excavation, PCC 1:5:10 and granite shall be paid under this item.

15.25 Providing and filling hot applied rubberized sealing compound of Tiki Tar or equivalent in joints of the roads, pavement to withstand against cracking conforming to IS-1834, Grade – A, Density 1020 kg. /cum and working temperature 175°C to 185 °C. This shall be ready to use material. Surface on which compound to be applied shall be completely dry. It shall be overfilled and trimmed to level. Size of the groove shall be

15.25.1 12 mm W x 18 mm D

15.25.2 25mm W X 25mm D

**1.0 Materials** – Material shall be of Tiki Tar or equivalent.

**2.0 Workmanship** – surface shall be cleaned on both side and edges to be repaired before commencing the work with micro-concrete silica base with polymer powder. Non-adhesive tape shall be used on both side before filling the grooves. Materials shall be used as per the supplier's specification and the above-mentioned item description. Materials shall be filled in dry condition only.

**15 Mode of Measurement** - It shall be measured and paid on Rmt basis without any wastage.

**15.26 Construction of granular sub-base (Grade - I) by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401.**

**15.26.1. Scope**

This work shall consist of laying and compacting well-graded material on prepared sub grade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

**15.26.2. Materials**

**15.26.2.1.** The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination thereof depending upon the grading required. The material shall be free from organic or other deleterious constituents and conform to one of the three gradings given in Table 400-1.

While the gradings in Table 400-1 are in respect of close-graded granular sub-base materials, one each for maximum particle size of 75 mm, 53 mm and 26.5 mm, the corresponding gradings for the coarse-graded materials for each of the three maximum particle sizes are given at Table 400-2. The grading to be adopted for a project shall be as specified in the Contract.

**15.26.2.2. Physical requirements:** The material shall have a 10 per cent fines value of 50 kN or more (for sample in soaked condition) when tested in compliance with BS :812 (Part III) . The water absorption value of the coarse aggregate shall be determined as per IS: 2386 (Part 3); if this value is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS : 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in

equilibrium conditions which be taken as being the density relating to a uniform air voids content of 5 percent.

**TABLE 400-1. GRADING FOR CLOSE-GRADED GRANULAR SUB-BASE MATERIALS**

IS Sieve	Per cent by weight passing the IS sieve		
	Grading I	Grading II	Grading III
75.0 mm	100	-	-
53.0 mm	80-100	100	-
26.5 mm	55-90	70-100	100
9.50 mm	35-65	50-80	65-95
4.75 mm	25-55	40-65	50-80
2.36 mm	20-40	30-50	40-65
0.425 mm	10-25	15-25	20-35
0.075 mm	3-10	3-10	3-10
CBR Value (Minimum)	30	25	20

**TABLE 400-2. GRADING FOR COARSE GRADED GRANULAR SUB-BASE MATERIALS**

IS Sieve	Per cent by weight passing the IS Sieve		
	Grading I	Grading II	Grading III
75.0 mm	100	-	-
53.0 mm		100	
26.5 mm	55-75	50-80	100
9.50 mm			
4.75 mm	10-30	15-35	25-45
2.36 mm			
0.425 mm			
0.075 mm	<10	<10	<10
CBR Value (Minimum)	30	25	20

Note: The material passing 425 micron (0.425 mm) sieve for all the three gradings when tested according to IS: 2720 (Part 5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively.

### 15.26.3. Strength of sub-base

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.



When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remolded at field dry density and moisture content and any other tests for the "quality" of materials, as may be necessary.

#### **15.26.4. Construction Operations**

**15.26.4.1 . Preparation of sub grade:** Immediately prior to the laying of sub-base, the sub grade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

**15.26.4.2. Spreading and compacting:** The sub-base material of grading specified in the Contract shall be spread on the prepared sub grade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.

When the sub-base material consists of combination of materials mentioned in Clause 401.2.1. mixing shall be done mechanically by the mix-in-place method.

Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small-sized jobs. The equipment used for mix-in-place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS : 2720 (Part 2) and suitably by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS : 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.

Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer up to 225 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight with plain drum or pad foot-drum or heavy pneumatic tyred roller of minimum 200 to 300 kN weight having a minimum tyre pressure of 0.7 MN/m<sup>2</sup> or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall and

super elevation and shall commence at the edges and progress towards the centre for portions having cross fall on both sides.

Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS: 2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

#### **15.26.5. Surface Finish and Quality Control of Work**

The surface finish of construction shall conform to the requirements of Clause 902.

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

#### **15.26.6. Arrangements for Traffic**

During the period of construction, arrangement of traffic shall be maintained in accordance with Clause 112.

#### **15.26.7. Measurements for Payment**

Granular sub-base shall be measured as finished work in position in cubic meters. The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

#### **15.26.8. Rate**

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- (i) making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;
- (ii) furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
- (iii) all labor, tools, equipment and incidentals to complete the work to the Specifications;
- (iv) carrying out the work in part widths of road where directed; and

(v) carrying out the required tests for quality control.

**15.27 Providing, laying, spreading and compacting layers of 125 mm with graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density as per MoRTH Clause 406**

#### 15.27.1. Scope

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared sub grade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as necessary to lines, grades and cross-sections shown on the approved drawings or as direction by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200 mm upon approval of the Engineer.

#### 15.27.2. Materials

##### 15.27.2.1 Aggregates

**15.27.2.1.1. Physical requirements:** Coarse aggregates shall be crushed stone. The aggregates shall conform to the physical requirements set forth in Table 400-10 below. Sevaliya special aggregate is only acceptable.

**TABLE 400-10. PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WET MIX MACADAM FOR SUB-BASE/BASE COURSES**

	Test	Test Method	Requirements
1.	* Los Angeles abrasion value or	IS : 2386 (Part-4)	40 per cent (Max.)
	* Aggregate Impact value	IS : 2386 (Part-4) or IS : 5640	30 per cent (Max.)
2.	Combined Flakiness and Elongation indices (Total)	IS : 2386 (Part-1)	30 per cent (Max.)**

\* Aggregate may satisfy requirements of either of the two tests.

\*\* To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by

weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness index and elongation index so found are added up.

If the water adsorption value of the coarse aggregate is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS : 2386 (Part- 5).

**15.27.2.1.2. Grading requirements:** The aggregates shall conform to the grading given in Table 400-11.

**TABLE 400-11. GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADAM**

IS Sieve Designation	Per cent by weight passing the IS sieve
53.00 mm	100
45.00 mm	95-100
26.50 mm	-
22.40 mm	60-80
11.20 mm	40-60
4.75 mm	25-40
2.36 mm	15-30
600.00 micron	8-22
75.00 micron	0-8

Materials finer than 425 microns shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

**15.27.3. Construction Operations**

**15.27.3.1. Preparation of base:** Clause 404.3.1. Shall apply.

**15.27.3.2. Provision of lateral confinement of aggregates:** While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 407.4.1.

**15.27.3.3. Preparation of mix:** Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pugmill or pan type mixer of concrete batching plant. For small quantity of wet mix work, the Engineer may permit the mixing to be done in concrete mixers.

Optimum moisture for mixing shall be determined in accordance with IS : 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75

mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

**15.27.3.4. Spreading of mix:** Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub grade/sub-base/base in required quantities. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread either by a paver finisher or motor grader. For portions where mechanical means cannot be used, manual means as approved by the Engineer shall be used. The motor grader shall be capable of spreading the material uniformly all over the surface. Its blade shall have hydraulic control suitable for initial adjustments and maintaining the same so as to achieve the specified slope and grade.

The paver finisher shall be self-propelled, having the following features:

- (i) Loading hoppers and suitable distribution mechanism
- (ii) The screed shall have tamping and vibrating arrangement for initial compaction to the layer as it is spread without rutting or otherwise marring the surface profile.
- (iii) The paver shall be equipped with necessary control mechanism so as to ensure that the finished surface is free from surface blemishes.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of layer and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

**15.27.3.5 Compaction:** After the mix has been laid to the required thickness, grade and cross fall/camber the same shall be uniformly compacted, to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, smooth wheel roller of 80 to 100 kN weight may be used. For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h.

In portions having unidirectional cross fall/superelevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the centre line of the road, uniformly over-lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the sub-base/base course or sub grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case should the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS : 2720 (Part-8).

After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and recompact.

**15.27.3.6. Setting and drying:** After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

#### **15.27.4. Opening to Traffic**

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface till it has dried and the wearing course laid.

#### **15.27.5. Surface Finish and Quality Control of Work**

**15.27.5.1. Surface evenness:** The surface finish of construction shall conform to the requirements of Clause 902.

**15.27.5.2. Quality control:** Control on the quality of materials and works shall exercised by the Engineer in accordance with Section 900.

**15.27.6. Rectification of Surface Irregularity**

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, reshaped with added premixed material or removed and replaced with fresh premixed material as applicable and recomputed in accordance with Clause 406.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

**15.27.7. Arrangement for Traffic**

During the period of construction, arrangement of traffic shall be done as per Clause 112.

**15.27.8. Measurements for Payment**

Wet mix macadam shall be measured as finished work in position in cubic meters.

**15.27.9. Rates**

The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.8.

**15.28 Providing & fixing M25 grade of concrete precast exposed /fare finish kerb stones of following sizes on the foundation prepared of M15 grade concrete as of approved design including curing, formwork etc. complete. The rate shall also include for erecting and fixing the pieces in position with necessary equipments and materials. The rate shall also include the flush pointing in CM (1:2) for all joints of the kerb stones. (Sample must be approved). Monolithic and homogeneous casting is required using approved metal mould only. Two-layer casting is not allowed in any case. The contractor rate shall also include the cost of foundation of M15 grade (Sample to be approved).**

- (a) 300 mm x 150 mm x 300 mm kerb stone for sidewalk**
- (b) 300 mm x 150 mm x 190 mm kerb stone for curb cut**
- (c) 300 mm x 150 mm x 300 mm thickness 150 mm for outer corner (L shape)**
- (d) 300 mm x 150 mm x 300 mm thickness 150 mm for internal corner (L shape)**
- (e) 750 mm x 150 mm x (245 to 190 mm H) for curb cut**
- (f) 750 mm x 150 mm x (300 to 245 mm H) for curb cut**
- (g) 750 mm x 150 mm x (245 to 190 mm H) for curb cut**

**(h) 750 mm x 150 mm x (300 to 245 mm H ) for curb cut**

**(l) Radius-Outer 293, inner 314x 300 x150 for sidewalk**

**1.1 Materials:**

Water, Cement, Grit, Sand, Graded stone aggregate 20-mm. nominal size as per general specification of other concreting

**General:**

Contractor shall have to manufacture the blocks as per the dimensions given in the drawing.

Specific machineries shall be used to manufacture the precast blocks. These machineries should be compatible to produce blocks of required strength and dimensions. Moulds/ Dies of the machine shall be dimensionally checked & to be got approved before commencing the production. Contractor shall prepare proper Drying Yard for keeping the blocks before curing. The drying yard shall be levelled and covered so that no shrinkage cracks are formed. Contractor shall prepare adequate size curing pond to cure the blocks for not less than 21 Days. No other means of curing shall be allowed.

The technical specification of concrete shall confirm to MORT&H Clause 1700.

The concrete mix shall be M25. Concrete work shall have exposed concrete surface or as specified in the item.

a. Deleted

1.3 The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 m<sup>3</sup>.) for different proportions of mix shall be as per MORT&H Clause 1700. The proportion of the aggregate for the kerb stone shall be modified as per the approval of the engineer-in-charge.

The water cement ratios shall not be more than those specified as per MORT&H Clause 1700. The cement of the mix shall be increased, if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the table is not exceeded.

The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than 1/4th of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.



Admixture shall be used in concrete only with approval of the Architect and Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete impaired by the use of such admixtures.

#### **1.4 Workmanship:**

##### **1.4.1 Inspection:**

All Moulds shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete.

Formwork/Metal Mould for exposed concrete surface (If indicated):

All the moulds shall be checked for exact dimensions of the Precast blocks. All the edges of the Precast blocks shall confirm the profile of the final drawing & edges/ curvatures of the moulds shall be checked accordingly. Moulds shall be regularly checked for correctness of dimensions of Blocks, twists, bends due to handling, etc. before starting every day's work.

Care shall be taken to set all formwork/Mould in perfect line, level (or in required camber or slope as specified) and plumb. Formwork/Mould propping shall be strong, rigid and sturdy. The formwork/Mould shall be as per pattern & design shown in drawings. Formwork/Mould shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off of all rust, dust and loose materials. Colourless oil or grease of approved quality shall be applied before placing steel. Also the formwork material will be of wood/plywood/steel or any sort of such material, as approved by the Architect; so that all exposed concrete surfaces have uniform colour.

For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used.

##### **1.4.2 Removal of Moulds:**

Specific time shall be identified for removal of moulds, such that the concrete of the precast blocks shall gain strength to withstand the stresses generated due to self weight and handling to drying yards without any deformation to shape/ dimensions/ edges.

##### **1.4.3 Drying Period:**

Sufficient time shall be given to the block after it is removed from the mould so that it can gain strength and dry in shade to prevent any cracks due to shrinkage. This shall be done in drying yards.

#### **1.4.4 Curing Period:**

Curing of block shall be done only in curing pond and curing shall be done for minimum 14 days.

Drying period after removing from pond & before delivery to site:

Water should be drained of from the block before it is actually sent to the site. Time should be provided for proper draining of water, which may be present in the block kept for curing in the pond.

#### **1.4.5 Precautions:**

Precaution shall be taken while transporting of the blocks to site.

The blocks should be loaded and unloaded with due care so as to avoid generation of stresses leading to breaking of block.

Care should be taken to prevent the block from breaking during transporting.

#### **1.4.6 Laying:**

The pits of the required size shall first be excavated, true to line and level. The relevant specifications shall be followed for excavation work.

The pits shall be filled with a layer of 100mm thick PCC bedding. The curbs then shall be placed in position as per drawing. The concrete kerb shall be cured minimum for 7 days. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise, permitted by the Architect and Engineer-in-charge. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream upto form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture.

#### **1.5 Curing:**

Only pond curing shall be adopted and curing shall be done for min. 14 days.

##### **Sampling and testing of concrete:**

Samples from fresh concrete shall be taken as per IS: 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units.

**NOTE: At least 1 sample shall be taken from each shift. Ten test specimens shall be made from each sample, 5 for testing at 7 days and the remaining 5 at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Architect and Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.**

The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 250 Kg/cm<sup>2</sup>. at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

If rock pockets/honeycombs in the opinion of Architect and Engineer-in-charge are of such an extent or character so as to effect the strength of the structure, materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portion of the structure affected.

#### **1.6 Precast Kerb Stones:**

- 1.1 The relevant specifications of concreting as per item above shall be followed except that work shall be carried out for precast concrete kerbstones as specified in the item.
- 1.2 All Precast members shall be cast at workshop. Sufficient curing shall be done before placement of the same.
- 1.3 The method of transporting and placing the precast members shall be as approved by the Architect and Engineer-in-charge. Members shall be so transported that no breakage or undue stresses are induced in them.
- 1.4 If required, all members shall have a key provided on both the faces i.e. top and bottom surfaces, of adequate size so as to fill the same with concrete while laying. The function of this key is to avoid the leakage through the joint between the precast member and the member on which it is laid.

#### **1.7 Mode of Measurements and Payment:**

The rate shall include cost of formwork but exclude the cost of reinforcement.

The volume occupied by reinforcement shall not be deducted from R.C.C. work.

The rate shall be for a unit as specified in BOQ.

**15.30 Providing, making & fixing around the light pole, exposed /fare finish precast light pole cover block of following sizes of two halves as per drawing in M25 grade of concrete with minimum cement content of 360 Kg per cum including hoisting, curing, formwork etc. complete. The rate shall also include for erecting and fixing the pieces in position as shown in the drawing with necessary equipments and materials. (Mould must be approved). Monolithic and homogeneous casting is required using approved mould only. Two-layer casting is not allowed in any case. Rate shall also include the reinforcement (as per requirement), making provision for name plate. (Sample to be approved)**

**15.30.1 a.Size up to 410 mm dia.**

**15.30.2 b.Size up to 500 mm dia.**

Refer RCC M25 2.13

**15.31 Tree Guard**

Providing and fixing tree guard, fabricated from 25 x 25 x 3 mm MS angle and 32 x 32 mm of 3.2 mm thick MS weld mesh as per drawing and details. Necessary provisions for the anchoring to floor shall be made in the tree guard. Tree guard shall be painted with 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of MRF or equivalent paint as per manufacture's specification over all the surfaces or as specified in the drawing as per the shade approved as per the drawing and specification. The rate shall also include the fixing of necessary name plate. (Sample to be approved)

**15.31.1 Material**

The materials in use shall confirm to the material specification.

**15.31.2 Workmanship:**

The tree guard shall be fabricated using standard procedures as per MORTH section 20.04.

Tree guard shall be painted with 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade as per MORTH section 20.06 or as directed by Engineer-In-Charge.

The sides may be backfilled with good quality earth if required with approval of Engineer-In Charge.

**15.31.3 Mode of Measurement & Payment.**

Rate shall be for per number.

**CW 16.00****Special works**

**16.01 Providing and installing Textile Architecture for stadiums, stands, shoppings, logistic centres, walkways, carparking, swimming pool etc. by using FERRARI or equivalent composite membrane made up of weave of high-tenacity polyester base yarn material of approved shade and quality by Architect and Engineer-in-charge. The material should have properties like long lasting mechanical resistance, dimensional stability, flexibility, non fading, UV resistant, flame retardant, ease of fitting. The material shall be delivered in manufacture's original unopened containers and packaging with labels clearly identifying product name and manufacturer. It should be stored in dry and clean indoor areas and handling in such a way to prevent damage in accordance with manufacture's instructions. Contractor shall submit manufacturer's maintenance and cleaning manual, gurantee/warranty on stamp paper in prescribed format, manufacurer's certificate etc. Work shall be executed as per the drawing in best workmanship manner upto the satisfaction of Architect or Engineer-in-charge.**

**During execution of structural fabrication work contractor shall periodically inspect workmanship of basic structural fabrication and erection work so final product does not affect. Contractor shall prepare and get approval of Detail Design and Shop Drawings and list of accessories of support mechanism and fabric related structure based on conceptual design from Architect and Engineer-in charge. Before installing the fabric structure shall be painted with one coat of Rustocap primer and two coat of polyurathene paint to all MS structure work. Rate shall be inclusive of material as per manufacturer's specification, fixing accesories like tensile wires, turn buckles, anchors etc. as per manufacture's specification to keep the material in proper position and labour required for satisfactory installation. MS structural work, foundation and related civil works for the supporting frame structure will be paid in relevant item.**

Item shall be executed as manufacture's specification. Rate shall be inclusive of material as per manufacturer's specification, fixing accesories like tensile wires, turn buckles, anchors etc. as per manufacture's specification to keep the material in proper position and labour required for satisfactory installation. MS structural work, foundation and related civil works for the supporting frame structure will be paid in relevant item. Item shall be measured and paid in sqm.

**16.02 Providing & fixing Jali made out of Birla White precast GRC (Glass Fibre reinforced Cement) of 50 mm thick in required shape and size of all as per manufacturers specifications, such as all decorative articles should be made by using high power spray machine, using Cem-fill manufactured AR Glass fiber with minimum ZrO2 17% including necessary scaffoldings for all heights, fixing the individual or composite elements and their proper jointing/sealing with approved adhesives & sealants and drilling holes in**

**RCC/ Steel/ Brick work and fixing on to external façade with Stainless steel clamps/ devices of suitable dia. & lengths, grouting with sealants etc. all complete as per drawing/ dimension and directions of Architect or Engineer-in-Charge.**

Item shall be executed as manufacture's specification. Rate shall be inclusive of material as per manufacturer's specification.

MS structural work, foundation and related civil works for the supporting frame structure will be paid in relevant item. Item shall be measured and paid in sqm.

- 16.03 Providing and fixing Factory made solid both panel PVC door of sintex endura or equivalent make. Door shutter made from especially hot press moulded SMC (sheet moulding compound) sheets, Polyurethane core and PVC Frame Section. SMC sheet shall be conforming to IS:13410. Sheet shall have an average thickness of 1.5mm +-0.35mm. Core of the door shutter shall be filled with high density Polyurethane foam, injected with the help of hydraulic injection method. Shutter frame to be made of PVC extruded section conforming to IS: 10151:1982 of size 26mm x 47mm with a wall thickness of 1.5mm +-0.3mm. The hardware location shall be reinforced with special polymeric reinforcement wooden blocks suitable size. The corners of the shutter frame shall be reinforced with Polymeric "L" Shaped angle of size 105mmx230mm. The lock rail shall be made from PVC extruded sections having overall dimension of 26mm x 47mm 1.5mm+-3mm, with usual process variation correspondence to sintex code DWUF 305 by combining two numbers. Wooden pieces are inserted in periphery. Suitable MS Tube reinforcement shall be provided on vertical sided of shutter frame, and rate shall be inclusive of all hardwares like pivot, hinges, tower bolts, studs, door handle of 300 length of SS 304, door stopper etc. complete. Rate shall inclusive of all complete as per direction of Engineer-in-charge, manufacture's specification & Drawing. (Sample to be approved)**

**a.A-D2 (900 mm x 2100 mm)**

Item shall be executed as manufacture's specification. Rate shall be inclusive of material as per manufacturer's specification.

MS structural work, foundation and related civil works for the supporting frame structure will be paid in relevant item. Item shall be measured and paid in sqm.

- 16.26 Providing and making Tree pit. It includes excavation up to 600 mm depth including removal of the debris, Size of the pit is 1000 mm dia. Hume pipe of 900mm dia. NP2 class with 600mm height to be placed in the excavated pit and outside area of the Hume pipe to be filled with the garden soil completed as directed by Engineer-in-Charge. Rate shall also include necessary fixing with Rod as shown in the drawing or as directed by Engineer-in-Charge. Garden soil filling is considered as a separate item.**

**1.0 General:**

The material shall be of standard specifications and shall be approved before mass production.

## **2.0 Workmanship:**

Excavation of tree pit shall be carried out as per specification.

The pit prepared shall be cleared of all the debris, roots and other deleterious materials attaining the natural earth level sufficient for the growth of the trees.

The Bottom 600 mm depth of the pit shall be filled up with good quality garden earth as approved by Engineer- In –Charge.

The filling shall be properly compacted.

In remaining 600 mm proper NP3 class Hume pipe shall be erected.

The pipe shall be factory made Of 900 mm dia such that both the faces are finished.

No piece pipes broken from full length pipes shall be used for this purpose.

The Hume pipe shall be secured in to position by filling the sides with good quality earth and proper ramming.

The inside of Hume pipe shall be filled with garden earth along with Farmyard manure and required fertilizers etc as directed by Engineer-In-Charge.

**The rate shall be for per no of Tree pit prepared.**

### **16.27 Concrete Benches**

**Providing and laying in position machine batched, machine mixed and machine vibrated design mix fair finish / smooth finish cement concrete of M25 grade for reinforced cement concrete work for cast in situ exposed concrete benches as a street benches including pumping laying of concrete to site by any means like pumping or tower crane, finishing and curing etc. and including Admixtures in recommended proportions as per IS 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge. Rate shall be inclusive of providing grooves, drip moulds, ghis, pockets, cutouts etc. and labour for insert sleeves if any wherever required while casting. Rate also to include lift charges and scaffolding for all heights / depths from FFL / GL. Rate shall include cost of formwork but exclude cost of reinforcement.**

16.27.1 Material & workmanship as per RCC M25 2.13

16.27.2 Mode of payment

The rate shall include cost of formwork reinforcement, kotastone, pvc pipe cable,

and necessary items as per specified in the drawing.

The rate shall be for a unit as specified in BOQ item.

**16.28 Providing and Fixing the Dustbin with M.S. sheet –SAF-01A made of Saflow or equivalent with supporting fabrication with SRFDCL logo as per the shade approved as per drawing and specification. (Sample to be approved)**

16.28.1 Sanitary Disposal Bins manual provides a unique and exclusive option when touch free technology is not required.

The telescoping top has been designed with a lifting ring, positioned purposefully away from the opening where waste is deposited. This minimizes contact for the user and reduces the negative perceptions of manual operations.

The rotating cap allows access from any angle with the wall mounting feature providing an innovative solution to all washrooms.

**Sanitary Disposal Bin Liners:**

Sanitary Bin Liners are easy to service with the elasticated top providing a self closing action when removed from bin, offering a smart solution with minimal contact and efficient results.

Bin liners are made from Oxo-biodegradable plastics. Oxo-biodegradable plastics are conventional plastics with added property mixture to accelerate the breakdown chemical structure of the plastics. The resultant breakdown products are then amenable to conversion by micro-organisms into carbon dioxide and water.

Oxo-biodegradable plastics offer essentially the same properties as the untreated polyolefin's but degrade into a form that is safely absorbed into the ecosystem.

Sani sense Granuals:

Sani Sense controls waste biocide. Sani Sense granules automatically activates when sanitary waste is placed inside the bin. Pathogens and harmful bacteria are deactivated and restrained from multiplying, ensuring safe storage of solid dressings. As well odor neutralizers kill bas odors and freshness is maintained. Available in 1kg bottle with 50metered 20gms doses.

**16.28.2 Mode of measurement-** Item shall be executed as manufacture's specification. Rate shall be for one unit inclusive of material as per manufacturer's specification.

**16.29 Providing, fabricating and fixing 10 gauge MS Perforated sheet (3 mm holes) of complete including cutting, and welding the members as per detailed drawing and design. The rate shall include for applying three coats of approved make synthetic**



**enamel paint over a coat of zinc chromate yellow oxide as primer, as per instructions.  
(Only actual installed measurements will be paid for)**

16.29.1 Relevant specification for Structural steel work should be followed

16.29.2 Mode of measurement- Rate shall be for one sqmt inclusive of material and fabrication complete in all manners.

**16.30. Dismantling existing plain or reinforced concrete by Vibration free cutting to shape and size as per drawing using "Hydraulic Wall saw system" with complete mechanical, electrical and control system HILTI D-LP 32/TS32 or equivalent including site inspection, planning and preparation of working drawing by competent engineer, and obtaining approval on the same; executing work at site by authorized and trained applicator of the manufacturer of the above equipment, applicator guaranting successful execution of work, including all necessary tools and tackles; checking for safety of all working men and existing structures all complete as per direction of engineer-in-charge. Rate shall also include scaffolding, water supply, dismantling of existing cut piece by jack hammer or any other suitable method without disturbance to the adjoining concrete and disposal of debris as per direction of engineer-in-charge.**

16.30.1 The rate shall include all equipment, machine tools, labour, manpower, consumable materials, safety appliances, transportation, disposal of concrete to the un objectionable places as directed by Engineer In Charge, all lead and lift, electricity, water supply etc.

16.30.2 Prior approval is must before starting the cutting work.

16.30.3 Mode of measurement is actual size of piece (Length x Thickness of piece which has been cut by blade).

**16.30.4 The unit rate is in Sqmt.**

**16.31 Providing and fixing dowel bars in existing concrete by drilling 16 mm holes for 12 mm dia rebar grouting of Hilti RE - 500 / Fischer or equivalent for the depth of 260 mm and grouting the anchors bars with epoxy resin, testing charges etc complete. The reinforcement will be paid separately in respective item.**

**Shall be executed prior permission to EIC and shall be paid in no.**

**16.32 Cylindrical Bollard**

**Providing and fixing cylinder pre cast bollard with fair finished made in M-30. Bollard is precast with cement concrete of M-30 grade by providing 4 no of 12 mm dia. tor steel by vibro compaction method using FRP / steel mould for achive shuttering finish as directed and approved by EIC.**

**a) 918mm height x300mm dia.**

The Bollards designs, approved by the architect/ EIC has to be installed as per the c standard specifications/ Drawings from Architect/ EIC. Rate shall be for Per No. of Bollard Fixed.

**16.33** Providing and laying hot applied thermoplastic road marking compound in approved color and shade for road marking on bituminous/ concrete road surface in centre line 100mm wide 2.5mm thick using fully automatic extrusion machine and using premelter for melting thermoplastic Material, including cleaning the surface of all dirt, dust, and other foreign matter, demarcation at site/ premarking, finishing and managing the traffic control etc. complete and as per specifications, detailed drawings and as directed.

**1.0 General**

The colour, width and layout of road marking shall be in accordance with the Code of Practice for Road Markings with paints, IRC: 35, and as specified in the drawings or as directed by the Engineer.

**2.0 Materials**

Road markings shall be of ordinary road marking paint, hot applied thermoplastic compound, or reflectorised paint as specified in the item and the material shall meet the requirements as specified below.

**Ordinary Road Marking Paint**

Ordinary paint used for road marking shall conform to Grade I as per IS: 164.

The road marking shall preferably be laid with appropriate road marking machinery.

Laying thickness of road marking paint shall be as specified by the Engineer.

Hot Applied Thermoplastic Road Marking

**General:**

(i) The work under this section consists of marking traffic stripes using a thermoplastic compound meeting the requirements specified herein.

(ii) The thermoplastic compound shall be screeded/extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation and laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an adherent pavement marking of specified thickness and width and capable of resisting deformation by traffic.

(iii) The colour of the compound shall be white or yellow (IS colour No. 356) as specified in the drawings or as directed by the Engineer.

(iv) Where the compound is to be applied to cement concrete pavement, a sealing primer as recommended by the manufacturer, shall be applied to the pavement in advance of placing of the stripes to ensure proper bonding of the compound. On new concrete surface any laitance and/or curing compound shall be removed before the markings are applied.

**Thermoplastic Material**

**General:** The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and glass reflectorizing beads.

**Requirements:**

- (i) **Composition:** The pigment, beads, and aggregates shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800-3.

**TABLE 800-3. PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL  
(Percentage by weight)**

Component	White	Yellow
Binder	18.0 min.	18.0 min.
Glass Beads	30-40	30-40
Titanium Dioxide	10.0 min.	-
Calcium Carbonate and Inert Fillers	42.0 max.	See
Yellow Pigments	-	Note

Note: Amount of yellow pigment, calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this Specification are met.

- (ii) **Properties:** The properties of thermoplastic material, when tested in accordance with ASTM D36/BS-3262–(Part I), shall be as below:

**(a) Luminance:**

White: Daylight luminance at 45 degrees – 65 per cent min. as per AASHTO M 249

Yellow: Daylight luminance at 45 degrees - 45 per cent min. as per AASHTO M 249

(b) **Drying time:** When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to bear traffic in not more than 15 minutes.

(c) **Skid resistance:** not less than 45 as per BS 6044.

(d) **Cracking resistance at low temperature:** The material shall show no cracks on application to concrete blocks.

(e) **Softening point:** 102.5 ± 9.5° C as per ASTM D 36.

(f) **Flow resistance:** Not more than 25 per cent as per AASHTO M 249.

(g) **Yellowness index (for white thermoplastic paint):** not more than 0.12 as per AASHTO M 249

- iii) **Storage life:** The material shall meet the requirements of these Specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or unmelted particles for the one-year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/Contractor.

- iv) **Reflectorisation:** Shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Clause 803.4.3.
- v) **Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:
  - 1.The name, trade mark or other means of identification of manufacturer
  2. Batch number
  3. Date of manufacture
  4. Colour (white or yellow)
  5. Maximum application temperature and maximum safe heating temperature.
- iv) **Sampling and testing:** The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM /BS method. The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

**3.0 Reflectorising glass beads**

**General:** This Specification covers two types of glass beads to be used for the production of reflectorised pavement markings.

Type 1 beads are those which are a constituent of the basic thermoplastic compound vide Table 800-3 and Type 2 beads are those which are to be sprayed on the surface vide clause 803.6.3.

The glass beads shall be transparent, colourless and free from milkiness, dark particles and excessive air inclusions.

These shall conform to the requirements spelt out in clause 803.4.3.3.

**4.0 Specific requirements**

- A. **Gradation:** The glass beads shall meet the gradation requirements for the two types as given in Table 800–4.

Table 800-4. GRADATION REQUIREMENTS FOR GLASS BEADS

Sieve Size	Per cent retained	
	Type 1	Type 2
1.18 mm	0 to 3	-
850 micron	5 to 20	0 to 5
600 –do-	-	5 to 20
425 –do-	65 to 95	-
300 –do-	-	30 to 75
180 –do-	0 to 10	10 to 30
Below 180 micron	-	0 to 15

- B. **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.
- C. **Refractive index:** The glass beads shall have a minimum refractive index of 1.50.

- D. Free flowing properties:** The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

**5.0 Test methods:** The specific requirements shall be tested with the following methods:

- i) Free-flow test: Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter desiccator which is filled within 25 mm of the top of a desiccator plate with sulphuric acid water solution (specific gravity 1.10). Cover the desiccator and let it stand for 4 hours at 20 to 29-degree C. Remove sample from desiccator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6 mm orifice. If necessary, initiate flow by lightly tapping the funnel. The glass spheres shall be essentially free of lumps and clusters and shall flow freely through the funnel.
- ii) The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part I).
- iii) The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all specified herein and shall certify that the material meets all requirements of this Specification. However, if so required, these tests may be carried out as directed by the Engineer.

**5.0 Application properties of thermoplastic material**

The thermoplastic material shall readily get screeded/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

The material upon heating to application temperatures, shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

**Preparation:**

- (i) The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.
- (ii) After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

803.4.6. Properties of finished road marking:

- a) The stripe shall not be slippery when wet.
- b) The marking shall not lift from the pavement in freezing weather.
- c) After application and proper drying, the stripe shall show no appreciable deformation or discolouration under traffic and under road temperatures upto 60°C.
- d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.
- e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.
- f) The colour of yellow marking shall conform to IS Colour No. 356 as given in IS: 164.

**16.35 Providing, making & fixing around the tree pit, exposed /fare finish precast Tree Pit cover block of following sizes of four halves as per drawing in M25 grade of concrete with minimum cement content of 360 Kg per cum including hoisting, curing, formwork, grooves, rendering etc. complete. The rate shall also include for erecting and fixing the pieces in position as shown in the drawing with necessary equipments and materials. (Mould must be approved). Monolithic and homogeneous casting is required using approved mould only. Two-layer casting is not allowed in any case. Rate shall also include the reinforcement (as per requirement), making provision for name plate. (Sample to be approved)**

**16.35 Square of 1000mm x 1000mm with a opening of 600mm dia at center in Four Halves**

Refer RCC M25 2.13. Shall be paid in per no.

### **COAL TAR EPOXY COATING**

16.36 Providing & applying Coal Tar Epoxy of approved make like Dr. Fixit (Pidilite), Fosroc, clean coats, Sika, two component epoxy coating in two coats as per the mixing and application procedure suggested by manufacturer on the concrete surfaces. Coverage recommended is 3.0 – 4.0 m<sup>2</sup> Per ltr for two coat application at the coverage rate of approx. 250 - 300-micron DFT.

### **GENERAL**

#### **INTENT**

This Section covers the Work of chemically resistant coating to the surfaces of the RCC retaining wall.

#### **APPLICATOR**

Ensure that all Work is done by a competent applicator licensed and/or approved by the chemically resistant coating material manufacturer. Submit the manufacturer's certification of this approval.

#### GUARANTEE

Furnish a written guarantee covering the materials and workmanship for a period of 5 years from the date of acceptance of the Work, and be responsible for making good, at your expense, any and all defects due to the failure of the coating materials or workmanship.

Provide completely corrosion resistant work with no leakage through or around the coating.

#### SUBMITTALS

Submit the proposed materials, schedule of applications and the manufacturer's literature for the materials and the recommended methods of application.

Submit sketches showing standard and special details for the corrosion protection. Submit the manufacturer's approval of the applicator.

Immediately prior to commencing Work in each Area, submit a letter of acceptance for the wall surfaces to be coated, signed by the applicator's authorized representative.

Upon acceptance, submit a written guarantee.

#### PRODUCTS

Coating for Application on RCC Retaining wall surface

System Design – Epoxy Tar Based Coating

The coating shall be corrosion resistant coal tar epoxy coating with minimum of 50% solids content. The dry film thickness shall not be less than 200 microns per coat and should be applied in minimum two (2) coats. The cured film shall be tough and abrasion resistant.

The Contractor must follow the manufacturer's guidelines for the preparation of surfaces, for mixing and application of coating.

#### **Surface Preparation and Inspection**

#### EXECUTION

##### General

- Deliver materials to job site in factory sealed containers with manufacturer's identification on each package.
- The Contractor shall store the materials to protect them from damage.
- Clean surfaces of deleterious material in accordance with the manufacturer's recommended practice.

- Prepare surfaces to be coated in accordance with manufacturer's instructions.
- Verify the surfaces are dry. (ASTM D4263)
- Have the coating manufacturer's authorized agent inspect surfaces to be coated and certify in writing to the Engineer-in-Charge that the surfaces are acceptable for the application of the coating. Do not apply the coating until written certification is received by the Engineer-in-Charge.
- Chip out damaged concrete to sound concrete.
- Repair rebar if damaged.
- Clean concrete surfaces, dampen and hand place patching concrete in accordance with the pipe manufacturer's recommended practice. Wet cure immediately and as recommended by the manufacturer.
- Conform to the coating manufacturer's instructions for application.
- Schedule the Work to allow application to be performed in a manner that it conforms to the Manufacturer's recommendations.
  - Apply coating only when atmospheric conditions are suitable and as recommended by the Manufacturer.
  - Protect the coating from damage.
  - Allow to cure before further work or putting the coating into service.
  - Clean-up
  - Promptly, as the Work proceeds and upon completion, clean up and remove from the site, rubbish and surplus material resulting from the Work of this Section.

#### **Mode of Measurements and Payments**

The item shall be measured and paid in the unit of Sqmt.

#### **TECHNICAL SPECIFICATION FOR PLUMBING WORK**

Item No: 1- (1.1,1.2,1.3,1.4,1.5,1.6)

**Providing laying and jointing in true line and level U.P.V.C. Pipe SCH-40 for internal use &SH-80 (external use for cold water including fittings & bends make ASHIRVAD/ PRINCE / SUPREME / ASTRAL / FINOLEX or equivalent as approved by Architect in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including jointing with one step UPVC pipe solvent cement, testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials make ASTRAL upvc pressure pipe - or equivalent as approved and selection by architect.**

15mm dia

25mm dia

32mm dia



40mm dia

50mm dia

65mm dia

#### UNPLASTICISED POLYVINYL CHLORIDE PIPES AND FITTINGS

- UPVC Pipes Pipes shall conform to Type A pipes of IS 13592. The internal and external surfaces of the pipes shall be smooth and clean and free from groovings and other defects. The end shall be clearly cut and shall be square with the axis of the pipe. The end may be chamfered on the plain sides. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible provided the wall thickness remains within the permissible limit.

#### Colour of Pipe

- Surface colour of the pipes shall be dark shade of grey or as r as specified.

#### Marking

- Each pipe shall be clearly and indelibly marked with the following information at intervals not more than 3 meter.
  - a) Manufacturer's name or trade mark.
  - b) Nominal outside dia of pipe.
  - c) Type 'A'
  - d) Batch number.

#### Dimensions

##### Diameter and Wall Thickness:

- Mean outside diameter, outside diameter at any point and wall thickness for type –A manufactured plain or with socket shall be as given in Table- 1 of IS 13592.
- UPVC rain water pipes shall be of the dia, specified in the description of the item and shall be in nominal lengths of 2,3,4 or 6 metres either plain or with sliding/grooved socket unless shorter lengths are required at junctions with fittings. Tolerances on specified length shall be + 10 mm and – 0 mm.

#### Fixing and Jointing

- Pipes shall be either fixed on face of wall or embedded in masonry as required in the description of the item.
- Plain pipes shall be secured to the walls at all joints with PVC Pipes clips by means of 50 x 50 x 50 mm hard wood plugs, screwed with M.S. screws of required length i/c cutting brick work and fixing in cement mortar 1:4 (1 cement: 4 coarse sand). The clips shall be kept about 25 mm clear off finished face of wall, so as to facilitate cleaning of pipes. Pipes shall be fixed perfectly vertical or to the lines as directed. The pipes shall be fitted

to fittings with seal ring conforming to IS 5382 allowing 10 mm gap for thermal expansion.

#### Installation in Wall/Concrete

- The walls/concrete slots should allow for a stress free installation. Pipes and fittings to be inserted into the slots without a cement base have to be applied first with a thin coat of PVC solvent cement CPWD SPECIFICATIONS 2009 522 followed by sprinkling of dry sand (medium size). Allow it to dry. The process gives a sound base for cement fixation. This process is repeated while joining PVC material to CI/AC materials.

#### Fittings

- manufacturer and shall have a minimum wall thickness of 3.2 mm. The fittings shall be supplied with grooved socketted ends with square grooves and provided with Rubber Gasket conforming to IS 5382. The plain ends of the fittings should be chamfered. The fittings shall be joined with the help of Rubber lubricant. The details of fittings refer IS 13592.

#### Measurements

- The fittings shall be measured by numbers. The pipes shall be measured net when fixed correct to a cm. excluding all fittings along its length.

#### Rate

- The rate shall include the cost of all materials and labour involved in all the operations described above including jointing but excluding the supply and fixing of wall plugs and PVC clips which shall be paid for separately.
- Note: These pipes shall be used only in shaft or unexposed location to avoid damage to these pipes due to willful act.

#### Specifications:

- Lead free material, nontoxic, strong lightweight, leak proof joints, good insulator, chemical resistant, UV stabilized.
- Fits easily with or without needing couplers (Solvent Cement Joint)
- NSF approved Solvent cement joint is permanent, strong and trouble-free.
- Available in 3 mtr & 6 mtr length or can be customized
- Available size- SCH 40 -15(1/2") to 300 mm (12") diameters

#### Item No: 2- (2.1,2.2,2.3,2.4)

Providing, Fixing, testing and commissioning of High density low noise multi-layer pipes having external layer PP, middle layer mineral reinforced PP, internal layer -PP one/two end socket with special ring fittings of specified diameter with all necessary specials, bend, reducers, elbow, y & T connections, traps of same material with push fit socket with special ring etc.

specifications, drawings, details as directed by Architect in Charge. make ASTRAL - SILENCIO-6RFT DS or equivalent as approved and selection by architect.

50mm dia

75mm dia

110mm dia

160mm dia

High density low noise multi-layer SWR pipes:

- High density low noise multi-layer SWR Pipes, manufactured as per European standards. High density low noise multi-layer SWR Pipes made from mineral reinforced Poly propylene this base material provides excellent mechanical & acoustic properties. High density low noise multi-layer SWR are made with high molecular structure which enables absorption of air borne sound and structure borne sound energy does not spread over pipe wall. manufacture of pipe should confirm European Standards for pipes, wherein the standards are prepared with the help of CEN/TC 155. The standardization is then followed by the committees in both, India and Europe.

**Layer construction and special socket joint:**

- **External Layer – PP:** The tough protective shell of the pipe is sturdy and highly impact resistant
- **Middle Layer – Mineral Reinforced PP:** Mineral-reinforced plastic provides very high stability and establishes superior noise insulating effect
- **Internal Layer – PP:** Provides a superior flow performance with its smooth structure, with resistance against high water temperature
- **Door Fittings:** Provides additional inner door cap along with threaded door cap to maintain flow without blockage
- **Push-Fit Socket with Special Ring:** The Push-Fit socket is fitted with German Technology ring that guarantees hydraulic tightness and free movement of the pipe caused by expansion/contraction
- **External Ribs:** Placed on the outer side of the
  - right depth fitment with thermal expansion to prevent pipe bending
  - **Swept Angle:** Designed with swept angle to have smooth flow & avoid blockage

**Fittings**

- Fittings shall be of the same make as that of pipes, injection molded and shall conform to European Standards. The inner surface of the pipes and fittings shall be clean with cleanout solution and fittings shall have push fit socket with special ring the ring allows free movement during hydraulic tightness and thermal expansion. an application of the

solvent cement joint as supplied by the contractor shall be done for outer surfaces of the pipe. The pipes and fittings shall be fixed to walls OR suspended by using proper clamps. The pipes shall be fixed or hanged perfectly vertical or in a line as directed. All soil pipes shall be carried up above the roof and shall have cowl on top.

- Where pipes are laid along walls or floor, the SWR pipes are to be fixed 25mm away from the wall surface & suspended as per instructed by the architect or engineer. Anchor fasteners and clamps, hangers etc. to be used for this purpose.
- 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 brass bolts.
- Using branches shall make connections between main pipe and the branch pipes and bends invariably with access doors for cleaning.

Specifications:

- Self-socket at one end
- Plain at another end
- Socket with rubber ring
- Available in 20 feet length or can be customized
- Available in 3 mtr S/S OR D/S to 2,3,4,6 FT D/S length.

Nominal Outside Diameter (Nominal Size, in mm)	Mean Outside Diameter (mm)		Wall thickness (mm)
	Min	Max	Min
40	40	40.3	2.2
50	50	50.3	4.0
75	75	75.3	4.5
110	110	110.4	5.3
160	160	160.5	5.3

#### MATERIAL PROPERTIES

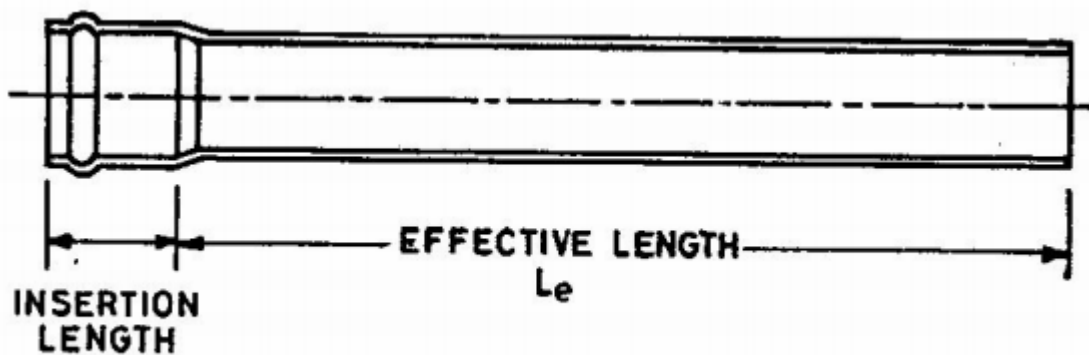
Property	Unit	Value
Density	G/Cm <sup>3</sup>	1.9
Elongation @Break	%	30
Tensile Strength	N/mm <sup>2</sup>	16.8
Modulus Of Elasticity	N/mm <sup>2</sup>	3800
Coefficient of linear expansion	mm/Mk	0.09
Fire resistance	DIN 4102,B2 EN 13501-1:D-s2 ,d0	
Life expectancy	more than 50 years	

#### Laying and Jointing

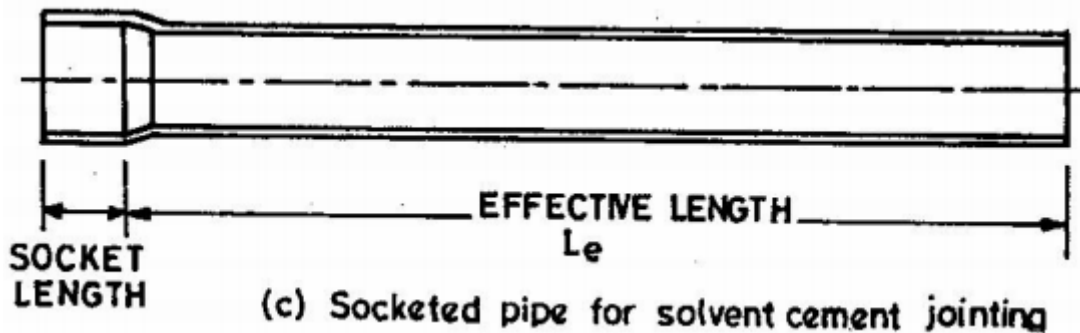
- The pipes shall be laid and clamped to wooden plugs fixed above the surface of the wall. **Alternatively**, plastic clamps of suitable designs shall be preferred. Provision shall be made for the effect of thermal movement by not gripping or disturbing the pipe at supports between the anchors for suspended pipes. The supports shall allow the repeated movements to take place without abrasion.
- Jointing for pipes shall be made by means of solvent for horizontal lines and 'O' rubber ring for vertical line. Rubber ring sockets and T-shaped rubber ring joints are firm joints which will be 15 chamfered ends. The type of joint shall be used as per site conditions / direction of the consultant. Where pipes are to be used for rain water pipes, the pipe shall be finished with GI adopter for insertion in the RCC slab for a water proof joint complete as directed by consultant.

### SUPPORT AND SPACING

- All piping should be supported with an approved hanger at intervals sufficiently close to maintain correct pipe alignment and to prevent sagging or geode reversal. Pipe should also be supported at all branch ends and at all changes of direction. Support traps arms as close as possible to the trap. In keeping with good plumbing practices support and brace all closet bends and fasten closet flanges.
1. Concentrated load should be supported directly so as to eliminate high stress concentrations. Should this be impractical then the pipe must be supported immediately adjacent to the load.
  2. In system where large fluctuations in temperature occur, allowances must be made for expansion and contraction of the piping system. Since changes in direction in the system are usually sufficient to allow for expansion and contraction hangers must be placed so as not to restrict this movement.
  3. Hangers should provide as much bearing surface as possible. To prevent damage to the

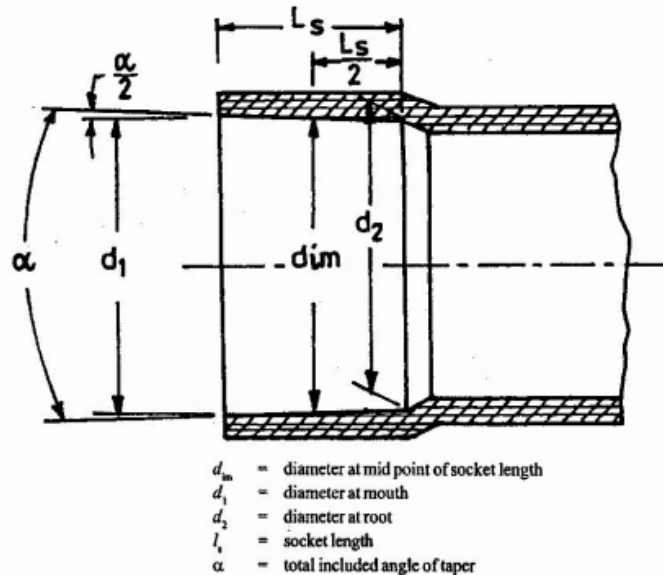


pipe, file smooth any sharp edges or burrs on the hangers or supports.



#### TESTING PRESSURE SYSTEM

1. Conduct pressure testing with water. DO NOT USE AIR OR OTHER GASES for pressure testing.
2. The piping system should be adequately anchored to limit movement. Water under pressure exerts thrust forces in piping systems. Thrust blocking should be provided at changes of direction, change in size and at dead ends.
3. Refer tables given for initial set & cure times before pressure testing.
4. The piping system should be slowly filled with water, taking care to prevent surge and air entrapment. The flow velocity should not exceed 1 foot per second.
5. All trapped air must be slowly released. Vents must be provided at all high points of the piping system. All valves and air relief mechanisms should be opened so that the air can be vented while the system is extremely dangerous and it must be slowly and completely vented prior to testing.
6. The piping system can be pressurized to 125% of its designed working pressure. **However**, care must be taken to ensure the pressure does not exceed the working pressure of the lowest rated component in the system (valves, unions, flanges, threaded parts etc.)
7. The pressure test should not exceed one hour. Any leaking joints or pipe must be cut out and replaced and the line recharged and retested using the same procedure.



### Pipe-Repairs

- While temporary or emergency repairs may be made to the damaged pipes, permanent repairs should be made by replacement of the damaged section. In case of damage by external blows, the extent of the damage may be greater on the inner-surface. Sometimes, pipes are damaged accidentally due to trenching operation in street repairs. Shell split or chip out occur in the wall of the pipe, a short piece of pipe of sufficient length to cover the damaged portion of the pipe is cut. The sleeve is cut longitudinally and heated sufficiently to soften it so that it may be slipped over the damaged pipe.

### Item No:3

Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, SDR- 11 having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Architect in Charge. make ASTRAL-CVPC PRO -SDR 11 or equivalent as approved and selection by architect. -

20mm dia

25mm dia

32mm dia

### CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPES

- CPVC pipes & fittings used in hot & cold potable water distribution The material from which the pipe is produced shall consist of chlorinated polyvinyl chlorides. The polymer

from which the pipe compounds are to be manufactured shall have chlorine content not less than 66.5%.

- The internal and external surfaces of the pipe shall be smooth, clean and free from grooving and other defects. The pipes shall not have any detrimental effect on the composition of the water flowing through it.

### **Fittings**

- The fittings shall be as follows: (a) Plain CPVC solvent cement fittings from size 15 mm to 160 mm. (b) Brass threaded fittings. (c) Valve from size 15 mm to 160 mm (d) Brass Threaded Fittings: All types of one end brass threaded male/female adaptors in various fittings like coupler, socket, elbow, tee are available for transition to other plastic/metal piping and for fixing of CP fittings. Ball, Gate valves in CPVC are available in all dimensions. All fittings shall carry the following information: (1) Manufacturer's name/trade mark. (2) Size of fitting

### **INSTALLATION GUIDELINES**

- Visually inspect pipe ends before making the joint. Use of a chamfering tool will help identify and crakes, as it will catch on to any crack.
- Pipe may be cut quickly and efficiently by several methods. Wheel type plastic tubing cutters are preferred. Ratchet type cutter or fine tooth saw are another options. However, when using the ratchet cutter be certain to score the exterior wall by rotating the cutter blade in circular motion around the pipe. Do this before applying significant downward pressure to finalize the cut. This step leads to a square cut. In addition, make sure ratchet cutter blades are sharp. Cutting tubing as squarely as possible provides optimal bonding area within a joint.
- Burrs and filings can prevent proper contact between the tube and fittings during the assembly, and should be removed from the outside and inside of the tube. A chamfering tool is preferred, but a pocket knife or file is also suitable for this purpose
- Use only CPVC cement jointing. Use CPVC cement, which is fully recommended by the manufacturer.
- When using adhesive solution/solvent cement be certain of proper ventilation
- When making a join, apply a heavy, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged waterways. Do not allow excess cement to puddle in the fitting and pipe assembly. This could result in a weakening of the pipe wall and possible pipe failure when the system is pressurized.
- Rotate pipe one-quarter to one-half turn while inserting it into the fitting socket and remove the excess adhesive solution/solvent cement from the joint with clean rag.



- When making a transition connection to metal threads, use a special transition fitting or CPVC male threaded adapter whenever possible. Do not over-torque plastic thread connections. Hand tight plus one-half turn should be adequate.
- Hang or strap CPVC systems loosely to allow for thermal expansion. Do not use metal straps with sharp edges that might damage the tubing.
- CPVC stub outs for lavatories, closets and sinks are appropriate. However, on areas where there is a likelihood that movement or impact abuse will occur, metal pipe nipples may be amore appropriate stub-out material. Showerheads, tub spouts and outside still cocks are examples.
- When connected to a gas water heater, CPVC tubing should not be located within 50 cm of the flue. For water heaters lacking reliable temperature control, this distance may be increased up to 1 m a metal nipple or flexible appliance connector should be utilized. This measure eliminates the potential for damage to plastic piping that might result from excessive radiant heat from the flue

### Piping Installation Support and Spacing

#### Concealed Piping:

- Pipes can be concealed in chases. The pipes and fitting are to be pressure tested prior to concealing the chases. To maintain alignment of CP fittings while joining, all alignment of fittings and pipe shall be done correctly. **DO NOT USE NAILS FOR HOLDING OF PIPES IN THE CHASES.**

#### External Installations:

- For pipes fixed in the shafts, ducts etc. there should be sufficient space to work on the pipes. Pipes sleeves shall be fixed at a place the pipe is passing through a wall or floor so as to allow freedom for expansion and contraction. Clamping of the pipe is done to support it while allowing the freedom for movement.
- All pipes exposed to sunlight shall be painted with a water based acrylic paint emulsion to enhance UV protection. Pipes in trenching shall be laid in accordance to the Good Plumbing practices followed for Metal piping.

Recommended Support Spacing (Distance between Pipe Clamps Horizontal Support)

Pipe Size	Horizontal Support (In meters)			
	Temperature			
	23°C	38°C	60°C	82°C
16 mm (1/2")	1.22	1.22	1.07	0.92
20 mm (3/4")	1.53	1.37	1.22	0.92
25 mm (1/0")	1.68	1.3	1.37	0.92
32 mm (1 1/4")	1.83	1.68	1.53	1.22

40 mm (1 1/2")	1.98	1.83	1.68	1.22
50 mm (2")	2.29	2.14	1.98	1.22

### Testing

All water supply systems shall be tested to hydrostatic pressure test. The pressure tests are similar to the test pressure used for other plastic/metal pipes. System may be tested in sections and such section shall be entirely checked on completion of connection to the overhead tank or pumping system or mains.

### Measurements

The net length of pipes as laid or fixed shall be measured in running meters correct to a cm for the finished work, which shall include CPVC pipe and fittings including plain and Brass threaded fittings and jointing solvent cement.

### Standards & Specifications

- IS 15778: Standard Specification for CPVC pipes for Hot and Cold Water Supplies – Specification
- ASTM D1784: Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and (Chlorinated Poly Vinyl Chloride) (CPVC) Compounds
- ASTM D2846: Specification for (Chlorinated Poly Vinyl Chloride) (CPVC) Plastic Hot & Cold water distribution systems
- ASTM F493: Standard Specification for Solvent Cements for (Chlorinated Poly Vinyl Chloride) (CPVC) Plastic Pipe & Fittings
- ASTM F441: Standard Specification for (Chlorinated Poly Vinyl Chloride) (CPVC) Plastic Pipe, SCH 40 & 80
- ASTM F438: Socket- Type Chlorinated Polyvinyl Chloride Plastic Pipe Fittings. Schedule 40
- ASTM F439: Socket-Type Chlorinated Polyvinyl Chloride Plastic Pipe Fittings. Schedule 80
- ASTM D2774: Underground installation of Thermoplastic pipes

### NSF Approved

- NSF International, a not-for-profit and non-governmental **organization**, is the world leader in standards development, product certification, education and risk management for public health and safety ([www.nsf.org](http://www.nsf.org)). Astral is the first Indian company to obtain approval from NSF for its CPVC product.

### Density:

- When tested in accordance with IS 12235 (Part 14), the density of the pipes shall be between 1450kg/m<sup>3</sup> and 1650kg/m<sup>3</sup>.

### Pipe Ends

- The ends of the pipes meant for solvent cementing shall be cleanly cut and shall be reasonably square to the axis of the pipe or may be chamfered at the plain end.

**Effect on Water:**

- The pipes shall not have any determinate effect on the composition of the water flowing through them, when tested as per 10.3 of IS 4985.

**Hydrostatic Characteristics:**

When subject to internal hydrostatic pressure test in accordance with the procedure given in IS 12235 (part 8/Sec 1), the pipe shall not fail during the prescribed test duration. The temperatures, duration and hydrostatic (hoop) stress for the test shall conform to the requirements given in Table 18.17. The test shall be carried out not earlier than 24 h after the pipes have been manufactured.

**Specifications:**

- CPVC PRO pipes and fittings are made from CPVC compound which meets cell class DP 110-2-3-2 as per IS 15778
- It has a maximum service temperature up to 93°C
- It has highest impact resistance without any loss in pressure bearing capacity / tensile strength or vicat softening temperature

**Available Sizes**

- SDR 11 & SDR 13.5: 1.5cm (½") to 5.0cm (2") CTS – confirming to IS 15778:2007, as per ASTM D2846
- SCH 40: 6.5cm (2½") to 10.0cm (4") IPS, as per ASTM F441 & ASTM F438
- SCH 80: 6.5cm (2½") to 30.0cm (12") IPS, as per ASTM F441 & ASTM F439

**Item No:4**

**Providing and fixing floor mounted Water Closet size 550 x 365 x 390mm including flushing system set soft seat cover P trap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement: 1 fine sand), making leakage proof of all fittings (i) in white color. make - UFC JAQUEL- floor mounted ewc P trap - 5201 or equivalent as approved and selection by architect.**

**Materials:**

- Water closets shall be of white vitreous china conforming to IS 2556 (Part-1) and 2556 (Part-2), as specified and shall be of "Wash down type". The closets shall be of 635x360x730 or equivalent. The closets shall be of **one-piece** construction. Each water closet shall have not less than two holes having a minimum diameter of 6.5 mm for fixing to floor and shall have an integral flushing rim of suitable type. It shall also have

an inlet or supply horn for connecting the flushing pipe of dimensions as per **product**. the flushing rim may be boxed or open type. In the case of box rims adequate number of holes, on each side together with a slot opposite the inlet shall be provided. The flushing rim and inlet shall be of the **self-draining** type. The water closet shall have a weep hole at the flushing inlet. Each water closet shall have an integral trap with either 'S' or 'P' outlet with at least 50 mm water seal. For P trap, the slope of the outlet shall be 14 deg. below the horizontal. Where required the water closet shall have an anti siphonage 50 mm dia vent horn on the outlet side of the trap with dimension conforming to those given in Fig. 17.22 and on either right or left hand or **center** as specified set at an angle of 45 deg. and invert of vent hole not below the central line of the outlet. The inside surface of water closets and traps shall be uniform and smooth in order to enable an efficient flush. The serrated part of the outlet shall not be glazed externally. The water closet, when sealed at the bottom of the trap in line with the back plate, shall be capable of holding not less than 15 litres of water between the normal water level and the highest possible water level of the water closet as installed.

#### Workmanship:

- Water Closet shall be fixed to the floor by means of 75 mm. long 6.5 mm. diameter counter sunk bolts and nuts embedded in the floor concrete using rubber or **fiber** washers so as not to allow any lateral displacement. The joint between the trap of W. C. and soil pipe shall be made with C.M. 1:1(1 cement: 1 fine sand).
- Any damage caused to the building, or to electric, sanitary, water supply or other, installations etc. therein, either due to negligence on the part of the contractor, or due to actual requirements of the work, shall be made good and the building or the installation shall be restored to its original condition by the contractor. Nothing extra shall be paid for such restoration works except where otherwise specified.
- For making good the damage to the under mentioned items of work, the specifications as given in the following paras shall apply, unless directed otherwise.

#### Mode of measurements & payment:

- The rate shall include the cost of all labour for fixing pans and seat and cover, inlet, connections etc. complete including testing the same. The payment of seat and cover, **traps**, cement mortar, fitting **accessories shall** not be made **separately**. The rate shall be for a unit of one number.

#### Item No:5

Providing and fixing wall mounted **wash basin 400 x 550 x 130mm with** integrated **pedestal white having 35 mm C.P. brass pillar tap** hole, fixing to the wall using with SS rag bolts & suitable accessories **making good the walls wherever** require: including 32mm Brass Full

**Thread Waste Coupling 3", White Vitreous China wash basin size 535x400 mm with single hole, make UFC JAQUEL-WALL HUNG BASIN 5504 - WHITE, waste coupling-100**

**Materials:**

- Wash **Basins shall** be of white vitreous china conforming to IS 2556 (Part-I) and IS 2556 (Part-4). Wash basins either of flat back or angle back as specified shall be of **one-piece** construction, including a combined overflow. All internal angles shall be designed so as to facilitate cleaning. Each basin shall have a rim on all sides, except sides in contact with the walls and shall have a skirting at the back. Basins shall be provided with single or double tap holes as specified. The tap holes shall be 28 mm square or 30 mm round or 25 mm round for pop up hole. A suitable tap hole button shall be supplied if one tap hole is not required in installation. Each basin shall have circular waste hole to which the interior of basin shall drain. The waste hole shall be either rebated or beveled internally with dia meter of 65 mm at top. Each basin shall be provided with a non-ferrous 32 mm waste fitting. Stud slots to receive the brackets on the underside of the wash basin shall be suitable for a bracket with stud not exceeding 13 mm diameter, 5 mm high and 305 mm from the back of basin to the **center** of the stud. The stud slots shall be of depth sufficient to take 5 mm stud. Every basin shall have an integral soap holder recess or recesses, which shall fully drain into the bowl. A slot type of overflow having an area of not less than 5 sq. cm, shall be provided and shall be so designed as to facilitate cleaning of the overflow. Where oval shape or round shape wash basins are required to be fixed these shall be fixed preferably in RCC platform with local available stone topping either fully sunk in stone top or top flush with the stone topping as directed by Engineer-in-Charge. (a) Flat back: (b) Angle back: White glazed pedestals for wash basins, where specified shall be provided. The quality of the glazing of the pedestal shall be exactly the same as that of the basin along with which it is to be installed. It shall be completely recessed at the back to accommodate supply and waste pipes and fittings. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from the floor to top of the rim of basin 75 to 80 cm All the waste fittings shall be brass chromium plated, or as specified.

**Waste Fittings for Wash Basins and Sinks.**

- The waste fittings shall be of nickel chromium plated brass, with thickness of plating not less than service grade 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect to IS 2963 and shall be sound, free from laps, blow holes and fittings and other manufacturing defects. External and internal surfaces shall be clean and smooth. They shall be neatly dressed and be truly machined so that the nut smoothly moves on the body. Waste fitting for wash basins

shall be of nominal size of 32 mm. Waste fittings for sinks shall be of nominal size 50 mm

#### Fixing

- The installation shall consist of an assembly of wash basin, integrated half pedestal of **same rag bolts**, C.P. brass or P.V.C. waste coupling and waste pipe union, as specified. The wash basin shall be provided with one or two 15 mm C.P. brass pillar tap **hole**, as specified. The height of top of the rim of wash basin from the floor level shall be within 750 mm to 800 mm. or shall be confirming to the NBC standards.
- The basin shall be fixed on wall SS rag bolt of same brand of basin conforming to IS 775 and be embedded in cement concrete (1:2:4) block 100 x 75 x 150 mm. The wall plaster on the rear shall be cut to rest over the top edge of the basin so as not to leave any gap for water to seep through between wall plaster & skirting of basin. After fixing the basin, plaster shall be made good and surface finished matching with the existing one. S.C.I. floor traps conforming to IS 1729 having 50 mm water seal (minimum 35 mm in two pipe systems with gully trap) should be used. Waste pipes laid horizontally should have gradient not flatter than 1 in 50 and not steeper than 1 in 10. The waste water from wash basin shall be discharged directly to vitreous semi-circular open drain, discharging to a floor trap and finally to the vertical stack on upper floors and in case of ground floor, the waste water shall be discharged either directly to the gully trap or through the floor trap C.P. brass trap and union are not to be used in such situations.
- If waste pipe is concealed or crosses the wall, waste water shall be discharged through nonferrous trap like PVC Engineering plastic or C.P. brass and union (Fig. 17.17) to vertical stack. The C.P. brass trap and union shall be paid for separately. Where so specified a 20 mm G.I. puff pipe terminating with a perforated brass cap screwed on it on the outside of the wall or connected to the anti-syphon stack shall be provided.

#### Measurements

- Wash basins shall be measured in numbers.

#### Rate

- The rate shall include the cost of all the materials comes with **kit fixing** accessories, and connection to waste coupling and **urinal &** drainage line and labor involved in all the operations described above.

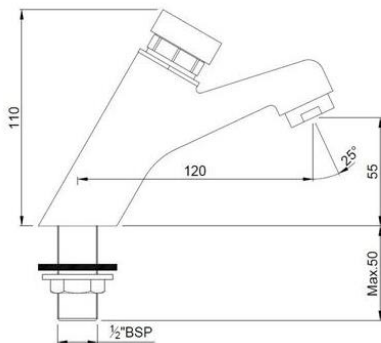
#### Item No:6

Providing and fixing Brass pressmatic auto closing Pillar Faucet with push type knob,  $7.5 \pm 2.5$  second flow time with base flange, integrated honeycomb structured aerator, plastic cartridge in mirror polished chrome to the wash basin and connected to the supply line complete with required fittings, for utility area basins, of approved quality and conforming to Manufacturers Standards. make UFC JAQUEL- PRESSMATIC PILLAR COCK-602 or equivalent as approved and selection by architect.

### Pressmatic Pillar Taps

- Each tap in this range **shall incorporate** a self-cleaning mechanism that prolongs the working life of the tap and reduces the likelihood of maintenance work being required. **Pressmatic pillar** taps are supplied with either push button or lever activation, are Water Mark certified and provide industry-leading water saving benefits. Manufactured from DR brass and heavy duty in construction, these taps can withstand high degrees of wear and tear.
- Pressmatic Pillar taps shall be **having 4 liters** per minute flow regulators and easy push operation **mechanism chromium** plated brass and shall conform to IS 1795. The nominal sizes of the pillar tap shall be 15 mm or 20 mm as specified. The nominal size shall be designated by the nominal bore of the pipe outlet to which the tap is to be fitted. Finished weights of 15 mm and 20 mm pillar taps shall be as prescribed in Table 17.2.

Particulars	Weights in gms	
	15 mm size	20 mm size
Body	255	505
Washer plate	15	28
loose valve	40	50
Back nut Tap	650	1175



- Casting shall be sound and free from laps, blow hole and pitting. External and internal surfaces shall be clean, smooth and free from sand and be neatly dressed. The body, bonnet and other parts shall be machined true so that when assembled, the parts shall be axial, parallel and cylindrical with surfaces smoothly finished.
- The area of waterway through the body shall not be less than the area of the circle of diameter equal to the bore of the seating of the tap. The seating of pillar tap shall be integral with the body and edges rounded to avoid cutting of washer. Pillar taps shall be nickel chromium plated and thickness of coating shall not be less than service grade No. 2 of IS 4827 and plating shall be capable of taking high polish which shall not easily tarnish or scale.
- Every pillar tap, complete with its component parts shall withstand an internally applied hydraulic pressure of 20 Kg/sq. cm maintained for a period of 2 minutes during which period it shall neither leak nor sweat.

### Specification:

- in-built self-cleaning mechanism

- Push button and lever action models
- Water Mark certified
- Industry-leading water saving benefits
- Can't be left running after use
- Robust construction
- $\pm 2.5$  second flow time
- Push-button **shall activate flow** with automatic shut-off after 7.5 sec or equivalent

Workmanship:

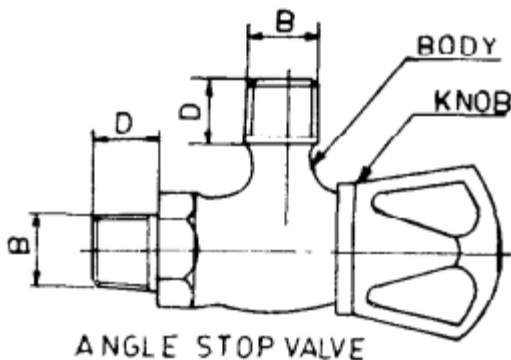
- Pressmatic pillar tap of specified dia. shall be fixed as directed with required washer of selected leather or rubber asbestos composition or of plastic as directed. The cock shall have fixed with pipe line with white zink end spun yarn to make joint water light. The work shall be carried out in best workman like manner.

Mode of measurements & payment:

- The rate includes cost of all labour, materials lolls and plant etc. required for satisfaction completion of this item. The rate shall be for a unit of one number.

Item No:7

Providing, fixing and testing and commissioning of 15mm CP brass angle cock with brass wall flange & quarter turn lever operating knob, with ceramic spindle complete as per drawing and details. (for wash basin control valves make UFC JAQUEL- antique ANGULAR STOP COCK-1804 or equivalent as approved and selection by architect.



CP BRASS ANGLE VALVE

- Casting shall in all respects, be sound and free from defects like laps, blowholes and pitting. External and internal surfaces shall be clean, smooth and free from sand. They shall be neatly dressed and no casting shall be burned, plugged stopped and patched.
- Forging shall be sound without any lamination; smooth and well finished. The body, bonnet, spindle and other parts shall be machined true, so that when assembled, the parts shall be axial parallel and cylindrical, with surface smoothly finished within the limits of dimensions specified for various components.
- The inlet and outlet connection threads whether internal or external, shall be a pipe thread conforming to either IS 554:1985 or IS 2643 (Part 1 to 3): 1975. This requirement does not apply to single hole combination tap assembly. The threads on the spindle shall be trapezoidal or square conforming to IS 7008 (Parts 1 to 4): 1988 and IS 4694: 1968



respectively. The length of spindle threads shall be such that when the washer plate is resting on the seating without any washer, a length of thread equal to not less than 50 percent of the external diameter of the threaded portion of the spindle shall be in full engagement with the internal thread of the washer plate.

Sl No.	Component	Material	Indian Standard
1.	Body, body components, inlet tubes, nozzle, bonnet and back nuts	a) Cast brass	Grade CB 2 of IS 292 : 1983
		b) Die cast brass*	Grade DCB2 of IS 1264 : 1989
		c) Forged brass	Grade FIB of IS 6912 : 1985
		d) Leaded tin bronze	Grade LTB 2 of IS 318 : 1981
		e) Brass rods	Type 1 Half hard of IS 319 : 1989
		f) Brass tubes	IS 497 : 1981
		g) Copper tubes	Soft, annealed IS 10773 : 1983
2.	Flanges	a) Cast brass	Grade LCB 2 of IS 292 : 1983
		b) Die cast brass*	Grade DCB2 of IS 1264 : 1989
		c) Forged brass	Grade FLB of IS 6912 : 1985
		d) Leaded tin bronze	Grade LTB 2 of IS 318 : 1981
		e) Brass rods	Type 1 Half hard of IS 319 : 1989
		f) Brass sheet	Grade CuZn 37 of IS 410 : 1977
3.	Spindle, glands, washer plate, nuts, screws and pin	a) Brass rods ( Extruded or rolled )	Type 1 Half hard of IS 319 : 1989
		b) Forged brass	Grade FLB of IS 6912 : 1985
4.	Circlip, wire locks	a) Phosphor bronze sheet	Grade 111 HE of IS 7814 : 1975
		b) Phosphor bronze wire	IS 7608 : 1987
		c) Stainless steel	Grade I of IS 4454 ( Part 4 ) : 1975
5.	O ring	a) Synthetic rubber	IS 9975 ( Parts 1 to 4 ) : 1981
6.	Gasket and seat washer	a) Acrylo Nitrille butadiene rubber	
		b) Neoprene rubber	
		c) Synthetic butadiene rubber ( S.B.R. )	Grade 5 of IS 7450 : 1974
7.	Knob, knob components, divertor and divertor components	a) Cast brass	Grade LCB 2 of IS 292 : 1983
		b) Die cast brass*	Grade DCB 2 of IS 1264 : 1989
		c) Forged brass	Grade FLB of IS 6912 : 1985
		d) Leaded tin bronze	Grade LTB 2 of IS 318 : 1981
		e) Brass rods	Type 1. Half hard IS 319 : 1989
		f) Zinc base alloys	IS 742 : 1981
		g) Plastics	Polyacetal, Polypropylene, ARS ( Acrylo Nitrille - Butadiene Styrene), Acrylics - Polymethyl - Methacrylates, Nylon - Polymides

\*Conformity only with chemical composition to comply with.

#### Workmanship:

The brass angle stop valve 15 mm. dia. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine-spun yarn round the screwed end of the angle cock. The valve shall be fixed to water tight position.

#### Mode of measurements & payment:

The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Item No:8**

**Providing and fixing 15MM brass 2-way Bib cock with wall flange and aerator, quarter turn lever operating knob, with ceramic spindle, in mirror polished chrome, connected to the supply line complete. with required fittings, for utility area wc , of approved quality and conforming to Manufacturers Standards.**

**make UFC JAQUEL- antique BIB COCK-1801 or equivalent as approved and selection by architect.**

**Materials**

- 15 mm. dia. 2-way brass with bright polished chrom finish shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

**Workmanship:**

- The 2-way bib cock 15 mm. dia. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine spun yarn round the screwed end of the pipe. The bib cock shall be than screwed and fixed to water tight position

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. 3.2. The rate shall be for a unit of one number.

**Bib cock and stop cock:**

- A bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipe line for controlling or stopping the flow.
- They shall be of lever operated quarter turn with 2-way nozzle and aerator type and of brass chromium plated and of diameter as specified in the description of the **item**.
- They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished bright.

**The minimum finished weight of bib cock and stop cock shall be as given below:**

<b>Diameter</b>	<b>Bib cock</b>	<b>Stop cock</b>	<b>Diameter</b>	<b>Bib cock</b>	<b>Stop cock</b>
8 mm	0.25 Kg.	0.25 Kg.	15 mm.	0.40 Kg.	0.40 Kg.
10 mm.	0.30 Kg.	0.35 Kg.	20 mm.	0.75 Kg.	0.75 Kg.

**Item No: 9**

**Metropole Flush valve concealed push type (dual flush 40 mm) in mirror polished chrome, with wall flange, with required fittings, of approved quality and conforming to Manufacturers**

**Standards. make UFC JAQUEL-metropole dual flush -513 - or equivalent or as approved and selection by architect.**

- Metropole Flush valve concealed push type (dual flow)40 mm (1.5") of jaquel or similar CP brass external body & brass conceal body

Workmanship:

- These shall be of CP / sanitary ware. The make and model shall be as specified in the BOQ. These shall be fixed by means of stainless steel screws to wooden / plastic cleats firmly embedded in the wall.
- The work is done with all labour and material required with fittings to complete the item. No any extra payment shall be made to require another item if required to complete the set in working condition as providing and fixing. Finishing work shall be of super fine class. In this work rate is for with all lead and lift up to all floors.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

Item No:10

**Providing, stop cock consisting sleeve, lever, flange and concealed part suitable for 25 mm pipeline with inner head all fittings complete as per specification/drawings and details. make UFC JAQUEL-stop cock 20 mm -1822 or equivalent as approved and selection by architect.**

Materials

- 25 mm. dia. Stop cock with lever operated quarter turn knob with bright polished chrome finish shall conform to I.S. 781-1977. The bib cock shall be best Indian make and quality.

Workmanship:

- The stop cock 25mm. dia. as specified above conceal brass body shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine spun yarn round the screwed end of the pipe. The bib cock shall be than screwed and fixed to water tight position

Mode of measurements & payment:

- The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

Item No:11,11.1

**Providing, Installation, testing & commissioning of heavy quality brass drain Valve screw down type of 40 mm size with screwed/flanged ends, factory tested, etc. complete as per**

**specification and to the satisfaction of Project Manager. (Water Supply Riser) for all depth/ heights and lead. make zoloto/Honeywell, JAQUEL or equivalent as approved and selection by architect.**

**40mm**

**32mm**

**Materials:**

- The drain screw down valve be of approved quality. shall be of gate valve opening full way and of the size as specified. These shall conform to I.S. 778-1971. valve shall be of tested quality

**Workmanship:**

- 40mm Drain Valves should be installed in true tolerance of +/-5mm with respect to the center line of the pipe. Where threaded joints are encountered the threads should be initially sealed with UPVC tape to avoid leakage due to improper tightening and leakage from threading. Proper care has to be taken in welded installation so that the centerline of valve should not deviate from the pipe causing uneven load on the pipe and further stress during its operation. The welding should be done only after proper inspection of the joint by the Client/PMC/Consultants in the tacked position of the joint. Before putting the line in operative mode the valves should be checked for free and easy operation of the hand wheel. Any burrs or foreign materials should be removed by flushing before final operation so that no choking in the valves should occur which might damage the valve seating.

**Mode of measurements & payment:**

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item. 3.2. The rate shall be for a unit of one number.

**Item No:12**

**Providing and Fixing flush valve 25mm with round flange for urinal with GI inlet connection pipe & Urinal spreader with necessary bolt washers, make Cera or equivalent make JAQUEL elite spreader 360 & metropole 501 or equivalent as approved and selection by architect.**

**Material**

- Metropole Flush valve concealed push 25mm of jaquel or similar cp brass external body & brass conceal body
- **Workmanship:**
- These shall be of CP / sanitary ware. The make and model shall be as specified in the BOQ. These shall be fixed by means of stainless steel screws to wooden / plastic cleats firmly embedded in the wall.

- The work is done with all labour and material required with fittings to complete the item. No any extra payment shall be made to require another item if required to complete the set in working condition as providing and fixing. Finishing work shall be of super fine class. In this work rate is for with all lead and lift up to all floors.
- **Mode of measurements & payment:**
- The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Item No:13**

Providing and Fixing Soap Dish in Polished chrome of approved make and conforming to Manufacturers Standards. As per approved and selection by architect/consultant make UFC JAQUEL-soap dish -113 or equivalent as approved and selection by architect.

**Materials:**

- The Soap dish shall be of approved type as specified in the BOQ. It shall be made up of ABS plastic / CP material.
- Selection of high quality Brass Polished Chrome Finish, surface smooth level off, ensuring quality and longevity, Never Rust even in bathroom wet environments for long. The soap dish for the bathroom has a practical drainage hole on its surface, which helps excess water to run off and dry faster. Modern Look with Concealed Screws Design Fits Well in Different Styles. Color: Bright Silver Chrome

**Workmanship:**

- The soap dish in polished chrome as specified above shall be fixed as directed. The installation of the dish would be on the wall tiles of the washrooms. Proper machines and instruments should be used such that no tiles should be damaged. The product shall be screwed tight to the wall.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Item No: 14**

**Providing and fixing 450mm Long Braided Hose pipe with M10X1 Nipple, 15mm Nut, O-Ring & Rubber Washer (Suitable for Wash Basin, Kitchen Sink etc) of approved make and conforming to Manufacturers Standards. make UFC JAQUEL or as approved and selection by architect.**

**Materials:**

Hose pipe The make and model shall be as specified in the BOQ.

**Workmanship: -**

These shall be fixed by means of 15 mm nuts, washers and ring connected to the pillar cock and angle cock. The pipe shall be than screwed and fixed to water tight position.

**Mode of measurements & payment:**

The rate shall include the cost of all the materials, fixing accessories, and connection to pillar cock and angle cock and labor involved in all the operations described above.

**Item No: 15**

**Providing and fixing CP Brass Bottle Trap (Silver) Bottle Trap with 12" pipe of same of approved quality & make and make UFC JAQUEL-bottle trap -5914 or equivalent as approved and selection by architect.**

**Materials:**

- The chromium plated bottle trap shall be of approved make and of best quality. The bottle trap shall be provided with coupling.

**Workmanship:**

- The bottle trap shall be fixed on hand wash basin with wooden gullies and screws as directed. The work shall be carried out in best workman like manner.

**Mode of measurements & payment:**

- The rate includes cost of all materials and labour involved for satisfactory completion of this item. The rate shall be for a unit of one number.

**Item No: 16**

**Providing and fixing Flexible pipe 32MM DIA P.V.C. waste pipe 1.5 mtr long for sink or wash basin or urinal including P.V.C. waste fittings complete make UFC JAQUEL or equivalent as approved and selection by architect.**

**Materials:**

- Flexible PVC waste 1.5 mtr long pipe The make and model shall be as specified in the BOQ.

**Workmanship: -**

- PVC waste pipe which shall be suitably bent towards the wall and shall discharge into a floor trap. C.P. brass trap and union and waste shall be paid separately.

**Mode of measurements & payment:**

- The rate shall include the cost of all the materials, fixing accessories, and connection to float trap and drainage outlet from urinal or washbasin and labor involved in all the operations described above.

**Item No: 17**

**Providing, fixing and testing and commissioning of Health faucet with full CP brass body with 1 metre PVC Silver foil connection pipe & full brass stand with all fittings complete as per specification/drawings and details. As per approved and selection by architect/consultant - make UFC JAQUEL-bidet spray -251**

- These shall be of CP / sanitary ware. The make and model shall be as specified in the BOQ. These shall be fixed by means of stainless steel counter sunk screws to wooden/plastic cleats firmly embedded in the wall. 15 mm CP health faucet with 1.0m long flexible tube with end nuts & Hook. 1 No 15mm CP brass angular stop cock with wall flange Hook with CP brass counter sunk screws.

**Mode of measurements & payment:**

- The rate shall include the set of all the brass stand, connection with 2-way bib cock and tube as mentioned in BOQ. and labor involved in all the operations described above.

**Item No: 18**

**Providing and fixing C.P. Full brass towel ring complete with C.P. brass brackets fixed to wooden plugs with C.P. brass screws. make UFC JAQUEL-towel ring -110 or equivalent as approved and selection by architect.**

- The towel rail shall be of CP BRASS as specified and as per direction of Architect -in-charge.  
INSTALLATION OF TOWEL RING
- It shall be fixed in position by means of C.P. brass screws on wall surface by S.S dash fasteners, firmly embedded in wall.

**Measurements**

- Towel ring shall be measured in numbers.

**Rate**

- Rate shall include the cost of all the materials and labour involved in all the operations described above.

**Item No: 19**

**Providing and fixing plain spigot type FLOOR trap high riser size 110x75mm OR according to pipe outlet size and inlet size, of self-cleansing design with screwed down or hinged square jali 110x110mm with vent arm complete, including cost of cutting and making good the surfaces and floors make ASTRAL – SILENCIO**

**Materials:**

- High density low noise multi-layer fittings Spigot Type Floor drains of self-cleansing design with water seal not less than 35 mm. shall of make and size mentioned in BOQ with grating of size same as mentioned.

**Workmanship:**

- Both the inner and outer surfaces of the fitting shall be cleanly finished, smooth and free from grooving, blistering or other deleterious defects, when viewed without magnification. Each end of the fitting shall be free from chips and rough edges, and shall be square to the axis of the approximate line.
- Fittings conforming to IS 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. For other details refer the item description.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tolls and plant required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Specification:**

- **External Layer – PP:** The tough protective shell of the pipe is sturdy and highly impact resistant
- **Middle Layer – Mineral Reinforced PP:** Mineral-reinforced plastic provides very high stability and establishes superior noise insulating effect
- **Internal Layer – PP:** Provides a superior flow performance with its smooth structure, with resistance against high water temperature
- multilayered fittings
- having push fit socket with special ring
- threaded door fitting with additional internal door cap
- spigot area shall have stopper mark called depth gauge
- shall have swept gauge to incorporated to ensure smooth flow
- external ribs on outer side of the socket to provide extra strength to socket

**Item No: 20**

**Providing and fixing MULTI FLOOR trap size 110X75X50 mm spigot type OR according to pipe outlet size and inlet size & number of connection of self-cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making**



**good the walls and floors make ASTRAL - SILENCIO or equivalent as approved and selection by architect.**

**Materials:**

- High density low noise multi-layer fittings MULTI Floor spigot type 75 mm W.S drains of self-cleansing design with water seal not less than 35 mm. shall of make, size, and material mentioned in BOQ with grating of size same as mentioned.

**Workmanship:**

- Both the inner and outer surfaces of the fitting shall be cleanly finished, smooth and free from grooving, blistering or other deleterious defects, when viewed without magnification. Each end of the fitting shall be free from chips and rough edges, and shall be square to the axis of the approximate line.
- Fittings conforming to IS 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. For other details refer the item description.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tolls and plant required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Specification:**

- **External Layer – PP:** The tough protective shell of the pipe is sturdy and highly impact resistant
- **Middle Layer – Mineral Reinforced PP:** Mineral-reinforced plastic provides very high stability and establishes superior noise insulating effect
- **Internal Layer – PP:** Provides a superior flow performance with its smooth structure, with resistance against high water temperature
- multilayered fittings
- having push fit socket with special ring
- threaded door fitting with additional internal door cap
- spigot area shall have stopper mark called depth gauge
- shall have swept gauge to incorporated to ensure smooth flow
- external ribs on outer side of the socket to provide extra strength to socket

**Item No: 21**

**Providing and fixing NHANI trap size 110X75 mm OR according to pipe outlet size and inlet size & number of connection of self-cleansing design with screwed down or hinged grating with or without vent arm complete, including cost of cutting and making good the walls and floors make ASTRAL - SILENCIO or equivalent as approved and selection by architect.**

**Materials:**

- NHANI TRAP drains of self-cleansing design with water seal not less than 35 mm. shall of make and size mentioned in BOQ with grating of size same as mentioned.

**Workmanship:**

- Both the inner and outer surfaces of the fitting shall be cleanly finished, smooth and free from grooving, blistering or other deleterious defects, when viewed without magnification. Each end of the fitting shall be free from chips and rough edges, and shall be square to the axis of the approximate line.
- Fittings conforming to IS 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. For other details refer the item description.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tolls and plant required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Specification:**

- **External Layer – PP:** The tough protective shell of the pipe is sturdy and highly impact resistant
- **Middle Layer – Mineral Reinforced PP:** Mineral-reinforced plastic provides very high stability and establishes superior noise insulating effect
- **Internal Layer – PP:** Provides a superior flow performance with its smooth structure, with resistance against high water temperature
- multilayered fittings
- having push fit socket with special ring
- shall have swept gauge to incorporated to ensure smooth flow
- external ribs on outer side of the socket to provide extra strength to socket

**Item No: 22**

**Providing and fixing 100 mm sand cast Iron grating for gully trap. make ASTRAL / ashirvad / prince - or equivalent as approved and selection by architect.**

- Gully traps shall conform to IS 651. These shall be sound, free from visible defects such as fire cracks, or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear tone when struck with light hammer. There shall be no broken blisters.
- Each gully trap shall have one C.I. grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 x 300 mm the cover weighing not less than 4.50 Kg and the frame not less than 2.70 Kg. The grating, cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

**Item No: 23 - 24**

**Providing & fixing PVC Cowl on PVC ventilating pipes and verticals for soil and waste Pipes & Rain water pipes at top level/ terrace level, as specified and required, etc. complete.**

**(A) 110 mm diameter**

**(B) 75mm diameter**

**make ASTRAL/ashirvad/prince - or equivalent as approved and selection by architect**

**Materials:**

- Vent cowls may be of suitable length with perforations/openings. The dimensions of wall thickness and socket depth may be as per Table below.

<b>Sl No.</b>	<b>Nominal Diameter mm</b>	<b>Socket Depth Min mm</b>	<b>Wall Thickness of Socket, Min mm</b>
<b>(1)</b>	<b>(2)</b>	<b>(3)</b>	<b>(4)</b>
i)	40 to 63	20.0	1.8
ii)	75 to 90	22.0	2.0
iii)	110 to 160	24.0	2.0

**Workmanship:**

- Both the inner and outer surfaces of the fitting shall be cleanly finished, smooth and free from grooving, blistering or other deleterious defects, when viewed without magnification. Each end of the fitting shall be free from chips and rough edges, and shall be square to the axis of the approximate line.

**Mode of measurements & payment:**

- The rate includes cost of all labour, materials, tolls and plant required for satisfactory completion of this item. The rate shall be for a unit of one number.

**Item No: 25**

**Re-fixing existing mirror to wooden cleats with new C.P. brass screws and washers complete**

- Fixing The mirror shall be mounted on backing with environmentally friendly material other than asbestos cement sheet shall be fixed in position by means of 4 C.P. brass screws and C.P. brass washers, over rubber washers and wooden plugs firmly embedded in walls. C.P. brass clamps with C.P. brass screws may be an alternative method of fixing, where so directed. Unless specified otherwise the longer side shall be fixed horizontally.

**Measurements**

- Fixing of existing Mirror shall be measured in numbers.

**Rate**

- Rate shall include the cost of all the materials used to fix existing mirror and labour involved in all the operations described above.

**Item No: 26**

**Dismantling sanitary fittings like wash basin. W. C. Pan Indian & European Type Flushing tank, etc. including stacking the materials with all lead and lift.**

**Workmanship:**

- The demolition shall consist of demolition of one or more parts of the building Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified in BOQ. The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Architect- in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition. Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property. 1.4. Wherever required, temporary enclosures or partitions shall also be provided. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary. 1.5. Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed. All materials obtained from demolition shall be the property of Government unless otherwise specified and shall be kept in safe custody until handed over to the Engineer-in-charge.

- Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed, with all lead and lift. All unserviceable materials, rubbish etc. shall be slacked as directed by the Engineer-in-charge. On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed
- The relevant shall be followed except that the dismantling work of sanitary fittings such as wash basin, W. C: Pan (all type of pans), flushing tanks etc. shall be carried out.

**Mode of measurements & payment:**

- The-rate shall be for a unit of one number.

**Item No: 27**

**Demolition of Brick work and stone masonry including stacking of serviceable materilas and disposal of unserviceable materials with all lead and lift. (ii) In Cement Mortar.**

**Workmanship**

- The relevant specifications of item No. 28 (I) shall be followed except the dismantling work of brick work and stone work is to be done.

**Mode of measurements & payment:**

- The relevant specifications of item No. 28 shall be followed except that the dismantling work of brick work and stone work shall be measured in this item. The rate shall be for a unit of one sq. meter.

**Item No: 28**

**Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20cm. in depth consolidating each dispoisited layer by ramming and watering**

**Workmanship**

- The earth to be used for. filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken. As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, brick bats, mortar dropping etc; and filled with earth in layers not exceeding 20 Cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow-bars, where rammer cannot be used. The plinth shall be similarly filled with earth in layers not exceeding 20 Cms. adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated. The finished level of filling shall be kept to shape intended to be given to floor. In case of large heavy duty flooring like factory flooring, the consolidation may

be done by power rollers, where so specified. The extent of consolidation required shall also be as specified. The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no 28 Circumstances black cotton soil be used for filling the plinth.

**Mode of measurement and payment:**

- The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above. The rate shall be for a unit of one cubic meter

**Item No: 29**

**Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material**

**Workmanship**

- The relevant specifications of item No. 28 (I) shall be followed except the dismantling stone slab flooring work is to be done.

**Mode of measurements & payment:**

- The relevant specifications of item No. 28 shall be followed except that the dismantling stone slab floor work shall be measured in this item. The rate shall be for a unit of one sq. meter.

**Item No: 30**

**Dismantling tile work in floors and roofs laid in cement mortar including stacking material within 50 meters' lead.**

**Workmanship**

- The relevant specifications of item No. 28 (I) shall be followed except the dismantling tile work is to be done.

**Mode of measurements & payment:**

- The relevant specifications of item No. 28 shall be followed except that the dismantling tile work shall be measured in this item. The rate shall be for a unit of one sq. meter.

**Item No: 31**

**Taking out existing wooden door shutter, repair by cutting, painting etc. and re-fixing of repaired door shutters to existing door frames, including replacement of hinges with screws, etc. as required, all complete as per the direction of the Engineer-in-charge.**

- Taking out existing wooden door shutter, repair by cutting, painting etc. and re-fixing of repaired door shutters to existing door frames, including replacement of hinges with screws, etc. as required, all complete as per the direction of the Engineer-in-charge.

**Mode of measurement and payment:**

- The payment shall be made for labor and material specified in BOQ. measurement shall be done in sq mtr rate.

**Item No: 32**

**Removing and scraping of old deteriorated plaster of any thickness from wall / R.C.C member including stacking of serviceable material and disposal of unserviceable from site of work with all lead and lift**

**Materials & Workmanship:**

- All loose pieces and scales shall be removed by sand papering and surface shall be cleared of all grease, dust, dirt, etc. on plastered wall surface. Where heavy scaling has taken place, the entire surface shall, be scrapped by means of steel scrappers so as to remove all accumulated old deteriorated plaster, & leaving clean surfaces. Necessary repairs to the scratches shall be made as directed. All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches

**Mode of measurements & payment**

- The rate shall be for a unit of one sq. meter.
- The rate shall include the cost of all materials, labor, scaffolding, protective measures etc. involved in all the operations described above. No deduction shall be made for attachment such as casing, conducts, pipe, electric wiring
- Area in individual items shall be worked out to the nearest 0.01 Sq. M.
- No deductions shall be made for ends of joints beams, posts etc

**Item No: 33**

**Dismantling C.I. or asbestos rain water pipe with fittings and clamps including stacking the material within 50 metres lead: 150 mm dia pipe**

**Workmanship**

- The relevant specifications of item No. 28 (I) shall be followed except the dismantling pipes work is to be done.

**Mode of measurements & payment:**

- The relevant specifications of item No. 28 shall be followed except that the dismantling pipe work shall be measured in this item. The rate shall be for a unit of one meter.

**Item No: 34**

**Cutting holes up to 15x15 cm in R.C.C. floors and roofs for passing drain pipe etc. and repairing the hole after insertion of drain pipe etc. with cement concrete 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.**

- This method involves drilling and testing cores from the concrete for determination of compressive strength. In suitable circumstances, the compressive strength of the concrete in the structure may be assessed by drilling cores from the concrete and testing. The procedure used shall comply with the requirements of IS 1199 and IS 516.
- The points from which cores shall be taken shall be representative of the whole concrete and at least three cores shall be obtained and tested. If the average of the strength of all cores cut from the structure is less than the specified strength, the concrete represented by the cores shall be liable to rejection and shall be rejected if a static load test (B-5) either cannot be carried out or is not permitted by the Engineer-in-Charge.
- specification for core cutting will be as per equipment used for making holes by service provider and relevant IS code will be followed.
- Waterproofing chemical - additive in mortars: 1 part Keraplast Eco P6: 3 parts cement  
Mortars to repair plasters/renders and cracks: damp the surface and apply a coat of modified mortar on the previously cleaned surface.
- Detail specification as per IS 2645 (2003): Integral Waterproofing Compounds for Cement Mortar and Concrete -Specification [CED 2: Cement and C Concrete]

**Item No: 35**

**Providing waterproofing treatment in two coats for sunken slab areas, bathrooms, balconies, chajjas, exposed roofs before laying of screeds, water tanks (underground or external), lift pits, after preparing and cleaning the surface The surface must be perfectly cured and dry, solid (i.e. free of weak or easily removable parts) and free from oil, grease, paint and de-bonding agent. The recommended mixing ratios are shall follows the manufacturers standard's or as indicated on packaging. Apply the first coat about 1 – 2 mm thick, pressing down to ensure maximum adhesion to the surface. Aqua stop AR1 mesh, submerge the reinforcing mesh fully in the first layer of freshly applied Aqua stop Nanoflex®, pressing down with the trowel. the second coat of Aqua stop Nanoflex®. Apply a continuous, even layer about 2 – 3 mm thick covering the surface completely. waterproofing with The subsequent fixing of the covering should be placed at least 24 hours after the last layer has been applied, using H40® Eco range eco-friendly mineral adhesive. mix should be lump free including cost of finishing, cleaning the surface before applying lead and lift, mixing procedure shall be as per manufacture's specification and architect in charge. make Aquastop Nanoflex® & Aqua stop AR1 mesh, or equivalent as approved and selection by architect.**

**Preparation of substrates**



- The surface must be perfectly cured and dry, solid (i.e. free of weak or easily removable parts) and free from oil, grease, paint and de-bonding agent. When working on weakened parts, when parts of the substrate are missing and also in the case of gravel beds, the substrate must be restored with suitable products. Correct uneven areas with suitable finishing products. On ceramic substrates all traces of surface treatments such as wax and oil must be removed. The most suitable cleaning methods are sandblasting, mechanical scarification or washing with detergents and jet washing. Before application damp absorbent surfaces without letting any stagnant water. Take due care to waterproof perimeter joints, expansion and desoliderisation joints using Aquastop 120 tape, bonded with Aquastop Nanoflex®. Use the special pieces to waterproof external angles, internal angles and connections to drains. Any structural joints must first be waterproofed. Preparation Prepare Aquastop Nanoflex® in a clean container by pouring in approximately ¾ of the water required. Gradually add Aquastop Nanoflex® to the container, mixing the paste from the bottom upwards with a low-rev (≈ 400/min) agitator. Add more water until the desired consistency is obtained. The mixture must be of smooth consistency and without any lumps. The amount of water to be added, indicated on the packaging, is an approximate guide. It is possible to obtain desired consistency of mixture according to the application demand.

#### **Application**

- Aquastop Nanoflex® should be applied with a brush or a plain trowel on a previously prepared surface. Apply the first coat about 1 – 2 mm thick, pressing down to ensure maximum adhesion to the surface. Once hardened and after removing any surface condensation, apply the second coat of Aquastop Nanoflex®. Apply a continuous, even layer about 2 – 3 mm thick covering the surface completely. When waterproofing with Aquastop AR1 mesh, submerge the reinforcing mesh fully in the first layer of freshly applied Aquastop Nanoflex®, pressing down with the trowel. The subsequent fixing of the covering should be placed at least 24 hours after the last layer has been applied, using H40® Eco range eco-friendly mineral adhesive. When working in low temperatures and with high humidity, the waiting time before laying will be longer. If rain falls on the product before it is fully hardened, check it is ready before applying the next coat/

#### **covering.**

- Cleaning Residual traces of Aquastop Nanoflex® can be removed from tools with plain water before the product hardens.

#### **Item No: 36**

#### **12 mm cement plaster of mix: 1:4 (1 cement: 4 fine sand)**

**Material:****CEMENT PLASTER**

- The cement plaster shall be 12 mm, 15 mm or 20 mm thick as specified in the item.

**Scaffolding**

- For all exposed brick work or tile work double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed.
- For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one meter in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.
- **Note:** In case of special type of brick work, scaffolding shall be got approved from Engineer-in-charge in advance.

**Preparation of Surface**

- The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.
- In case of concrete surface if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface.

**Mortar**

- The mortar of the specified mix using the type of sand described in the item shall be used. It shall be as specified in Subhead 3.0. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used

**Application of Plaster**

- Ceiling plaster shall be completed before commencement of wall plaster.
- Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15 × 15 cm shall be first applied, horizontally and vertically, at not more than 2 meters' intervals over

the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and sideways movements at a time. Finally, the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided.

#### **Thickness**

- Where the thickness required as per description of the item is 20 mm the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case of brick work, the minimum thickness over any portion of the surface shall be not less than 15 mm while in case of stone work the minimum thickness over the bushings shall be not less than 12 mm.

#### **Curing**

- Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered.

#### **Finish**

- The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

#### **Rate**

- The rate shall include the cost of all labour and materials involved in all the operations described above

#### **Item No: 37**

#### **12 mm cement plaster finished with a floating coat of neat cement of mix: 1:4 (1 cement: 4 fine sand)**

- The cement plaster shall be 12, mm thick, finished with a floating coat of neat cement, as described in the item.
- Specifications for this item of work shall be same as described in above item except for the additional floating coat which shall be carried out as below.
- When the plaster has been brought to a true surface with the wooden straight edge it shall be uniformly treated over its entire area with a paste of neat cement and rubbed smooth, so that the whole surface is covered with neat cement coating. The quantity of

cement applied for floating coat shall be 1 kg per sqm. Smooth finishing shall be completed with trowel immediately and in no case later than half an hour of adding water to the plaster mix. The rest of the specifications described in above item

**Item No: 38**

**6 mm cement plaster 1:3 (1 cement: 3 fine sand) finished on top on walls, R.C.C. slabs and beams.**

- The cement plaster shall be 6 mm thick, as described in the item.
- Specifications for this item of work shall be same as described in above item except for the thickness of plaster.

**Item No: 38.1**

**Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers make kerakall eco p6 or equivalent as approved and selection by architect**

- Water Proofing Compound Integral cement water proofing compound conforming to IS 2645 and of approved brand and manufacture, enlisted by the Engineer-in-Charge from time to time shall be used.
- The contractor shall bring the materials to the site in their original packing. The containers will be opened and the material mixed with dry cement in the proportion by weight, recommended by the manufacturers or as specifically described in the description of the item. Care shall be taken in mixing, to see that the water proofing material gets well and integrally mixed with the cement and does not run out separately when water is added.
- It shall be measured by weight.
- The rate shall include the cost of all labor and materials involved in all the operations described above.

**Item No: 39**

**Providing and injecting approved grout in proportion recommended by the manufacturer into cracks/honey-comb area of concrete/masonry by suitable gun/pump at required pressure including cutting of nipples after curing etc. complete as per directions of Engineer-in-Charge. (The payment shall be made on the basis of actual weight of approved grout injected.)**

- Providing and injecting approved grout in proportion recommended by the manufacturer into cracks / honey-comb area of concrete / masonry by suitable gun / pump at required pressure including cutting of nipples after curing etc. complete as per directions of Engineer-in-Charge. (The payment shall be made on the basis of actual weight of approved grout injected.)

**Rate**

- The rate shall include the cost of all labor and materials involved in all the operations described above

**Item No: 40**

**Providing and laying Ceramic glazed wall tiles of size 300x600 mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS: 15622, of approved make, in all colours, shades White, Ivory, Grey, Fume Red Brown or any laid on 20 mm thick bed of cement mortar 1:4 (1 Cement: 4 Coarse sand), excluding pointing the joints make tile AGL TILE 300X600 GVT or equivalent as approved and selection by architect**

**Material:**

**i) Water:**

- Water shall not be salty brackish and shall be clean reasonably clear and free objectionable quantities of silt and traces of oil injurious alkalis salts organic matter and other deleterious
- material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R.C.C container for transport storage and huddling of water shall be clean, Water shall conform to the standard specified in I S 455 -1978
- If required by the Engineer in charge it shall be tested by comparison with distilled water compression shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in I S 269-1976 Any indication of unsoundness charge in time of setting by 30 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- Water for curing mortar concrete or masonry should not be too acidic or too alkaline

**i) Cement**

- Cement to be used in the works shall be any of the following types with the prior approval of the Engineer:
  - a) Ordinary Portland cement, 33 Grade, conforming. to IS:269.
  - b) Rapid Hardening Portland Cement, conforming to IS:8041.
  - c) Ordinary Portland Cement, 43 Grade, conforming to IS:8112.
  - d) Ordinary Portland Cement, 53 Grade, conforming to IS:12269.
  - e) Soleplate Resistant Portland Cement, conforming to IS:12330.

**ii) Sand**

- Sand shall be natural sand, clean well graded, hard strong durable and gritty particular free from immures amounts of dust, clay, kankar modules, soft: or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of slit as determined by field test. if necessary the sand.
- Coarse Sand: The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand be as under:

I. S. Sieve Designation	% by wt. passing
4.75 mm	100
2.36mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100
300 MC	85 to 70
150 MC	00 to 50

FINE SAND: The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under:

IS. Sieve Designation	% by wt. passing
4.75 mm	100
2.3 6mm	. 100
1.18 mm	75 to 100
600 MC	40 to 85
300 MC	05 to 50
150 MC	00 to 10

**iii) Ceramic Tiles:**

- As per approved make by the consultant/architect/engineer. Ceramic glazed tiles 8 mm to 10 m thick 300x600mm size plane white or off white Shade.

**iv) White Cement:**

- White cement shall be of approved make it shall confirm definition of I S 8042 –E-1978 the sample of white cement shall be approved by Engineer in charge

**Workmanship:**

- First of all, surfaces shall be cleaned by thoroughly brooming and then by wire brushes. All the loose material dust and debris shall be removed thoroughly for the entire surface.
- All joints and cracks shall be racked off and cut in v trench which shall be filled by neat cement slurry admixed with water proofing compound The joints shall be racked up to 30 cm height and shall be applied by neat cement slurry admixed with water proofing compound

- Neat cement slurry shall be prepared and a water proofing compound of approved make shall be mixed with the slurry in proportion specified by the manufacturer of the compound and shall be laid throughout the surface by the use of brushes mala etc. Cement slurry shall be prepared by adding adequate quantity of water so as to spread it uniformly on the surface.
- After two days of proper curing applying a second coat of cement slurry on entire surface shall be finished with 20 mm thick Cement Mortar 1:6 (1cement: 6coarsesand) or Lime Mortar 1:1.5 (1lime: 1.5coarsesand) and vitrified granite tilling in true level and slope as directed by Engineer in charge & finally finishing the surface with trowel with white cement slurry.

**Item No: 41**

**Providing and laying anti-skid glazed vitrified floor tiles Size of Tile 600x600 mm size (thickness to be specified by the manufacturer) with water absorption less than 0.08% and conforming to IS: 15622, of approved make, in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement: 4 coarse sand), mixed with water proofing chemical compound excluding pointing the joints make tile AGL TILE 600X600 GVT or equivalent as approved and selection by architect**

- refer above specification accept for the glazed vitrified antiskid Tiles:
- 600 x 600mm white or off white shade as per approved make by the consultant/architect/engineer

**Item No: 42**

**Providing and laying Ceramic glazed colored wall tiles of size 300x600 mm or 300x300mm (thickness to be specified by the manufacturer), of 1st quality conforming to IS: 15622, of approved make, in all colours, shades White, Ivory, Grey, Fume Red Brown or any laid on 20 mm thick bed of cement mortar 1:4 (1 Cement: 4 Coarse sand), mixed with water proofing chemical compound excluding pointing the joints make tile AGL TILE or equivalent as approved and selection by architect**

- refer above specification accept for the glazed ceramic colored red, blue and yellow vibrant colors Tiles:
- 300x200mm or equivalent as per approved make by the consultant/architect/engineer

**Item No: 43**

**Grouting the joints of flooring tiles having joints of 3 mm width, using epoxy grout mix of 0.70 kg of organic coated filler of desired shade (0.10 kg of hardener and 0.20 kg of resin per kg), including filling / grouting and finishing complete as per direction of Engineer-in-charge make dubond or equivalent as approved and selection by architect**

**Epoxy Grout**

- Grout is the material that is used to fill the space between adjacent tiles and support the joints.
- The Epoxy grout consists of mix of 0.70 kg of organic coated filler of desired shade and mixing of 0.10 kg of hardener and 0.20 kg of resin per kg. They have very low water absorption, higher compressive strength and are resistant to staining and easy to maintain. Epoxy grout is a waterless mix formed by mixing a base material (part A) and a hardener (part B). These components are mixed at site just prior to grouting.
- Generally, epoxy grouts require no additional sealer to protect the surface.

#### **Application process**

- Surface preparation It shall be ensured that tiles are firmly set and adhesive or mortar is completely dry for 24 hours. All spacers, pegs, ropes and string shall be removed and joints be cleaned by removing free loose dirt particles.

#### **Preparing mix and application**

- The complete unit Part A (Base) and Part B (Hardener) shall be properly mixed in given ratio. The desired colour of grout shall be obtained by mixing required quantity of colour with base to ensure homogeneity.
- The grout shall be pressed firmly by using a hard rubber squeeze into joints ensuring that joints are completely filled. Excess grout material shall be removed from joints and surface by moving squeeze on grout line after 22 to 25 minutes. The damp sponge shall be used in circular motion on tile surface to achieve the flush joint. After completion of work the grout haze shall be cleaned with clean water or soap solution. The suitable rubber gloves shall be used to avoid skin contact during application.

#### **Measurement**

- Length and breadth of grouted tile of any size area shall be measured correct to a cm and the area shall be calculated in sqm correct to two places of decimal.

#### **Rates**

- The rate shall include the cost of all materials and labor involved in all operations described above. Nothing extra shall be paid.

#### **Item No: 44**

**Brick work 7 cm thick with common burnt clay F.P.S. (non-modular) brick of class designation 7.5 in cement mortar 1:3 (1 cement: 3 coarse sand) in superstructure above plinth level and up to floor five level.**

#### **HALF BRICK WORK**

#### **Laying**



- Brick work in half brick walls shall be done in the same manner as described above **except that the bricks shall be laid in stretcher bond**. When the half brick work is to be reinforced, 2 Nos. M.S. bars of 6 mm dia., shall be embedded in every third course as given in the item (the dia of bars shall not exceed 8 mm). These shall be securely anchored at their end where the partitions end. The free ends of the reinforcement shall be keyed into the mortar of the main brick work to which the half brick work is joined. The mortar used for reinforced brick work shall be rich dense cement mortar of mix 1:4 (1 cement: 4 coarse sand). Lime mortar shall not be used. Over laps in reinforcement, if any shall not be less than 30 cm.
- The mortar interposed between the reinforcement bars and the brick shall not be less than 5 mm.
- The mortar covering in the direction of joints shall not be less than 15 mm.
- All loose materials, dirt and set lumps of mortar which may be lying over the surface on which brick work is to be freshly started, shall be removed with a wire brush and surface wetted. Bricks shall be laid on a full bed of mortar, when laying, each brick shall, be properly bedded and set in position by gently pressing with the handle of a trowel. Its inside face shall be buttered with mortar before the next brick is laid and pressed against
- The brick work shall be built in uniform layers. No part of the wall during its construction shall rise more than one meter above the general construction level. Parts of wall left at different levels shall be raked back at an angle of 45 degrees or less with the horizontal. Tothing shall not be permitted as an alternative to raking back. For half brick partition to be keyed into main walls, indents shall be left in the main walls.
- All pipe fittings and specials, spouts, hold fasts and other fixtures which are required to be built into the walls shall be embedded, as specified, in their correct position as the work proceeds unless otherwise directed by the Engineer-in-Charge

### Joins

- The thickness of all types of joints including brick wall joints and cross joints shall be such that four course and three joints taken consecutively shall measure as follows: (i) In case of modular bricks conforming to IS 1077 specification for common burnt clay buildings bricks, equal to 39 cm.
- (ii) In case of non-modular bricks, it shall be equal to 31 cm.
- Bricks shall be laid with frog (where provided) up. However, when top course is exposed, bricks shall be laid with frog down. For the bricks to be laid with frog down, the frog shall be filled with mortar before placing the brick in position.

- In case of walls one brick thick and under, one face shall be kept even and in proper plane, while the other face may be slightly rough. In case of walls more than one brick thick, both the faces shall be kept even and in proper plane.
- Curing The brick work shall be constantly kept moist on all faces for a minimum period of seven days. Brick work done during the day shall be suitably marked indicating the date on which the work is done so as to keep a watch on the curing period.

### **Scaffolding**

- Scaffolding shall be strong to withstand all dead, live and impact loads which are likely to come on them. Scaffolding shall be provided to allow easy approach to every part of the work.
- Walls half brick thick and less shall each be measured separately in square metres stating thickness.

### **Measurements**

- The length and height of the wall shall be measured correct to a cm. The area shall be calculated in sq.m. where half brick wall is joined to the main walls of one brick or greater thickness and measurements for half brick wall shall be taken for its clear length from the face of the thicker wall.

### **Rate**

- The rate includes the cost of the materials and labour involved in all the operations described above except reinforcement which is to be paid for separately.

### **Item No: 45**

**VENT: -Providing and fixing standard extruded of aluminum section of size 63.50 x 38.10 x 1.95 mm (of Jindal Section no:4605, @ Wt 1.094Kg /Rmt with color anodized aluminum frame with 5 mm thick transparent bronze color tinted float glass with color anodized aluminum frame for ventilation with 5 mm thick frosted glass as details etc complete for.**

### **Window**

Material & Workmanship: -

- Aluminum alloy used in the manufacturing of extruded section for windows shall confirm to HE9-WP of I.S 733 – 1956 and also hollow aluminum section confirm to IS designation HV9 – WP – IS – 1285 – 1958. Aluminum section of approved weight shall be procured at site. Fabrication shall be done as per I.S 1948 – 1961 & drawing or as directed. Details of the anodized powder coating section to be used are as under:
  1. Frame 63.5mm x 38.10 mm x 1.95mm
  2. Louver frame 40.00 mm x 18.00 mm x 1.29 mm
  3. Transparent float glass 5.00 mm thick

Float Glass:

- 5 mm thick transparent float glass of the make MODI GUARD / ASAHI / SAINT GLOBAL or as equivalent of approved by Engineer-in-charge shall be used & shall be conforming to relevant I.S code. Necessary colour anodized aluminum glazing clips shall confirm to relevant IS code. Transparent Silicon Gasket and PVC track rubber shall confirm to quality approved by engineer in charge.

Fixtures & fastenings:

- Fixtures and fastenings shall be provided as per requirement & as directed by Engineer in charge.
- Section used shall be single or double type as per requirement. Window - frame without shutter shall be prepared as per drawing or as directed by the Engineer – in – Charge. Whole framework shall be finished and erected in true line and level. The section shall be fixed with necessary screws & wooden peg nails required.
- Size of glass for glazing at panels shall be as per drawing and shall be fixed in such a way so as to allow a clearance of 2.50 mm between the edges of glass and aluminum glazing clips surround clearance may be increased if directed.
- All stains from the surfaces of glass shall be removed and cleaned with thinner or spirit without any extra payment. Working of all hinges shall be smooth and free. If any hinges or locking arrangement found faulty, shall be replaced to the satisfaction of Engineer – in – Charge without claiming any extra charges.
- The size of mosquito's proof jali at panels shall be as per drawing or as directed by Engineer-in-charge. The entire work shall be executed to the satisfaction of Engineer – in - Charge. The window shall be fully sliding as per drawing or as directed by Engineer – in – Charge

**CONDITIONS FOR ALUMINUM WORKS**

(a) The glazing shall be fixed with the External finished surface (either stone cladding/external plaster) and hence all the necessary rubber strips, packing and poly-sulphide polymer (between the frame and concrete or other surface all around) shall be provided within the rate quoted so as to make the junctions fully water tight/air tight.

(d) Approved make selected glass of thickness as specified shall be used in doors. Wired glass louvers shall be provided wherever shown on drawings.

(e) Necessary locking arrangement of approved design (by Architect) shall be provided without any extra cost.

(f) Wherever necessary, PVC lining (silver grey or white only) etc. shall be provided for air/water tightness.

- (g) Necessary operating device (as per design) for operation of louvers of windows, ventilators, sky lights, including necessary rods shall be provided without any extra cost.
- (h) The rates quoted shall be inclusive of manufacture, supply and installation at Site, and inclusive of all the necessary accessories rubber strips, locks, rods, excise duty, taxes, transport, labour charges, insurance, storage and safe custody, etc. complete.
- (i) The rates shall also be inclusive of providing and applying with gun as per latest I.S., of Dow Corning or equivalent and making the joints around glazing watertight, on the external periphery of the building at the junction of two different materials as directed by the Architect and site engineer.
- (j) Necessary provision for rain water disposal shall be done in the bottom guides/frames as directed and approved by Architect.
- (k) Work must be in accordance with detailed drawings with dimensions of aluminum sections in frames and shutters as shown in drawing. It shall be accompanied by the detailed drawing if any deviation is proposed.
- (l) All the door shutters shall have double action hydraulic floor springs/hinges as per approved shop drawings, of approved make with minimum one year guarantee. The floor springs shall be of least possible thickness.
- (m) Details/arrangements for after sales/maintenance services shall be furnished.
- (n) Work shall be carried out in co-operation and in coordination with all other agencies working at Site.
- (o) The civil work as required for fixing of floor springs, hold fast or other works required for the erection and completion of doors/windows etc. shall be done by the Contractor without any extra cost.
- (p) Any damage, if caused to the existing work done by other agencies, shall be reinstated by the Contractor to its original condition without any extra cost.
- (q) During the course of work, the Contractor shall pay due care to avoid any stains on the powder coating work and if required, the Contractors shall provide necessary protective arrangement as directed by the Architects for which no extra payments shall be made. After the installation is completed, if required by the Architects, the aluminum work shall be washed with mild solution of non-alkali soap and water.
- (r) The Contractor shall be responsible for the windows/doors/grills etc. being set straight, in plumb level and for their satisfactory operations after the fixing is completed.

(s) Wherever required and as directed strengthening of members shall be done by providing steel/M.S. concealed members without extra cost.

(t) The door shutters may have hydraulic door closer of approved make with minimum one year guarantee as and where shown in the drawings and as directed.

- Double scaffolding system (cup lock type) on the exterior side, up to seven story height made with 40 mm dia M.S. tube 1.5 m center to center, horizontal & vertical tubes joining with cup & lock system with M.S. tubes,
- M.S. tube chalis, M.S. clamps and M.S. staircase system in the scaffolding for working platform etc. and maintaining it in a serviceable condition for the required duration as approved and removing it thereafter. The scaffolding system shall be stiffened with bracings, runners, connection with the building etc. wherever required for inspection of work at required locations with essential safety features for the workmen etc. complete as per directions and approval of Engineer in-charge. The elevational area of the scaffolding shall be measured for payment purpose. The payment will be made once irrespective of duration of scaffolding.

Mode of measurement & payment:

- The rate for window shutter with frame shall include the cost of materials & labour involved to finish the work.
- The dimension of the window shall be measured clear size of the frame in closed position of shutter between the two outer edges of the frame.
- The payment shall be made on completion of work.
- The unit rate for the item shall be for a unit of **one square meter**.

**Item No: 46**

**Renewing glass panes, with putty and nails wherever necessary including racking out the old putty: Float glass panes of nominal thickness 4 mm (weight not less than 10kg/sqm)**

- **Removing Broken Glass Panes** Old putty shall be raked out with hack knife. The brad (small nails without head) and pieces of broken glass shall be removed from the rebates of the sash bars. The pieces of glass panes as found useful shall be handed over to the Engineer-in-Charge of the work. No glass shall be inserted in frames until they have been primed and prepared for painting so that the wood may not draw oil out of the putty.
- **Floating Glass Panes** The floating glass panes shall conform to specifications described in IS 14900.

**Fixing**

- The floating glass panes shall be so cut that it fits slightly loose in the frame and as specified in A&B of IS 14900. A thin layer of Putty conforming to IS 419 shall be prepared by mixing one part of white lead with three parts of finely powdered chalk and then adding the boiled linseed oil to the mixture to form a stiff paste and adding varnish to the paste @ 1 litre of varnish to 18 kg. of paste. The putty so prepared in the form of a stiff paste shall be drawn along the inner edge of the rebate, for bedding the back of the glass panes. The glass pane shall then be put in position, pressed home against the thin layer of the putty, and secured in rebate by new brads. The brads shall not be spaced more than 7.5 cm from each corner and not more than 15 cm apart. The putty shall then be applied in the rebate uniformly, sloping from the inner edge of the rebate. In doing this care shall be taken to keep the putty a little within the inner edge of the rebate and surplus putty removed so that none of it is seen through the glass from the inside. The putty so filled in the rebates shall be leveled smooth and finished in a straight line. When dried the putty shall be covered with a coat of paint of approved quality and shade to match the existing finish of joinery work.

The floating glass panes shall be cleaned with methylated spirit. All splashings or droppings of washing and paints shall be removed. All rubbish and unserviceable materials shall be disposed off to the dumping ground promptly as per the direction of Engineer-in-Charge.

#### Thickness and Tolerance of Floating Glass

Thickness	Tolerance
4 mm	$\pm 0.3$ mm
5 mm	$\pm 0.3$ mm
6 mm	$\pm 0.3$ mm

- **Note:** Frosted glass panes should be replaced with frosted glass panes. These shall be fixed with frosted face on the inside.

#### Measurements

- Length and breadth of glass panes shall be measured correct to a cm. The area of the glass panes as fixed shall be calculated in square metre correct to two places of decimal.
- 589 SUB HEAD 14.0: REPAIRS TO BUILDINGS

#### Rate

- The rate shall include the cost of labour and materials involved in all the operations described above

#### Item No: 47

**Providing and fixing Metal suspension system for drainage pipe 50 mm -75mm ,110mm to 160 mm respectively ,pipe should be clamped using electro-galvanized pipe hanger clamps of size according to the pipe dia in true horizontal level and proper alignment with desire slope**

by maintain spaces between pipes , pipe clamps directly screwed to mtr electrogalvanized threaded rod which are then screwed to the anchor bolt with sleeves or plug which are fastened to the ceiling by mechanical equipment with care the holes are then injected with hilti chemical grouting, finishing & making good complete for all heights .making good no damage to the RCC will be paid by contractor. zinc coated slotted strips of 400mm length are installed at the required space to support the system, the work shall be carried out as per specifications of Indian standards of steel work & drawing and as per directions of the architect -in-Charge. all necessary hexagonal bolts lock nut, sleeves, rod plug, dash fasteners, etc are included in above work. above single set of suspension system consisting of 4 diff size of pipe clamps, 4 threaded rod make ASHIRVAD, ASTRAL, HILTI or equivalent as approved and selection by architect

## **PART 1 GENERAL**

### **SECTION INCLUDES**

The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the pipe hanger and supports as described in this specification.

### **REFERENCES**

- A. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel
- B. ASTM A123 - Specification for Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars, and Strip
- ASTM A653 - Specification for Steel Sheet, Zinc-Coated by the Hot-Dip Process
- ASTM A1011 – Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability (*Formerly ASTM A570*)
- E.MSS SP58 - Manufacturers Standardization Society: Pipe Hangers and Supports- Materials, Design, and Manufacture
- F.MSS SP69 - Manufacturers Standardization Society: Pipe Hangers and Supports- Selection and Application
- G. NFPA 13 - Standard for the Installation of Sprinkler Systems

### **QUALITY ASSURANCE**

- A. Hangers and supports used in fire protection piping systems shall be listed and labeled by Underwriters Laboratories.

B. Steel pipe hangers and supports shall have the manufacturers name, part number, and applicable size stamped in the part itself for identification.

C. Hangers and supports shall be designed and manufactured in conformance with MSS SP 58.

D. Supports for sprinkler piping shall be in conformance with NFPA 13.

## **PRODUCTS**

### **ACCEPTABLE MANUFACTURERS**

A. Manufacturer: Subject to compliance with these specifications, pipe hanger and support systems shall be as manufactured by Cooper B-Line, Inc. [or engineer approved equal].

### **PIPE HANGERS AND SUPPORTS**

#### **A. Hangers**

1. Uninsulated pipes 2 inch and smaller:

- a. Adjustable steel swivel ring (band type) hanger, B-Line B3170.
- b. Adjustable steel swivel J-hanger, B-Line B3690.
- c. Malleable iron ring hanger, B-Line B3198R or hinged ring hanger, B3198H.
- d. Malleable iron split-ring hanger with eye socket, B-Line B3173 with B3222.
- e. Adjustable steel clevis hanger, B-Line B3104 or B3100

2. Uninsulated pipes 2-1/2 inch and larger:

- a. Adjustable steel clevis hanger, B-Line B3100.
- b. Pipe roll with sockets, B-Line B3114.
- c. Adjustable steel yoke pipe roll, B-Line B3110.

3. Insulated pipe- Hot or steam piping:

- a. 2 inch and smaller pipes: use adjustable steel clevis with galvanized sheet metal shield. B-Line B3100 with B3151 series.
- b. 2-1/2 inch and larger pipes

#### **B. Pipe Clamp**

1. When flexibility in the hanger assembly is required due to horizontal movement, use pipe clamps with weldless eye nuts, B-Line B3140 or B3142 with B3200. For insulated lines use double bolted pipe clamps, B-Line B3144 or B3146 with B3200.

#### **C. Vertical Supports**



1. Steel riser clamp sized to fit outside diameter of pipe, B-Line B3373.

**D. Plastic Pipe Supports**

1. V-Bottom clevis hanger with galvanized 18-gauge continuous support channel, B-Line B3106 and B3106V, to form a continuous support system for plastic pipe or flexible tubing

**Supplementary Structural Supports**

1. Design and fabricate supports using structural quality steel bolted framing materials as manufactured by Cooper B-Line. Channels shall be roll formed, 12 gauge ASTM A1011 SS Grade 33 steel, 1-5/8 inch by 1-5/8 inch or greater as required by loading conditions. Submit designs for pipe tunnels, pipe galleries, etc., to engineer for approval. Use clamps and fittings designed for use with the strut system.

**UPPER ATTACHMENTS**

**A. Beam Clamps**

1. Beam clamps shall be used where piping is to be suspended from building steel. Clamp type shall be selected on the basis of load to be supported, and load configuration.
2. C-Clamps shall have locknuts and cup point set screws, B-Line B351L, or B3036L. Top flange c-clamps shall be used when attaching a hanger rod to the top flange of structural shapes, B-Line B3034 or B3033. Refer to manufacturers recommendation for setscrew torque. Retaining straps shall be used to maintain the clamps position on the beam where required.
3. Center loaded beam clamps shall be used where specified. Steel clamps shall be B-Line B3050, or B3055. Malleable iron or forged steel beam clamps with cross bolt shall be B-Line B3054 or B3291-B3297 Series as required to fit beams.

**B. Concrete Inserts**

1. Cast in place spot concrete inserts shall be used where applicable; either steel or malleable iron body, B-Line B2500 or B3014. Spot inserts shall allow for lateral adjustment and have means for attachment to forms. Select inserts to suit threaded hanger rod sizes, B-Line N2500 or B3014N series.
2. Continuous concrete inserts shall be used where applicable. Channels shall be 12 gauge, ASTM A1011 SS Grade 33 structural quality carbon steel, complete with styrofoam inserts and end caps with nail holes for attachment to forms. The continuous concrete insert shall have a load rating of 2,000 lbs/ft. in concrete, B-Line B22I, 32I, or 52I. Select channel nuts suitable for strut and rod sizes.

## **VIBRATION ISOLATION AND SUPPORTS**

- A. For refrigeration, air conditioning, hydraulic, pneumatic, and other vibrating system applications, use a clamp that has a vibration dampening insert and a nylon inserted locknut. For copper and steel tubing use B-Line BVT series Vibra clamps, for pipe sizes use BVP series.
- B. For larger tubing or piping subjected to vibration, use neoprene or spring hangers as required.
- C. For base mounted equipment use vibration pads, molded neoprene mounts, or spring mounts as required.
- D. Vibration isolation products as manufactured by B-Line, Vibratrol systems.

## **ACCESSORIES**

- A. Hanger Rods shall be threaded both ends, or continuous threaded rods of circular cross section. Use adjusting locknuts at upper attachments and hangers. No wire, chain, or perforated straps are allowed.
- B. Shields shall be 180 degree galvanized sheet metal, 12-inch minimum length, 18-gauge minimum thickness, designed to match outside diameter of the insulated pipe, B-Line B3151.
- C. Pipe protection saddles shall be formed from carbon steel, 1/8-inch minimum thickness, sized for insulation thickness. Saddles for pipe sizes greater than 12 inch shall have a center support rib.

## **FINISHES**

- A. Indoor Finishes
  - 1. Hangers and clamps for support of bare copper piping shall be coated with copper colored epoxy paint, B-Line Dura-Copper®. Additional PVC coating of the epoxy painted hanger shall be used where necessary.
  - 2. Hangers for other than bare copper pipe shall be zinc plated in accordance with ASTM B633 OR shall have an electro-deposited green epoxy finish, B-Line Dura-Green®.
  - 3. Strut channels shall be pre-galvanized in accordance with ASTM A653 SS Grade 33 G90 OR have an electro-deposited green epoxy finish, B-Line Dura-Green®.
- B. Outdoor and Corrosive Area Finishes
  - 1. Hangers and strut located outdoors shall be hot dip galvanized after fabrication in accordance with ASTM A123. All hanger hardware shall be hot dip galvanized

or stainless steel. Zinc plated hardware is not acceptable for outdoor or corrosive use.

2. Hangers and strut located in corrosive areas shall be type 304 [316] stainless steel with stainless steel hardware.

## EXECUTION

### PIPE HANGERS AND SUPPORTS

- A. Pipe shall be adequately supported by pipe hanger and supports specified in PART 2 PRODUCTS. Hangers for insulated pipes shall be sized to accommodate insulation thickness.
- B. Horizontal steel piping shall be supported in accordance with MSS SP-69 Tables 3 and 4, excerpts of which follow below:

NOMINAL PIPE SIZE (INCHES)	ROD DIAMETER (INCHES)	MAXIMUM SPACING (FEET)
2	3/8	10
3	1/2	12
3-1/2	1/2	13
4	5/8	14
5	5/8	16
6	3/4	17

- D. Provide means of preventing dissimilar metal contact such as plastic coated hangers, copper colored epoxy paint, or non-adhesive isolation tape- B-Line Iso-pipe. Galvanized felt isolators sized for copper tubing may also be used, B-Line B3195CT.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Install hangers to provide a minimum of 1/2-inch space between finished covering and adjacent work.
- G. Place a hanger within 12 inches of each horizontal elbow.
- H. Support vertical piping independently of connected horizontal piping. Support vertical pipes at every [other] floor. Wherever possible, locate riser clamps directly below pipe couplings or shear lugs.

Where several pipes can be installed in parallel and at the same elevation, provide trapeze hangers as specified in section 2.02 C. Trapeze hangers shall be spaced according to the smallest pipe size, or install intermediate supports according to schedule in section 3.01B.

- J. Do not support piping from other pipes, ductwork or other equipment that is not building structure.

#### CONCRETE INSERTS

- A. Provide inserts for placement in formwork before concrete is poured.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Where concrete slabs form finished ceilings, provide inserts to be flush with slab surface.
- D. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inch.

#### **Item No: 48**

**Providing and fixing tiled false ceiling of specified materials of size 595x595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped galvanized steel sections ( galvanized @ 120 grams/ sqm, both side inclusive) consisting of main "T" runner with suitably spaced joints to get required length and of size 24x38 mm made from 0.30 mm thick (minimum) sheet, spaced at 1200 mm center to center and cross "T" of size 24x25 mm made of 0.30 mm thick (minimum) sheet, 1200 mm long spaced between main "T" at 600 mm center to center to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and size 24x25 mm made of 0.30 mm thick (minimum) sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.3 mm and laying false ceiling tiles of approved texture in the grid including, required cutting/making, opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc. Main "T" runners to be suspended from ceiling using GI slotted cleats of size 27 x 37 x 25 x 1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm long dash fasteners, 4 mm GI adjustable rods with galvanized butterfly level clips of size 85 x 30 x 0.8 mm spaced at 1200 mm center to center along main T, bottom exposed width of 24 mm of all T-sections shall be pre-painted with polyester paint, all complete for all heights as per specifications, drawings and as directed by architect-in-charge.**

#### **G.I. METAL TILES CEILING**

**Frame** The frame work shall consist of G.I spring tee of specified size fixed to main C carrier with the help of suspension Brackets. The frame work shall be executed in a manner so as to form a grid of 600 mm x 600 mm as specified in the item. The pre-painted steel 'C' wall angle of size 20x30x20 mm and 0.5mm thick shall be fixed along the periphery of the room with nylon sleeves and wooden screws at 300 mm center to center. The main 'C' carrier of size 10x38x10 mm made of G.I steel 0.7 mm thick shall be fixed with cleats of size 37x27x25x1.6 mm and rawl plugs of size 38x12 mm.

**Carrier Details:** Carrier, 28 mm wide at the bottom x 43 mm deep formed out of 0.50 mm thick galvanized steel sheet stove enameled black with protruding ears to hold the panels in a module of 100 mm. Installation Details: The carrier shall be suspended from slab by 4 mm dia galvanized rod with special height adjustment powder coated clips made out of spring steel at maximum 1.2 to 1.5 mtr. Centre to center. The 4mm dia galvanized rod shall be fixed to slab by forming one end “J” shape with roll inserts. The edge profile formed out of G. I. Sheet of the size 18 mm x 20 mm shall be fixed on the perimeter of the walls.

**Ceiling tiles:** Ceiling tiles shall be of G.I metal plain beveled of specified white color of size 600x600 mm and 0.5 mm thick with 25 mm height made of G.I. sheet having galvanizing of 100 gms/sqm and electro statically polyester powder coated of minimum 60 microns’ thickness including factory painted after bending with or without perforation.

**Fixing of ceiling tiles:** The ceiling tiles shall be placed over the G.I frame and clip-in with frame.

**Measurements:** These shall be the same as under 12.19.4.

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

**Item No: 49**

**Applying priming coat: With ready mixed red oxide zinc chromate primer of approved brand and manufacture on steel galvanized iron/ steel works make deluxe or equivalent as approved and selection by architect**

**Primer**

The primer for wood work, iron work or plastered surface shall be as specified in the description of item

Surfaces	Primer to be used
Iron, Steel and Galvanized steel	Red Oxide Zinc chromate Primer conforming IS 2074
Cement/Conc/RCC/brick work, Plastered surfaces, non-asbestos surfaces to receive Oil bound distemper or Paint finish	Cement primer conforming to IS 109

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

Where primer for wood work is specified to be mixed at site, it shall be prepared from a mixture of red lead, white lead and double boiled linseed oil in the ratio of 0.7 kg: 0.7 kg: 1 liter.

Where primer for steel work is specified to be mixed at site, it shall be prepared from a mixture of red lead, raw linseed oil and turpentine in the ratio of 2.8 kg: 1 liter: 1 liter.

The specifications for the base vehicle and thinner for mixed on site primer shall be as follows:

(a) White Lead: The White lead shall be pure and free from adulterants like barium sulphate and whiting. It shall conform to IS 103.

(b) Red Lead: This shall be in powder form and shall be pure and free from adulterants like brick dust etc. It shall conform to IS 102.

(c) Raw Linseed Oil: Raw linseed oil shall be lightly viscous but clear and of yellowish colour with light brown tinge. Its specific gravity at a temperature of 30-degree C shall be between 0.923 and 0.928.

Note: The oil shall be mellow and sweet to the taste with very little smell. The oil shall be of sufficiently matured quality. Oil turbid or thick, with acid and bitter taste and rancid odor and which remains sticky for a considerable time shall be rejected. The oil shall conform in all respects to IS 75. The oil shall be of approved brand and manufacture.

(d) Double Boiled Linseed Oil: This shall be more viscous than the raw oil, have a deeper colour and specific gravity between 0.931 and 0.945 at a temperature of 30-degree C. It shall dry with a glossy surface. It shall conform in all respects to IS 77. The oil shall be of approved brand and manufacture.

#### 563 SUB HEAD 13.0: FINISHING

**Turpentine:** Mineral turpentine i.e. petroleum distillate which has the same rate of evaporation as vegetable turpentine (distillate product of oleo resin of conifers) shall be used. It shall have no grease or other residue when allowed to evaporate. It shall conform to IS 533.

All the above materials shall be of approved manufacture and brought to site in their original packing in sealed condition.

#### **Preparation of Surface**

**Wooden Surface:** The wood work to be painted shall be dry and free from moisture. The surface shall be thoroughly cleaned. All unevenness shall be rubbed down smooth with sand paper and shall be well dusted. Knots, if any shall be covered with preparation of red lead made by grinding red lead in water and mixing with strong glue sized and used hot. Appropriate filler material conforming to IS 345 with same shade as Paint shall be used where specified. The surface treated for knotting shall be dry before Paint is applied. After obtaining approval of Engineer-in-Charge for wood work, the priming coat shall be applied before the wood work is fixed in position. After the priming coat is applied, the holes and indentation on the surface shall be stopped with glazier's putty or wood putty. Stopping shall not be done before the priming coat is applied as the wood will absorb the oil in stopping and the latter is therefore liable to crack.

**Iron & Steel Surface:** All rust and scales shall be removed by scrapping or by brushing with steel wire brushes. Hard skin of oxide formed on the surface of wrought iron during rolling which becomes loose by rusting, shall be removed.

All dust and dirt shall be thoroughly wiped away from the surface.

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

**Plastered Surface:** The surface shall ordinarily not be painted until it has dried completely. Trial patches of primer shall be laid at intervals and where drying is satisfactory, painting shall then be taken in hand. Before primer is applied, holes and undulations, shall be filled up with plaster of paris and rubbed smooth.

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

#### **Treatment on Steel for Aggressive Environment**

A second coat of ready mixed red oxide zinc chromate primer may be applied where considered necessary in aggressive environment such as near Industrial Establishment and Coastal regions where the steel members are prone to corrosion. The second coat (which shall be paid for separately) is to be applied after placing the member in position and just before applying Paint. The second coat of primer is not necessary in case of painting with synthetic enamel Paint as it is applied over an under coat of ordinary Paint.

#### **Item No: 50**

**Painting Steel work with Deluxe Multi Surface Paint to give an even shade. Two or more coat applied @ 0.90 ltr/10 sqm over an under coat of primer applied @ 0.80 ltr/10 sqm of approved brand and manufacture.**

**Synthetic enamel Paint,** suitable for painting over G.S. sheets, of approved brand and manufacture and of the required shade shall be used. New or weathered G.S. sheets shall be painted with a priming coat of one coat of red oxide zinc chromate Paint. Primer shall be applied before fixing sheets in place

#### **Painting Old Surface:**

If the old Paint is firm and sound, it shall be cleaned of grease, smoke etc. The surface shall then be rubbed down with sand paper and dusted. Rusty patches shall be cleaned up and touched with synthetic enamel paint.

If the old Paint is blistered and flaked, it shall be completely removed as described in 13.41. Such removal shall be paid for separately and painting shall be treated as on new work.

#### **Application**

The number of coats to be applied shall be as in the description of item. In the case of C.G.S. sheets, the crowns of the corrugations shall be painted first and when these get dried the general coat shall be given to ensure uniform finish over the entire surface without the crowns showing signs of thinning.

The second or additional coats shall be applied when the previous coat has dried.

The specifications described in 13.23 shall hold good so far as they are applicable.

**Item No: 51**

**Scraping oil paint from steel and other metal surface and making the surface even (with Hand Scraping.)**

**REMOVING OLD PAINT**

With Patent Paint Remover

Patent Paint removers shall consist of volatile organic liquids thickened with waxes and other ingredients to retard the evaporation of the liquid and to enable a substantial layer of remover to be applied to the surface. The Paint remover shall be of a brand and manufacture approved by the Engineer-in-Charge. It shall be free from alkaline matter and non-caustic so that it can be handled by workmen without injury. It shall be of non-inflammable quality as far as possible.

**Application:** Paint remover shall be used where burning off with blow lamp is not suitable. The Paint remover shall be applied liberally with a brush and allowed to remain on the surface for a period depending on the particular brand of remover used and on the thickness of the Paint coating to be removed. When the Paint film lifts and wrinkles under the action of the remover it shall be stripped with a sharp instrument. If the film is not thoroughly removed a second coat of remover may be applied if necessary over such patches and then the film thoroughly scrapped.

After the surface has been stripped, it shall be washed down with mineral turpentine to remove all traces of paraffin wax, which forms one of the ingredients of patent Paint remover and which if left in place will prevent the Paint from drying.

The cleaned surface shall be suitably prepared for application of Paint or other finish.

**Precautions :** Where the Paint remover used is of the inflammable type, suitable precaution against risk of fire shall be taken.

Neighboring painted surfaces which are not to be treated should be properly protected from contact with Paint remover.

**Preparation of Surface:** The surface shall then be prepared as described in 13.24.2.

**Measurements:** Specification for 13.23.6 shall hold good.



**Rate:** Rate shall include the cost of all labour and materials involved in all operations described above.

**Item No: 52,53**

**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.**

**CEMENT PRIMER COAT**

Cement primer coat is used as a base coat on wall finish of cement, lime or lime cement plaster or on non-asbestos cement surfaces before oil emulsion distemper Paints are applied on them. The cement primer is composed of a medium and pigment which are resistant to the alkalies present in the cement, lime or lime cement in wall finish and provides a barrier for the protection of subsequent coats of oil emulsion distemper Paints.

Primer coat shall be preferably applied by brushing and not by spraying. Hurried priming shall be avoided particularly on absorbent surfaces. New plaster patches in old work should also be treated with cement primer before applying oil emulsion Paints etc.

**Preparation:** of the Surface The surface shall be thoroughly cleaned of dust, old white or color wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying putty, made of plaster of Paris mixed with water on the entire surface including filling up the undulations and then sand papering the same after it is dry.

**Application:** The cement primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours, before oil emulsion Paint is applied.

The Specifications in respect of scaffolding, protective measures, measurements and rate shall be as described under 13.1.4.

**Item No: 54**

**Wall painting with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ liter, of approved brand and manufacture, including applying additional coats wherever required, to achieve even shade and colour. Two coats make deluxe or equivalent as approved and selection by architect**

Wall painting with Acrylic Emulsion Paint (Interior / Exterior Walls) Material 17.16.1 The Acrylic emulsion paint shall be of manufacturer as indicated or as approved by GE and of premium quality. The paint shall be 100% Acrylic and semi Acrylic paint shall not be used in the work.

### **Preparation of Surfaces**

The surfaces to be applied with Acrylic emulsion paint shall be cleaned to remove loose dirt or dust, lichen, algae, fungi or any organic growth by use of stiff brush. Then the surface is washed well and allows water to dry. All cracks, voids and minor damages shall be patched/ repaired prior to application of paint with white cement putty or with Plaster of Paris. In case of old surfaces where excessive fungal/ algal growth is observed the surface should be bio washed as per manufacturer's instructions. This product is diluted in water before application as per manufacturer instructions and shall be applied with brush. The coat of bio wash shall be allowed to dry for 12-24 hours and then washed with clean water. Allow the wall to dry before it is ready for painting.

### **Primer Coat**

Over this prepared surface apply a coat of acrylic primer as per manufacturer's instructions. This shall be allowed to dry for 4 to 6 hours before application of final paint.

### **Finishing Coat**

Acrylic paint of premium quality 100% Acrylic shall be applied in at least two coats as per manufacturer instructions. The Acrylic paint shall be prepared as per manufacturer's instructions by adding water in

### **Item No: 55**

Refer specification of item-51

### **Item No: 56**

**Melamine polishing on wood work (one or more coat) make deluxe or equivalent as approved and selection by architect**

### **Polishing Old Surface**

Preparation of Surface: If the old polished surface is not much soiled it shall be cleaned of grease and dirt by rubbing with turpentine and then rubbed with fine sand paper.

If the old polished surface is much soiled, then it will be necessary to remove the entire polish as described in 13.41 and such removal shall be paid for separately outside the rate of polishing. Further the polishing itself will have to do done like new work and will be paid for as such.

**Application:** The specifications shall be same as described in 13.38.2.2 as far as applicable.

**Measurements,** Rate and other details shall be as specified in 13.23 as far as they are applicable.



**WAPCOS**  
(A Government of India Undertaking)

Selection of Contractor for Construction of  
Director's Bungalow at Gujarat National Law  
University Campus

---

**VOLUME III – FINANCIAL PROPOSAL**

**WAPCOS LIMITED**

515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421Tele: 079-23600292Tele fax: 079-23600352  
Email: [gandhinagar@wancos.co.in](mailto:gandhinagar@wancos.co.in)

**SECTION-IX: FINANCIAL PROPOSAL (VOLUME-III)**

**1.0 Letter of Transmittal for Financial Bid**

Date: \_\_\_\_\_

To,  
WAPCOS Limited

**Sub: Financial Bid for the work of "Construction of Director's Bungalow at Gujarat National Law University"**

Dear Sir,

With reference to your NIT document dated ....., I/we, having examined the Bidding Documents and understood their contents, hereby submit my/our Bid for the aforesaid Project. The Bid is unconditional and unqualified.

1. I / We acknowledge that the WAPCOS will be relying on the information provided in the BID and the documents accompanying the BID for selection of the Contractor for the aforesaid Project, and we certify that all information provided in the Bid are true and correct; nothing has been omitted which renders such information misleading; and all documents accompanying the BID are true copies of their respective originals.

2. The BID Price has been quoted by me / us after taking into consideration all the terms and conditions stated in the NIT, draft Agreement, our own estimates of costs and after a careful assessment of the site and all own the conditions that may affect the project cost and implementation of the project.

3. I/ We acknowledge the right of the Authority to reject our BID without assigning any reason or otherwise and hereby waive, to the fullest extent permitted by applicable law, our right to challenge the same on any account whatsoever.

4. In the event of my/ our being declared as the Selected Bidder, I/we agree to enter into a Agreement in accordance with the draft that has been provided to me/us prior to the BID Due Date. We agree not to seek any changes in the aforesaid draft and agree to abide by the same.

5. I / We shall keep this offer as specified in the NIT.

6. I / We hereby submit our BID and offer a BID Price of Rs. ....including Goods and Services Tax (Rs..... in words) for undertaking the aforesaid Project in accordance with the Bidding Documents and the Agreement.

Yours faithfully,

Date:

(Signature, name and designation  
of the Authorized signatory)

Place:

**Name and seal of Bidder**

## 2.0 Price Schedule

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
<b>(A) CIVIL WORK</b>					
1	Clearing and grubbing road land including <b>uprooting rank vegetation</b> grass bushes, shrubs, sapling and trees girth upto 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (A) By manual means in area of light jungle	Hectre	0.20		
2	<b>Demolition of Brick work</b> and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift.(ii) In Cement Mortar.	Cmt	1.00		
3	<b>Demolition</b> including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift. (i) <b>R.C.C. work</b>	Cmt	1.00		
4	<b>Dismantling doors, windows, ventilators etc.</b> (wood or steel) shutters including chowkhats architraves, hold fasts and other reattachment etc. Complete and stacking them with in all lead and lift.(ii) <b>Exceeding 3 Sq.M.</b> in area.	No	1.00		
5	<b>Dismantling wooden boardings</b> in lining of walls and partitions, excluding supporting members but including stacking within 50 metres lead: Thickness above 10 mm upto 25 mm	Smt	1.00		
6	<b>Dismantling tiled or stone floors</b> laid in mortar including stacking of serviceable material & disposal of unserviceable material with all lead and lift.	Smt	1.00		
7	<b>Demolition</b> and disposal of unserviceable materials with all lead and lift.(i) <b>Unreinforced Concrete</b>	Cmt	1.00		
8	<b>Removing and scrapping</b> of old deteriorated <b>plaster</b> of any thickness from wall / R.C.C member including stacking of serviceable material and disposal of unserviceable from site of work with all lead and lift	Smt	5.00		
9	<b>Boring holes 3.5 m</b> deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 Meter for following diameter of pipes.(iii) 300 mm	No	35.00		
10	<b>Extra for under reaming</b> inside the bore Holes for under reamed piles of following Diameter. (iii) <b>300 mm</b>	No	35.00		
11	<b>Excavation for foundation up to 1.5 m</b> depth	Cmt	454.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	including sorting out and stacking of useful materials and disposing off the excavated stuff up to 50 Meter lead. (B) <b>Dense or Hard soil</b>				
12	Excavation for foundation for <b>depth from 1.5 m to 3.0m</b> including sorting out and stacking of useful materials and disposing off the excavated stuff up to 50 Meter lead. (B) <b>Dense or Hard soil</b>	Cmt	7.00		
13	Add <b>extra for Disposing off</b> the excavated stuff of above items for lead of (A) <b>50 m to 100 m</b>	Cmt	461.00		
14	<b>Filling available excavated earth</b> (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.	Cmt	465.00		
15	<b>Filling in plinth with sand</b> under floors including watering ramming, consolidating and dressing complete (Above10 Ton)	Cmt	31.00		
16	<b>Filling in foundation and plinth with murrum or selected soil</b> in layers of 20cm. thickness including watering, ramming and consolidating etc. complete. (Above10 Ton)	Cmt	197.00		
17	<b>Filling in foundation and plinth with brick Bats</b> Chhara in layers of 20cm. thickness including watering, ramming and consolidating etc. complete. (Above10 Ton)	Cmt	1.00		
18	Providing and laying <b>cement concrete 1:2:4</b> (1- Cement : 2- Coarse sand : 4- graded stone aggregates 20 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth / <b>PCC</b>	Cmt	79.00		
19	Providing and laying <b>Brick bat cement concrete 1:2:4</b> (1- Cement : 2- Coarse sand : 4- graded Brick aggregates 40 mm nominal size) and curing complete excluding cost of formwork in (A) Foundation and Plinth / <b>BBCC</b>	Cmt	18.00		
20	Providing, driving with hydraulic piling rigs with power units and installing driven cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of shoe and the length of pile to be embedded in the pile cap etc. all complete. (Length of pile for payment shall be measured from top of shoe	Rmt	561.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	to the bottom of pile cap) : <b>20.1.2 450 mm dia piles</b>				
21	Providing and laying controlled cement concrete <b>M.250</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) <b>Foundations, footings, Base of columns and Mass concrete.</b>	Cmt	1.00		
22	Providing and laying controlled cement concrete <b>M.250</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (B) <b>Walls</b> , from top of foundation level up to floor two level	Cmt	1.00		
23	Providing and laying controlled cement concrete <b>M.250</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (C) <b>Slabs</b> , landing, shelves, Balconies, Lintels, Beams, Girders and Cantilever up to floor two level.	Cmt	1.00		
24	Providing and laying controlled cement concrete <b>M.250</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (C) <b>Beams</b> , Girders and Cantilever upto floor two level.	Cmt	1.00		
25	Providing and laying controlled cement concrete <b>M.250</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (D) <b>Columns</b> , Pillars posts and struts, upto floor two level.	Cmt	1.00		
26	Providing and laying controlled cement concrete <b>M.200</b> and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (E) <b>Staircases excluding landing up to floor two level</b>	Cmt	1.00		
27	Providing and laying in position Ready Mixed <b>M-300</b> grade concrete for reinforced cement concrete work, using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for a lead up to 10 kms having continuous agitated mixer,	Cmt	9.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate / retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 475 kg )				
28	Providing and laying in position Ready Mixed <b>M250</b> grade concrete for reinforced cement concrete work , using cement content as per approved Design Mix manufactured in fully automatic batching plant and transported to site of work in transit mixer for a lead up to 10 kms having continuous agitated mixer, manufactured as per mix design of specified grade for reinforced cement concrete work including pumping of R.M.C. from transit mixer to site of laying, excluding the cost of centering shuttering finishing and reinforcement including cost of admixtures in recommended proportions as per IS: 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge. Without Fly Ash (Min cement level as per latest IS 456 shall be maintained) (Cement level 450 kg )	Cmt	450.00		
29	Providing TMT Bar <b>FE 500 / 500D reinforcement</b> for R.C.C. work including bending, binding and placing in position complete up to floor two level	Kg	30600.00		
30	Providing and applying <b>anticorrosive treatment</b> with polymer base materials to the steel reinforcement including descaling the dust and applying the preventive coating of approved make (for the R.C.C. structures near coastal area only) etc complete.	Kg	30600.00		
31	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping	Smt	198.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (A) <b>Foundations</b> Footings Bases of Columns etc. and Mass concrete.				
32	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (B) Flat surfaces such as soffits of suspended floors slabs Landings and the like. (1) Floors etc. <b>up to 200 mm in thickness.</b>	Smt	715.00		
33	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (B) Flat surfaces such as soffits of suspended floor roof slabs Landings and the like. (2) <b>Floors etc. above 200mm in thickness.</b>	Smt	4.00		
34	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (G) <b>Columns</b> Pillars Posts and struts. (1) Square Rectangular Polygonal in plan.	Smt	427.00		
35	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (H) (1) Sides and soffits of <b>Beams</b> Beam Haunchings cantilevers Girders Bressumers and Lintels not exceeding 1 M. in Depth.	Smt	499.00		
36	Providing <b>formwork</b> of ordinary timber	Smt	167.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	planking so as to give a rough finish including centering shuttering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (I) <b>Edges of slabs</b> and Breaks in floors and walls.				
37	Providing formwork of ordinary timber planking so as to give a rough finish including centering shuttering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in situ reinforced concrete and plain concrete work in. (M) <b>Staircase</b> with sloping or stepped soffits including risers and stringers excluding landing.	Smt	27.00		
38	<b>Extra</b> for Providing formwork with <b>sheathing steel</b> sheets so as to give a fair finish in (G) <b>Columns, Pillars, Posts and struts.</b> (1) Square, Rectangular or polygonal in plan.	Smt	10.00		
39	<b>Extra</b> for Providing formwork with <b>sheathing steel</b> sheets so as to give a fair finish in (B)Flat surfaces such as soffits <b>of slabs</b> Landings and the like. (1) Floors etc. upto 200mm in thickness.	Smt	10.00		
40	<b>Extra</b> for Providing formwork with <b>sheathing steel</b> sheets so as to give a fair finish in (H) (1) Sides and soffits of <b>Beams, Beam Haunchings cantilevers Girders, Bressumers and Lintels</b> not exceeding 1 M. in Depth.	Smt	10.00		
41	<b>Extra</b> for Providing formwork with <b>sheathing steel</b> sheets so as to give a fair finish in (M) <b>Staircase</b> with sloping or stepped soffits including risers and stringers excluding landing.	Smt	10.00		
42	Providing and laying <b>cushioning layer on R.C.C. Slab</b> consisting of 75mm thick lime, concrete using brick aggregate of 20mm nominal size mortar compressing of 1-Lime : 2- fine sand)	Smt	10.00		
43	Providing and laying cement concrete 1:3:6 (1- Cement : 3- Coarse sand : 6- crushed stone aggregates 20 mm nominal size) and curing complete including cost of formwork in (A) <b>Wall Caps / Coping</b>	Cmt	4.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
44	<b>Brick work</b> using common burnt clay building bricks having crushing strength not less than 35 kg. / Sq.Cm. in <b>foundation</b> and plinth in <b>Cement Mortar 1:5</b> . (1- Cement : 5 fine sand) (A) <b>Modular</b>	Cmt	34.00		
45	<b>Brick work</b> using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in <b>foundation</b> and plinth in <b>Cement Mortar 1:5</b> . (1- Cement : 5 fine sand)(B) <b>Conventional</b>	Cmt	1.00		
46	<b>Brick work</b> using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in <b>Cement Mortar 1:5</b> . (1- Cement : 5 -fine sand)(A) <b>Modular</b> + Extra for brick work in <b>superstructure</b> above plinth level up to floor two level (A) Modular	Cmt	170.00		
47	<b>Brick work using</b> common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in <b>foundation</b> and plinth in <b>Lime Mortar 1:1.5</b> (1- Lime putty :1.5 -fine sand) (B) <b>Conventional</b>	Cmt	2.00		
48	(i) <b>Half brick</b> masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in <b>Cement mortar 1:4</b> (1- Cement : 4 -coarse sand) in <b>foundation</b> and plinth (A) <b>Modular</b>	Smt	19.00		
49	(i) Half brick masonry in common brunt clay building bricks having crushing strength not less than 35 Kg/Sq.Cm. in Cement mortar 1:4 (1- Cement: 4 -coarse sand) in foundation and plinth (A) Modular + Extra for half brick masonry in superstructure above plinth level up to floor two level. (A) Modular	Smt	153.00		
50	Half brick thick <b>honey- comb brick work</b> with extruded wire cut modular building bricks having crushing strength not less than 35 Kg/Sq.Cm. (i) In Cement Mortar 1:4 (1- Cement : 4 coarse sand) as per direction by architect and approved sample of work	Smt	384.00		
51	<b>Brick work</b> with common burnt clay machine moulded <b>modular bricks of class designation 12.5 in exposed brick work</b> including making horizontal and vertical grooves 10 mm wide 12 mm deep complete in cement mortar 1:6 (1 cement: 6 coarse sand). + 6.28.2 Above plinth	Cmt	58.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	level up to floor V level				
52	Providing and laying <b>cement concrete pavement</b> (25mm to 50mm thick) with 1:2:4 (1-cement : 2- coarse sand : 4-stone aggregate 20mm nominal size) including finishing with floating coat of neat cement complete.	Cmt	10.00		
53	Providing and laying brick <b>on edge flooring</b> laid dry grouted with c.M. 1:6 (1 Cement : 6 coarse sand) including finishing the joints flush curing etc. complete.	Smt	10.00		
54	Providing and laying <b>Granite slab</b> (18 mm thick) one side polished flooring over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand) or L.M 1:1.5 laid and jointed with grey cement slurry including rubbing and polishing complete	Smt	10.00		
55	Providing and laying <b>polished granite stone slab</b> 18 mm thick in risers of steps, dado and pillars laid on 10 mm thick cement mortar 1:3 (1 cement: 3 coarse sand) and jointed with gray cement slurry including rubbing & polishing etc. Complete	Smt	147.00		
56	Providing and fixing pre-cast concrete <b>kerb stone</b> of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concrete as per approved design and including excavation for fixing in proper line and level, filling the joint with C:M 1:3 (1cement:3fine sand) etc complete.	Rmt	100.00		
57	Providing and fixing <b>pre-cast Rubber Dye inter locking concrete block</b> 60mm thick with grade of concrete M200 pneumatic compressed by mechanically pressed and as per approved design including 75mm Sand layer for levelling and filling the joint with sand in proper line and level etc. complete.	Smt	10.00		
58	Providing and fixing pre-cast Rubber Dye inter locking concrete <b>Grass paver block</b> 60mm thick with grade of concrete M250 pneumatic compressed by mechanically pressed using C&D waste recovered aggregate and fly ash content as per relevant IS codes and green building norms design by architect including 75mm Sand layer for levelling and filling the joint with sand in proper line and level etc.	Smt	100.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	complete. All product Make approved as per tender and architect selection.				
59	Providing and laying 8 to 10mm thick, <b>Glazed Vitrified Tiles</b> of size upto 598 x 598 mm of required finish as approved by Architect/ EIC for all floors/ any height/ any levels etc. with on floors, wall dedo, skirting, residue, steps of any approved shade as per design drawings over 20 mm (average) base of cement mortar 1:6 (1 cement: 6 coarse sand)/chemical mortar (proportion as per IS) laid on new surface or fixing on existing flooring by adhesive material. The jointed and groove shall be made as per specified in drawing and filled all grove 4 mm matching approved epoxy grout with color cement including all finishing. The rate of including curing, cleaning with mild oxalic acid, protecting till handling over by covering with plastic bubble sheet and abrotaps etc complete as directed by Engineer-in-charge. Rate of protector sheet shall be inclusive in item. All product Make approved as per tender and architect selection.	Smt	432.00		
60	Providing and laying 8 to 10mm thick, <b>Full body Vitrified Tiles</b> of size up to 600 x 1200 mm of required finish meeting green building norms for having postindustrial recycled waste content as per norms and as approved by Architect/ EIC for all floors/ any height/ any levels etc. with on floors, skirting, residue, steps of any approved shade as per design drawings over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand)/chemical mortar (proportion as per IS) laid on new surface or fixing on existing flooring by adhesive material. The jointed and groove shall be made as per specified in drawing and filled all grove 4 mm matching approved epoxy grout with color cement including all finishing. The rate of including curing, cleaning with mild oxalic acid, protecting till handling over by covering with plastic bubble sheet and abrotaps etc complete as directed by Engineer-in-charge. Rate of protector sheet shall be inclusive in item. All product Make approved as per tender and architect selection.	Smt	249.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
61	Providing and laying 8 to 10mm thick, <b>Double Charged Tiles</b> of size up to 1000 x 1000 mm of required finish meeting green building norms for having postindustrial recycled waste content as per norms and as approved by Architect/ EIC for all floors/ any height/ any levels etc. with on floors, skirting, residue, steps of any approved shade as per design drawings over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand)/chemical mortar (proportion as per IS) laid on new surface or fixing on existing flooring by adhesive material. The jointed and groove shall be made as per specified in drawing and filled all groove 4 mm matching approved epoxy grout with color cement including all finishing. The rate of including curing, cleaning with mild oxalic acid, protecting till handling over by covering with plastic bubble sheet and abrotaps etc complete as directed by Engineer-in-charge. Rate of protector sheet shall be inclusive in item. All product Make approved as per tender and architect selection.	Smt	124.00		
62	P & L 24" x 24" <b>vitrified 8 mm thick tile</b> flooring over 20 mm (average) base of cement mortar 1:6 ( 1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for light shade .All product Make approved as per tender and architect selection.	Smt	5.00		
63	Providing and laying 8 to 10mm thick, <b>white cool ceramic Tiles</b> of required finish meeting green building norms for having postindustrial recycled waste content as per norms and as approved by Architect/ EIC for all floors/ any height/ any levels etc. with on floors, skirting, residue, steps of any approved shade as per design drawings over 20 mm (average) base of cement mortar 1:6 (1 cement : 6 coarse sand)/chemical mortar (proportion as per IS) laid on new surface or fixing on existing flooring by adhesive material. The jointed and groove shall be made as per specified in	Smt	411.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	drawing and filled all groove 4 mm matching approved epoxy grout with color cement including all finishing. The rate of including curing, cleaning with mild oxalic acid, protecting till handling over by covering with plastic bubble sheet and abrotaps etc complete as directed by Engineer-in-charge. Rate of protector sheet shall be inclusive in item. All product Make approved as per tender and architect selection.				
64	Providing and laying <b>Marbo Granite tiles</b> 8to10 mm thick , 24" x 24" in skirting risers of steps and dado on 10mm thick cement plaster 1:3(1cement : 3-coarse sand) and jointed with white cement slurry as per selection by architect	Smt	25.00		
65	Providing & laying <b>sandwich platform</b> comprising of a) Sandwich of 18 mm thick single side polish Granite of approved size, shade and sample on top and 30 mm thick polished kota in bottom with 25mm thick cement mortar (1:4) in between b) At centre vertical sandwich supports of 30 mm thick two kota stone on sides and 20mm CM (1:4) in between and at both end walls vertical supports of 18mm thick double side granite. c) 75mm raised platform at bottom with kota on top and 50mm CM (1:4) at bottom, kota stone skirting as per design and approved sample. The rate includes rounding, champhering and mirror polishing of edges, facias of granite, MS support including necessary bonding adhesive (if required). Rate shall be also inclusive of making holes & cutouts for SS sink, Oval wash basin, Piller tap / Bib tap etc. as directed by engineer in charge. (Only plan area shall be measured & paid for). Rate shall be included all kota & granite mentioned in above	Smt	8.00		
66	<b>Lime plaster:</b> Providing & laying the ready mix lime mortar mix of proportion 1:1.5:1.5 (lime: surkhi: sand), by volume. The surkhi would be grounded to require size to get the necessary gradation. Lime: hydrated lime of at least 80% purity. Surkhi: Prepared from well burnt brick bats to the required fineness. mix is to attend the mortar grade of MM3 at 45 days. (IS: 2250 – 1981) minimum thickness of the lime plaster	Smt	1313.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	should be 18mm, done in two coats. lime plaster including with all necessary scaffolding finishing, curing, forming pattas, hacking properly any surface etc. for interior plastering at any height and finished even and smooth etc. complete. All product Make approved as per tender and architect selection.				
67	<b>Extra for making grooves / radius/any pattern</b> any design in lime plaster. The rate shall be including all necessary scaffolding finishing, curing, forming pattas, hacking properly any surface at any height and finished even and smooth etc. complete .All product Make approved as per tender and architect selection.	Smt	394.00		
68	Providing & applying <b>lime finishing coat</b> of about 3 mm thickness in 4 layers using lime paste finished with floating coat lime and oil soap. Lime paste made using moderately hydraulic lime + 100 mesh marble powder in 1:2 proportion by weight and prepared by crushing in stone Mill. and Extra for additional pigment in finishing coat at any height and any type of surface as per direction of architect in the item of lime finishing coat. The rate shall be including all necessary scaffolding finishing, curing. All product Make approved as per tender and architect selection.	Smt	1932.00		
69	Providing <b>10mm thick cement plaster</b> in single coat on brick/concrete walls for interior plastering up to floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement : 3- sand)	Smt	45.00		
70	Providing <b>15mm thick cement plaster</b> in single coat on Rough (Similar) side of single or half brick walls for interior plastering up to floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand)	Smt	619.00		
71	Providing <b>20mm thick cement plaster</b> in single coat on single or half brick walls for interior plastering up to floor two level and finished even and smooth in (i) Cement mortar 1:3 (1- cement:3-sand)	Smt	20.00		
72	<b>20mm thick sand faced cement plaster</b> on walls up to height 10 meters above ground	Smt	594.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	level consisting of 12mm thick backing coat of C.M. 1:3 (1-cement : 3-sand) and 8mm thick finishing coat of C.M. 1:1 (1cement : 1-sand) etc. complete.				
73	Providing <b>20 mm thick double coat mala cement plaster</b> on interior brick / concrete work for plastering comprising of base coat of 12 mm thick cement plaster in cement mortar (1 Cement : 4 coarse sand) in rough finishing and 8 mm thick top coat of cement mortar 1:2 (1 Cement : 2 Coarse sand) finished with trowel including scaffolding curing etc. complete.	Smt	339.00		
74	<b>Extra</b> over items 58 to 64 for finishing with a <b>floating coat of neat cement slurry</b> .	Smt	5.00		
75	(A) <b>Extra</b> over items 58 to 67 for providing and <b>mixing water proofing</b> materials in cement mortar in proportion recommended by the manufacturer.	Per bag of 50Kg of Cement	6.00		
76	<b>Extra</b> over items 58 to 71 for <b>plastering on ceilings and soffits of stairs</b> up to floor two level instead of plastering on walls.	Smt	5.00		
77	<b>Pointing</b> on brickwork with cement mortar 1:3 (1 cement : 3-coarse sand) (A) <b>Flush pointing</b>	Smt	773.00		
78	Wall painting (two coats) with <b>plastic emulsion paint</b> of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth.	Smt	5.00		
79	Finishing wall with <b>weather proof exterior emulsion paint</b> on wall surface (two coats) to give an required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials etc complete	Smt	594.00		
80	Applying two coats of <b>Birla or Asian acrylic lapy (putty)</b> & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.	Smt	5.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
81	Extra over item 57 for painting with plastic emulsion paint of approved brand on <b>ceilings and sloping roofs.</b>	Smt	5.00		
82	Applying <b>priming coat</b> over new steel and other metal surface after and including preparing the surface by thoroughly cleaning, oil, grease, dirt and other foreign matter and scoured with brushes fine steel wood, scrapers and sand paper with ready mixed priming paint brushing red lead.	Smt	5.00		
83	<b>Providing, fabricating,</b> assembling, hoisting/erecting and fixing in position at all heights/ all shapes & sizes with all leads & lifts using <b>Any MS Steel Sections</b> etc. as per drawing. all confirming to latest relevant IS codes for the work as per architect including straightening, cutting, bending, bolting and welding the members all as per structural drawings and as per detailed specifications complete in the situations described here in drawing. Note: Sample as per drawing shall be get approved from the consultants before procurement of material by the contractor. Work shall carry out as per the approved sample. Any change required in the fabrication drawings shall be carried out at No extra cost. Fabrication shall be in a perfect architectural workmanship manner and as provided in section V & VI of IS 800 & IS 7215. Welding shall be carried out by qualified welders/ fabricators. It should also include the cost of necessary scaffolding/ staging, zinc coated nut-bolt as required for safety, structural stability of all works at site. All product Make approved as per tender and architect selection.	Kg	1400.00		
84	Providing and <b>fixing Stainless Steel</b> (Grade 304) railing, gratings, frames, guard bar, ladder, brackets, gates and similar works made of Hollow tubes, channels, angles, flats, plates etc. including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete i/c fixing the railing with necessary accessories & stainless steel 304 dash fasteners of approved make, stainless steel bolts etc., of required size, on the top of the floor or the side of waist	Kg	200.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	slab with suitable arrangement as per approval of Engineer-in-charge. (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.) Rate shall be inclusive of all material, Labour, fastener, hardware, tools, scaffolding etc. complete.				
85	Providing and fixing 1.20-Meter-high <b>fencing with 2.0-Meter-long M.S. Angle posts</b> 40mm x 40 mm x6 mm and oil painting 3 coats fixed at 2.5 Mt, C/c. with five Horizontal lines and two diagonals of galvanized steel barbed wire weighting 9.38 Kg. per 100 Meter, strained and fixed to posts with G.I, staples including fixing the posts in ground with 0.5 M x 0.5.M x 0.5 M. block in C.C1:5:10 etc complete.	Rmt	10.00		
86	Applying general insecticide <b>pest control treatment</b> to floors, cupboards etc. including Labour material etc. complete. Using Heptachloride 20 EC. As Per 6113_pests Concentration Weight 0.50 percent is recommended one-liter chemical emulsion dilute with 39 liter of water will give. Total dilute concentration will be 40 liter inclusive of one liter chemical emulsion application 0.5 Liter chemical / Sqm of surface is recommended as per I.S code	Smt	250.00		
87	Providing throating or plaster drip and moulding to R.C.C. Chhajja.	Rmt	170.00		
88	Providing up to floor two level <b>precast cement concrete jali</b> or grill 1:2:4 mix (1-Cement: 2- coarse sand: 4-graded stone aggregate 6mm nominal size) reinforced with 1.6 mm dia. Mild steel wire including roughening, cleaning, fixing and finishing in cement mortar 1:3 and curing complete. (A) 50mm thick	Smt	2.00		
89	Providing and laying <b>damp proof course</b> 25mm thick cement concrete 1:2:4 (1-Cement : 2 coarse sand : 4 stone aggregate 10 mm nominal size) and curing complete	Smt	87.00		
90	<b>Extra</b> for providing and <b>mixing water proofing material in Cement concrete</b> in mix proportion recommended by the	Lit./Kg per Quintal	5.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	manufacturers.	of Cemen t			
91	Providing erecting and fixing double coated Syntex <b>PVC. (ISI) water tank</b> of required capacity each with all necessary fittings and connection etc. complete on terrace.	litre	5000.00		
92	Providing and applying barrier type <b>integral crystalline waterproofing treatment</b> (surface coating) of Penetron, Kryton, Kerakoll or equivalent to basement walls/ underground water retaining structure, beam, column, terrace and ribs of roof etc. having speed of penetration 31 Cm in 56 days and resistance to 16 bar hydrostatic water head from negative side & capable of reducing permeability of concrete by more than 90 %, compared with control concrete. Rate shall be inclusive with damage and honey comb concrete, sealing any future hairline cracks because of its self-healing nature as per manufacturer's specifications and as per technical specification etc complete. Work shall be carried out by approved applicator and as per method of waterproofing accepted by manufacturer. Work shall be guaranteed for 10 years against any leakages and guarantee shall be provided on Rs. 300/- stamp paper in approved Performa. Using PENETRON coating @ 0.7 Kg. per SqM per coat in two coats (within 15 to 20 days on wet concrete) or equivalent. Including cleaning and scarifying removing old damaged surfaces. All product Make approved as per tender and architect selection.	Smt	251.00		
93	Providing and fixing G.I. <b>hexagonal chicken mesh</b> of size 20mm x 20mm of 22 gauge at junction of concrete and brick work or between different materials fixed at 100mm on each side of surfaces with necessary "U" nails / screws / washers with cleats including scaffolding etc. at all floors / all levels / all heights etc. complete as per specifications and direction of Engineer-in-charge. Only laid area of mesh shall be measured for payment without considering any wastage and overlap	Smt	83.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
94	<b>Inauguration Steel Plate signage</b> hang from ceiling/wall: Providing and fixing 2mm thick brush/ satin finish SS 304 grade signage plate Brushed with acid etching/ engraving and duco paint filling. All plates will be made in CNC Water Jet Cutting, with all edges smoothen and all corner to be cuteround. Acidetching should be done 0.3mm deep and fill with duco paint of approved make and shade. Graphic matter shall be letter, number, symbol, logo, etc. The plate will be hung from wall or hang from ceiling with the hanging stud/fastener/ SS304 member / chain as per design / specification and approved by Architect or Engineer in charge. Only elevation area of sign plate shall be measured and paid. The rate shall also include cost of fabrication, engraving, acid etching, paint filling, fixing accessories, finishing, drilling, fastener, adhesive material, etc. at all height and all lead. The contractor should submit the shop drawings based on concept design and do the sampling and get it approval before execution.	Smt	0.25		
95	Providing <b>waterproofing treatment</b> in two coats for <b>sunken slab</b> areas, bathrooms, balconies, chajjas, exposed roofs before laying of screeds, water tanks (underground or external), lift pits, basements and exterior foundation walls with including side walls The recommended mixing ratios are as follows: - waterproofing: 1 part of Keraplast Eco P6 : 1 part of cement (two coat) including cost of finishing, lead and lift ,100 mm thick p.c.c, and light weight clay aggregate filling in sunk as per instruction by manufacturer and architect	Smt	28.00		
96	Providing and fixing <b>Polyurethane Foam sandwich insulated galvalume iron profile sheets</b> (size, shape, shade and pitch of corrugation as approved by Engineer-in-charge). Profile sheet of nominal 1015 mm effective cover width and nominal 28.5mm deep ribs with subtle square fluting in the five panat nominal 203mm center-to-center. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. The feed material is manufactured out of nominal 0.45mm Base	Smt	18.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>Metal Thickness (BMT), 0.50mm Total thickness, Hi-strength steel with min.550M Payield strength, metallic hot dip coated with aluminum Zinc alloy (55% aluminum, 45%Zinc) as per AS1397/ IS15961 Zinc alume AZ150 (Min.150gms /sq.mt total on both sides) with superior quality paint coat. The paint shall have a total coating thickness of nominal 35µm, comprising of nominal 20µm exterior coat on top surface and nominal 5µm reverse coat on back surface over nominal 5 µm primer coat on both surfaces of approved color shade. The steel manufacturer's test certificate for the chemical and mechanical properties of steel must be submitted for approval by the engineer in charge prior to installation. The sheet shall have brand marking of the manufacturer giving product details on the back of the sheet at every regular interval for confirming genuinity of the material. The sheet shall be fixed using Self Drilling, Self-Tapping bolts of Hilti, Build exor equivalent of required size (and all necessary overlaps complying to the manufacturer's specifications including cutting to size and shape, erecting at all levels, providing openings, all fixture sand fixing, accessories with EPDM sealing, silicon seal antatridge and valleys including all material, labour, scaffolding, wastage, tools, tackles, equipment, transportation, shop drawing, and excluding the cost of purlins and rafter set call complete as per drawings as directed by the engineer in charge. The rate shall include end laps, side laps, bolts etc. Sheets shall be supplied in custom lengths up to 12.0m. All overlaps shall be sealed with silicone sealants for sloped roofing's. Actual plan area of roof shall be measured for payment without considering wastage and overlap. All product Make approved as per tender and architect selection.</p>				
97	<p>Providing and joining ,fixing in position <b>Precast Jali block</b> products made of construction and demolition waste material and fly as per relevant IS codes and meeting green building norms for decorative elements of any size and</p>	No	10.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	shape with all necessary fixtures / fasteners / cement mortar (1:2) and including erection up to two level in pattern as per designed by architect : The rate shall be including scaffolding etc. at all floors / all levels / all heights etc. complete as per specifications and direction of Engineer-in-charge. All product Make approved as per tender and architect selection.				
98	Providing and paying for all expenses related to registration of <b>GRIHA/ LEED green building rating</b> , interim and final rating charges, site workshop charges, site visit fees including all expense related to official transportation, accommodation and food for GRIHA/ LEED officials including to and fro airfare and payment to third parties/ firm/ laboratories for sound audit, energy audit, any mandatory test and reports related green rating. The rates shall be inclusive of taking all necessary actions, processes and purchases related to ensuring minimum 3 star GRIHA rating/ Gold LEED rating including providing all data, photographs, work orders, invoices, technical data sheets, test reports, government compliances and permissions as required for successful green building rating but excluding consulting charges for architect in charge of the project and green building rating. All product Make approved as per tender and architect selection.	job	1.00		
<b>(B) INTERIOR WORK</b>					
99	<b>FIXED GLASS WINDOW:</b> - Aluminum Window with window section coated with Akzonobel colure with warranty of 15 years with Top Hung & Fixed Window consisting of all hardware, gasket, accessories as per standard. Window consist of DGU glass pane of 5mm Clear Toughened + 10mm Air gap + 5mm Clear Toughened for Thermal & Sound Insulation. Supply and installation at site with required material & Silicon.	Smt	2.00		
100	<b>SLIDING WINDOW:</b> - Providing and fixing window having extruded aluminum Color anodized section frame (up to 1.7 kg / smt of window) of domal section horizontal two track	Smt	238.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	member & vertical member of size as per design with sliding shutters of horizontal member with 5 mm thick transparent bronze color tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window as per direction of architect. All product Make approved as per tender and architect selection.				
101	VENT: -Providing and fixing standard extruded of <b>aluminum section</b> of size 63.50 x 38.10 x 1.95 mm (of Jindal Section no:4605, @ Wt 1.094Kg /Rmt with color anodized aluminum frame with 5 mm thick transparent bronze color tinted float glass with color anodized aluminum frame for ventilation with 5 mm thick frosted glass as details etc complete for. window	Smt	1.20		
102	SLIDING WINDOW:- Providing and fixing window having extruded aluminum Color anodized section frame main outer size 63.50 x 38.10 x 1.95 mm(of Jindal Section no:4605,@ Wt 1.094 Kg / Rmt), horizontal two track member size 61.85 mm x 31.75mm x 1.20mm (of Jindal Section no: 8687 @ wt. of 0.695 Kg/mt), vertical member of size 61.85 mm x 31.75mm x 1.30 mm (of Jindal Section no:8758 @ wt. of 0.659 Kg/mt) with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm (of Jindal Section no: 8949 @ wt. of 0.456Kg/mt), vertical member of size 40mm x 18mm x 1.29mm (of Jindal Section no:8947 @ wt. of 0.456Kg/mt/ Section 8948, @ Wt. 0.457 Kg/mt) with 5 mm thick transparent bronze color tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc. complete for window as per selection by architect	Smt	6.00		
103	DOOR: Door: Providing and fixing 1 hour fire rated, 38-52 mm thick door having single leaf/double leaf shutter hollow flush type door (36 mm thick base shutter along with 2/16 mm thick finish as specified), made out as following or superior specifications: 1) aluminum extruded profile section frame at periphery of	Smt	52.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>along with intermediate horizontal and vertical members of shutter in specified size, shape and thickness so as to have cumulative weight not less than 3.5 kg/m<sup>3</sup>. 2) 20 x 100 mm vertical/ horizontal teak wood member with black painting at handle side (fixed with aluminum section) for fixing tower bolt, handle, lock body, etc. 3) 8 mm thick, IS 303 grade, urea formaldehyde (UF) free environment friendly plywood or Wood Polymer Composite (WPC) Board or Magnesium Oxide (MgO) Board, meeting green building norms fixed on both side of aluminum frame. 4) Both side of shutter shall be covered either with 4 mm thick teak veneer / 1 mm thick laminate/2 mm thick PVC sheet/ 8 mm solid wood battens of width as per design of specified and approved figure, shade and make and fixed with suitable low VOC adhesive as per requirement and instruction of architect. 5) 38-52 mm wide - 9mm thick external lipping of seasoned teak wood with water based low VOC PU polishing with necessary backing coat low VOC primer as per requirement and gap between two part should be filled with wool pile etc. complete as per drawing and as directed by architect. 6) The cavity of the door shall be filled with 20 mm thick low VOC environmental friendly mineral wool slab insulation having minimum density 48 kg/m<sup>3</sup>. 7) Making adequate provision and fixing of vision panel with aluminum frame specified in sub point 1 and finishing with lipping as specified in sub point 5, for vision panel as per specified size and made either of single pane toughened glass/ single/double/ triple laminated toughened glass or double / triple glazed insulated glass with two or more panes of glass spaced apart with a spacer bar and hermetically sealed with a primary and secondary sealant to form a single unit with one or more air spaces in between as specified by architect. Rate shall be including all Wooden / aluminum door frame, veneer with polishing / laminates / PVC sheet/ Wooden batten with polishing along with the vision panel. the vision panel shall be paid in relevant</p>				

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	item. Necessary hardware like hinges, pivot, handle, tower bolts, locks etc. shall be separately measured and paid in the relevant tender items. Actual shutter including lipping area (single side) shall be measured for payment. Rate shall be inclusive of aluminum & wooden framing, style, lock rail with base paint, 8mm thick UF free ply on both side, seasoning, anti-termite coating, peripheral lipping with finishing, low VOC adhesive, nails, fastener with all Labour for each item specified or which is necessary to have a complete door assembly etc. complete for all level all height. Design, figure, color shade and polish tint to be as approved by architect. Including all necessary hardware's & fixtures and fasteners. All product Make approved as per tender and architect selection.				
104	ANTI SLIP STRIP: - Manufacturing, supply, arrangement and keeping in good condition until project completion aluminum fluted strips as anti-slip strips - 3.15 mm thick and 75 mm wide to be fitted with necessary banding, welding, holdfast, M.S. hinges, gusset plate including all necessary fixtures & fastening, locking arrangement like anchor bolts or similar etc. complete as per drawing Rate including minimum 50-micron pure polyester powder coating of approved shade, texture, color and make as approved by architect. All product Make approved as per tender and architect selection.	Rmt	45.00		
105	STORAGE: -Providing & fixing overhead storage, bottom storage, floor standing storage, bathroom storage, height up to 3000mm and depth up to 600mm storage all of size as per given detail drawing having wooden shelf, drawer / pull out, storage shutters, etc as per drawings each have framing of 18 mm ply and having equal no's of shutters as per given drawing of 18 mm thick ply. All complete with proper Burma border bidding. finished with natural polish All exposed & internal surfaces are covered with veneer with PU finish. External & internal joints covered with bidding Patti complete with laminate finish. All complete with proper hardware like S.S.	Smt	42.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Screws, MS Nails, S.S handles, knobs, channels, All Details as per shown in drawings & as per instructions of architect in charge. mode of measurement is in elevation				
106	LUXRAY SOFA: -Manufacturing, supply, arrangement and keeping in good condition until project completion of luxury Sofa any seater and shape as per requirement of architect. and design 1. 50mm thick, 40 kg/m <sup>3</sup> density low VOC CFC HFCF free or as per suitability at site, made up of poly urethane foam or 75 kg/m <sup>3</sup> density low VOC CFC HFCF free rubber latex foam + 50 mm thick super soft 23 kg/m <sup>3</sup> density low VOC CFC HFCF free polyurethane foam for Seat & back 2. 25mm thick 32 kg/m <sup>3</sup> density low VOC CFC HFCF free polyurethane foam or 60 kg/m <sup>3</sup> density low VOC CFC HFCF free rubber latex foam and minimum 300 GSM inherently fire retardant fiber having washable properties for seat and back to be pasted over the 100mm thick foam with low VOC adhesive. Fabric design, texture, finish and color as per selection by architect for maximum price 1000/ mtr 3. 12 mm and 19 mm thick, IS 303 grade, urea formaldehyde (UF) free environment friendly plywood and solid teak wood as per design drawings for framing and handles 4. Water based low VOC PU polish 5. Zic Zac Spring/ Belt/ Support Use in seat as per design. 6. Cold Rolled (CR) pipe framing/ support/ decorative finishing in size as per drawing along with minimum 50-micron pure polyester powder coating of approved shade, texture & color of approved make or minimum 12-micron thick chrome plating. 7. Including all hardware, ABS parts and Labour etc. All product Make approved as per tender and architect selection.	Rmt	13.00		
107	CAFE TABLE: - providing and placing modular Free Standing Circular Table -1050mm dia x 750mm Ht / Table Top - 25mm Thk. Pre-laminated Practical Board with 2mm Thk PVC Lipping / Understructure - tabletop Supported on two MS Powder Coated 70x70 square tubular Legs with foot as per approved and selection by architect in charge. ( featherelit or three equivalent make)	no	2.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
108	<p><b>CENTER TABLE:</b> -Manufacturing, supply, arrangement and keeping in good condition until project completion of Center table size 900(L) x 900(D) x 370(H) (tolerance shall be allowed + /- 50 mm) as per design and instruction of architect</p> <p>1. Framing - Solid teak wood frame round molded 25x50 mm thick duly polished water based low VOC PU polish in shade, finish, texture and specification as per architect including fine sanding before and after insulator (sealer) coats and first coat of PU, clear non-toxic low VOC termite control additive, 2 coat of clear epoxy insulator in 1:1 proportion of hardner and epoxy, dent filling with matching putty, wooden stainer and 2 coats of water based PU or or Cold Rolled (CR) pipe framing/ support/ decorative finishing in size as per drawing along with minimum 50 micron pure polyester powder coating of approved shade, texture &amp; color of approved make or minimum 12 micron thick chrome plating</p> <p>2. Top - 10 mm thick clear/tinted toughened glass with beveled crystal edges or 12 mm thick Indian mirror polished stone with beveled polished edges as per color, shade and grain selected by architect.</p> <p>3. Top shall be fixed with necessary hardware i.e. 38 mm dia mounting plate with one end as a screw to be fixed with UV adhesives and handheld UV spotlights suitable for glass/ stone bonds. 4 Including all hardware, ABS parts and all Labour etc.</p> <p>The plan area shall be considering for payment process. All product Make approved as per tender and architect selection.</p>	Smt	2.00		
109	<p><b>WORK TABLE:</b> - Manufacturing, supply, arrangement and keeping in good condition until project completion of freestanding Work Table up to 900 mm depth having legs, top, drawers, shutter, apron etc as per design and instruction of architect having 1). Table Top - Either of the material as per design and selection by architect such as 25 mm thick Block board with decorative veneer made of rubber wood/ Bamboo/ Chestnut confirming</p>	no	3.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>to Urea formaldehyde free MR/BWP grade Decorative type (BWP/MR-DEC) as per IS 1659-2004 meeting green building norms or having BIS ECO mark using low VOC adhesive and 9 mm solid wood lipping having color, shade and grain selected by architect low using VOC CFC HFCF free suitable adhesive. The table top shall have a 75-mm high, 600 mm wide and 600 mm deep drawer on soft closing telescopic channels as per specifications. 2). Understructure - tabletop supported on under structure frame below top, legs and bracings made of CRCA steel frame made of pipes or flat as per drawing with minimum 50-micron pure polyester powder coating of approved shade, texture, color and make as approved by architect. 3) Modesty panel full length of specified height made of rubber wood/ solid wooden baton lattice in frame using CRCA steel duly powder coated as per sub item 2 fixed with SS 304 hardware. 4). The table shall have concealed raceway for power cable, data and other cables along with pop-up box for electrical/ computer sockets made of CRCA 0.6 mm powder coated plate and flap of material of table top along with a PVC wire brush strip. 5) Including all hardware, cut-outs, cable manager, ABS parts and all labour including joining side storage, trolley, keyboard tray etc. 6) Wood joinery to be based on good practices such as tounge and groove joint, dovetail joint, finer joint, box joint etc and using hardware such as "L" brace, Tee, corner brace and pocket-screw joinery etc. as per drawings specification and instruction by architect. (tolerance shall be allowed + /- 50 mm) All product Make approved as per tender and architect selection.</p>				
110	<p><b>MEDIUM BACK CHAIR:</b> -. Manufacturing, supply, arrangement and keeping in good condition until project completion of Medium Back Chair as per design and instruction of architect having</p> <p>1. BACKREST: The outer frame of back rest made up of black glass filled nylon and upholstered with mesh fabric.</p>	no	3.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>2. Lumber support: 2-way adjustable lumber support, made of 25 mm thick forum injection moulded in black nylon. Lumber Support height 132mm and can be adjusted up to 35mm up down. Size</p> <p>3. Seat: moulded seat base and foam upholstered with fabric in ergonomic shape.</p> <p>4. Arm Rest: The arm rest made up of Moulded polyurethane.</p> <p>5. Mechanisam: Syncro mechanism with Singel Loking</p> <p>6. Base :Powder Coated five pronged base</p> <p>7. Gas Lift: 100 MM Class 4 ANSI/BIFMA Tested (5 Year Warranty)</p> <p>8. Caster: Twin wheel castors are injection moulded in nylon and diameter of Castor 50 mm. (8 Year Warranty) All product Make approved as per tender and architect selection.</p>				
111	<b>Wooden blind</b> : Providing and fixing wooden blind with back cloth and front tapestry to approved make and color with all mechanism for operation.	Smt	100.00		
112	<b>MIRROR PANELING:</b> - Manufacturing, supply, arrangement and keeping in good condition until project completion mirror paneling up to 2100 mm height as per design and instruction of architect having: 1) Mirror: 6 mm thick mirror having copper-free coating and lead-free protective paint 2) Spacer - Mirror shall be fixed on non-metaling full width horizontal and vertical 40mm X 10 mm spacer at maximum of 300 mm c/c with two side high strength adhesive tape. 3) Panel- the mirror pasted on spacers shall be fixed on 9mm thick heavy duty compressed (high pressure steam cured) Asbestos free fiber cement board confirming to IS 14862: 2000 Type A Category III. The fiber cement board back side facing wall/partition shall be painted with 2 coats of epoxy/ elastomeric polymer based water proofing chemical. 4) Framing & Beading- There shall be 30 mm deep continuous extruded aluminum "T" profile with rubber gaskets to support the mirror panel and fix the secured mirror panel to the wall/ partition using heavy duty anchor fasteners. The aluminum profile shall be	Smt	20.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>powder coated with pure polyester or epoxy polyester in 50-micron thickness as per color, finish as per drawing and instruction by architect. The aluminum profile shall have pocket all around to house aluminum profile LED light which shall be paid separately in relevant tender item. All product Make approved as per tender and architect selection.</p>				
<p>113</p>	<p><b>WALL PANELING:</b> - Manufacturing, supply, arrangement and keeping in good condition until project completion of wall paneling/ cladding up to 75 mm thickness up to 3000 mm height as per design and instruction of architect having 1). Framing - Wall paneling/ cladding to be erected/ installed using 150 GSM coated galvanized iron G.I. vertical stud of size 51mm (0.55mm thick having one flange of 42mm and another flange of 44mm &amp; two equal lips of 6mm) insert fixed into the floor and ceiling track at maximum 610mm c/c. Nogging cut from the track are fixed horizontally to the stud at the maximum spacing of 1.22m. Round bell mouthed service hole of 25mm diameter placed at equal spacing on the stud for conducting of electrical and mechanical service in a straight line. Single layer of 9mm thick Heavy Duty Compressed (High Pressure Steam Cured) Asbestos free Fiber Cement Board confirming to IS 14862: 2000 Type A Category III are screw fixed on either side of the framework with 25mm self-drilling, self-tapping countersunk screws at 300mm c/c. The joints of board are to be staggered to avoid through joints. fixing on the wall including all necessary material required for erecting and fixing the wall panel complete as per the design and direction of the architect. 2). Wall panel to be of material as specified by architect Either 12 mm thick Block board with decorative veneer made of rubber wood / Bamboo confirming to Urea formaldehyde free MR / BWP grade Decorative type (BWP/MR-DEC) as per IS 1659-2004 meeting green building norms or having BIS ECO mark using low VOC adhesive 9 mm solid wood lipping having color, shade and</p>	<p>Smt</p>	<p>14.00</p>		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<p>grain selected by architect low using VOC CFC HFCF free suitable adhesive. OR 10 mm thick solid wooden battens of width as per design OR 8 mm thick cork wood roll fixed with 25mm self-drilling, self-tapping countersunk screws at 300mm c/c. and suitable low VOC adhesive as per requirement and instruction of architect.3) Polish - wooden surface finished with water based low VOC PU polish in shade, finish, texture and specification as per architect including fine sanding before and after insulator (sealer) coats and first coat of PU, clear non-toxic low VOC termite control additive, 2 coat of clear epoxy insulator in 1:1 proportion of hardener and epoxy, dent filling with matching putty, wooden stainer and 2 coats of water based PU etc. complete as per drawing and as directed by architect. 4) Price to be inclusive of all hardware, adhesive, nails, screws, fasteners, hooks, clips, abro tape, ABS parts and all Labour etc. All product Make approved as per tender and architect selection.</p>				
114	<p><b>Wooden BED:</b> -Providing &amp; fixing bed in all bedrooms' height and size as per given detail drawing. with head panel and Main frame of head panel made of 1st class CP teak wood of section 4" (including 1/2" beading) x 1 1/4"(thick,) with central panel made in 8mm thick anti termite and water proof Plywood pasted with 1mm veneer as approved. having wooden shelf, hydraulic drawers, storage shutters, etc as per drawings each have framing of 18 mm ply and having equal nos of shutters as per given drawing of 18 mm thick ply. All complete with proper Burma border biding. finished with natural polish All exposed &amp; internal surfaces are covered with veneer with PU finish. using standard adhesive and any other necessary fixing arrangement External &amp; internal joints covered with bidding Patti complete with laminate finish. All complete with proper hardware like S.S. Screws, MS Nails, S.S handles, knobs, channels, All Details as per shown in drawings &amp; as per instructions of architect in charge with approval of all item sample.</p>	no	6.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
115	<p><b>Temple:</b> -making &amp; fixing wooden temple in all bedrooms' height and size as per given detail drawing with head panel and Main frame of head panel made of 1st class CP teak wood of section 4" (including 1/2" beading) x 1 1/4"(thick,) with central panel made in 8mm thick anti termite and water proof Plywood pasted with 1mm veneer as approved. having wooden shelf, hydraulic drawers, storage, shutters, etc as per drawings each have framing of 18 mm ply and having equal nos of shutters as per given drawing of 18 mm thick ply. All complete with proper Burma border biding. finished with natural polish All exposed &amp; internal surfaces are covered with veneer with PU finish. using standard adhesive and any other necessary fixing arrangement. External &amp; internal joints covered with bidding Patti complete with laminate finish. All complete with proper hardware like S.S. Screws, MS Nails, S.S handles, knobs , channels, All Details as per shown in drawings &amp; as per instructions of architect in charge with approval of all item sample.</p>	Smt	2.00		
116	<p>Modular kitchen: Providing &amp; fixing overhead storage, bottom storage, floor standing storage for height up to 3000m and depth up to 600mm storage of size as per given detail drawing. having wooden shelf, hydraulic drawer / pull out with tendom box channel, storage shutters, gas pump as per requirement etc. as per drawings each have framing of 18 mm ply and having equal nos of shutters as per given drawing of 18mm thick ply. All complete with proper Burma border biding. finished with natural polish All exposed &amp; internal surfaces are covered with veneer with PU finish. External &amp; internal joints covered with bidding Patti complete with laminate finish. All complete with proper hardware like S.S. Screws, MS Nails, S.S handles, knobs, channels, All Details as per shown in drawings &amp; as per instructions of architect in charge. mode of measurement is in plan</p>	Smt	5.00		
<b>(C) PLUMBING WORK</b>					
117	<p>Wash basin: Providing and fixing wall maounted wash basin 400x550x130mm</p>	no	8.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	without integrated pedestal white having 35 mm C.P. brass pillar tap hole, fixing to the wall using with SS rag bolts & suitable accessories making good the walls wherever require: including 32mm Brass Full Thread Waste Coupling 3", White Vitreous China wash basin size 535x400 mm with single hole, all product Make approved as per tender and architect selection.				
118	Kitchen Sink: Providing, fixing and keeping in good condition until project completion Stainless Steel Kitchen Sink ASIS 304 Grade x 1mm thick with overall size 610x445 mm & bowl size 500x345x210 as specified by Architect in charge on granite or masonry with proper cutting or fixing on sides etc, complete in level. All product Make approved as per tender and architect selection.	no	2.00		
119	Water Closet : Providing , fixing and keeping in good condition until project completion wash down back to Wall Water Closet pan including soft close seat cover with integral P or S trap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement : 1 find sand) (A) Vitreous china pattern- I (i) in white colour.	no	1.00		
120	Water Closet: Providing and fixing floor mounted Water Closet size 550x365x390mm including flushing system set soft seat cover P trap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement: 1 find sand), making leakage proof of all fittings (i) in white color. All product Make approved as per tender and architect selection.	no	8.00		
121	Towel rack: Providing and fixing C.P. Full brass towel ring complete with C.P. brass brackets fixed to wooden plugs with C.P. brass screws. All product Make approved as per tender and architect selection.	no	8.00		
122	Waste coupling: Providing, fixing, testing commissioning and keeping in good condition until project of WASTE COUPLING with 32 mm half thread. All product Make approved as per tender and architect selection.	no	10.00		
123	Long Braided Hose pipe: Providing and fixing 450mm Long Braided Hose pipe with M10X1 Nipple, 15mm Nut, O-Ring & Rubber Washer	no	10.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	(Suitable for Wash Basin, Kitchen Sink etc) of approved make and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.				
124	Soap Dish: Providing, fixing, testing commissioning and keeping in good condition until project Soap Dish in Polished chrome of approved make and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.	no	8.00		
125	Shower - Providing, fixing, testing commissioning and keeping in good condition until project of shower trim with valve and wall mounted shower with button spout, hand shower with bracket. As per approved and selection by architect / consultant. All product Make approved as per tender and architect selection.	no	8.00		
126	Soap dispenser: Providing, fixing, testing commissioning and keeping in good condition until project transparent soap dispenser 200 ml & holder on wall mounted with 7 year guaranteed against leakage. also lockable with key selected by architect. All product Make approved as per tender and architect selection.	no	8.00		
127	Metropole Flush valve: Providing, fixing, testing commissioning concealed push type (dual flush 40 mm) in mirror polished chrome, with wall flange, with required fittings, of approved quality and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.	no	8.00		
128	Two Way Bib Cock: Providing and fixing 15MM brass 2-way Bib cock with wall flange and aerator, quarter turn lever operating knob, with ceramic spindle, in mirror polished chrome, connected to the supply line complete. with required fittings, for utility area wc, of approved quality and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.	no	8.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
129	Kitchen Sink Cock: Providing, fixing, testing commissioning and keeping in good condition until project Single lever wall Mount Kitchen Sink Cock with Extended Swinging Spout (Wall Mounted Model) With Wall Flange, in Polished Chrome of approved make and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.	no	2.00		
130	Angular cock W/O flange : Providing ,fixing ,testing commissioning and keeping in good condition until project g of 15mm CP brass angle valve with CP copper connecting pipe 375 mm long along with nuts, washer and brass flange complete as per drawing and details.(for wash basin control valves All product Make approved as per tender and architect selection.	no	10.00		
131	Bib cock: Providing, fixing, testing commissioning and keeping in good condition until project of 15mm dia C.P. brass bib cock with C.P brass threaded wall flange complete including cutting and making good the wall wherever required. All product Make approved as per tender and architect selection.	no	17.00		
132	Ball cock 25mm - Providing, fixing, testing commissioning and keeping in good condition until project ball cock of approved. quality as directed. (A) Copper Metal (i) 25mm dia. All product Make approved as per tender and architect selection.	no	10.00		
133	Health Faucet: Providing, fixing, testing commissioning and keeping in good condition until project completion of Health faucet with all fittings complete as per specification / drawings and details. All product Make approved as per tender and architect selection.	no	8.00		
134	Pillar Faucet: Providing and fixing Brass pressmatic auto closing Pillar Faucet with push type knob, 7.5 ± 2.5 second flow time with base flange, integrated honeycomb structured aerator, plastic cartaidge in mirror polished chrome to the wash basin and connected to the supply line complete with required fittings,	no	8.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	for utility area basins, of approved quality and conforming to Manufacturers Standards. All product Make approved as per tender and architect selection.				
135	Bottle trap: Providing and fixing CP Brass Brass Bottle Trap (Silver) Bottle Trap with 12" pipe of same of approved quality &. All product Make approved as per tender and architect selection.	no	10.00		
136	P or S trap 100mm: Providing and fixing 100mm size P or S trap for including jointing the trap with the pan and soil pipe in cement Mortar 1:1 (1-Cement: 1-Fine sand) (A) Vitreous China. All product Make approved as per tender and architect selection.	no	8.00		
137	G.I. inlet: Providing and fixing G.I. inlet connection for flush pipe with W.C. Pan. All product Make approved as per tender and architect selection.	no	8.00		
138	RIGID PVC 40mm: Providing, fixing, testing commissioning and keeping in good condition until project RIGID PVC Pipe for Kitchen Sink, basin wash out & urinal wash out pipe ISI marked brand as per IS:4985(6 KG.) complete with PVC Fittings & claps & hinges including cutting and making good the walls & ceiling for waste pipes, connections & as directed by the engineer-in-charge. (Astral/Ashirvad/Supreme) 40 mm dia INCLUDING ALL BENDS. All product Make approved as per tender and architect selection.	rmt	100.00		
139	CPVC 15mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [A] 15 mm. All product Make approved as per tender and architect selection.	rmt	80.00		
140	CPVC 20mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling	rmt	40.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	and floor etc. complete. [B] 20 mm. All product Make approved as per tender and architect selection.				
141	CPVC 25mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [C] 25 mm. All product Make approved as per tender and architect selection.	rmt	40.00		
142	CPVC 32mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [D] 32 mm. All product Make approved as per tender and architect selection.	rmt	40.00		
143	CPVC 40mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [E] 40 mm. All product Make approved as per tender and architect selection.	rmt	40.00		
144	CPVC 50mm: Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [F] 50 mm. All product Make approved as per tender and architect selection.	rmt	40.00		
145	C.P. brass waste 40mm: Providing and fixing C.P. brass waste for washbasin or sink. (B) 40mm dia. All product Make approved as per tender and architect selection.	no	8.00		
146	UPVC 25mm: Providing laying and jointing in true line and level 25mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings make	rmt	100.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	PRINCE / SUPREME / ASTRAL / FINOLEX or equivalent as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. All product Make approved as per tender and architect selection.				
147	UPVC 32mm - Providing laying and jointing in true line and level 32mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings make PRINCE / SUPREME / ASTRAL / FINOLEX or equivalent as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. All product Make approved as per tender and architect selection.	rmt	100.00		
148	UPVC 32mm : Providing, fixing and testing and commissioning of heavy duty (ASTM F 441) uPVC Sch-80.0 pipes & Fittings (ASTM D 1784) with solvent weld socket joints and necessary fittings of brass thread with necessary fittings, such as elbow 90 degree, elbow 45 degree, coupling, tee, unions, reducer, bushings, male and female fitting at the end, bend suspenders etc. using uPVC solvent as per standard ASTM F-493, including necessary supports viz., split clamps (Chilly make) with anchor fastener to RCC or masonry pedestals and battens, if required as per drawing/detail, hydro testing and as per technical specifications directed by the Project Manager. 32 mm dia.	rmt	10.00	528.4 0	#REF!
149	UPVC 40mm - Providing, fixing and testing and commissioning of heavy duty (ASTM F 441) uPVC Sch-80.0 pipes & Fittings (ASTM D 1784) with solvent weld socket joints and necessary fittings of brass thread with necessary fittings, such as elbow 90 degree, elbow 45 degree, coupling, tee, unions, reducer, bushings, male and female fitting at the end, bend suspenders etc. using uPVC solvent as per standard	rmt	10.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	ASTMF-493, including necessary supports viz., split clamps (Chilly make) with anchor fastener to RCC or masonry pedestals and battens, if required as per drawing/detail, hydro testing and as per technical specifications directed by the Project Manager.40 mm dia.All product Make approved as per tender and architect selection.				
150	UPVC 50mm - Providing, fixing and testing and commissioning of heavy duty (ASTM F 441) uPVC Sch-80.0 pipes & Fittings (ASTM D 1784) with solvent weld socket joints and necessary fittings of brass thread with necessary fittings, such as elbow 90 degree, elbow 45 degree, coupling, tee, unions, reducer, bushings, male and female fitting at the end, bend suspenders etc. using uPVC solvent as per standard ASTMF-493, including necessary supports viz., split clamps (Chilly make) with anchor fastener to RCC or masonry pedestals and battens, if required as per drawing/detail, hydro testing and as per technical specifications directed by the Project Manager.50 mm dia. All product Make approved as per tender and architect selection.	rmt	100.00		
151	UPVC 65mm - Providing, fixing and testing and commissioning of heavy duty (ASTM F 441) uPVC Sch-80.0 pipes & Fittings (ASTM D 1784) with solvent weld socket joints and necessary fittings of brass thread with necessary fittings, such as elbow 90 degree, elbow 45 degree, coupling, tee, unions, reducer, bushings, male and female fitting at the end, bend suspenders etc. using uPVC solvent as per standard ASTMF-493, including necessary supports viz., split clamps (Chilly make) with anchor fastener to RCC or masonry pedestals and battens, if required as per drawing/detail, hydro testing and as per technical specifications directed by the Project Manager. 65 mm dia. All product Make approved as per tender and architect selection.	rmt	10.00		
152	UPVC 80mm - Providing, fixing and testing and commissioning of heavy duty (ASTM F 441) uPVC Sch-80.0 pipes & Fittings (ASTM D 1784) with solvent weld socket joints and necessary fittings of brass thread with necessary fittings,	rmt	15.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	such as elbow 90 degree, elbow 45 degree, coupling, tee, unions, reducer, bushings, male and female fitting at the end, bend suspenders etc. using uPVC solvent as per standard ASTM F-493, including necessary supports viz., split clamps (Chilly make) with anchor fastener to RCC or masonry pedestals and battens, if required as per drawing/detail, hydro testing and as per technical specifications directed by the Project Manager. 80 mm dia. All product Make approved as per tender and architect selection.				
153	UPVC 75mm - Providing, laying and jointing in true line and level 75 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. All product Make approved as per tender and architect selection.	rmt	5.00		
154	UPVC 110mm - Providing, laying and jointing in true line and level 110 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. All product Make approved as per tender and architect	rmt	35.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	selection.				
155	UPVC 160mm - Providing, laying and jointing in true line and level 160 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 160 mm diameter x 210 mm length x 196 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. All product Make approved as per tender and architect selection.	rmt	42.00		
156	UPVC foam core 160mm - Providing, Fixing, testing and commissioning of underground UPVC foam core multi-layer pipes having outer and inner layers of conventional PVC and middle layer of foamed PVC with fittings of specified diameter with all necessary specials etc. complete to specifications, drawings, details as directed by Project Manager. (Astral/Ashirvad/Supreme) (160 mm dia). All product Make approved as per tender and architect selection.	rmt	45.00		
157	UPVC foam core 200mm - Providing, Fixing, testing and commissioning of underground UPVC foam core multi-layer pipes having outer and inner layers of conventional PVC and middle layer of foamed PVC with fittings of specified diameter with all necessary specials etc. complete to specifications, drawings, details as directed by Project Manager. (Astral / Ashirvad / Supreme) (200 mm dia). All product Make approved as per tender and architect selection.	rmt	10.00		
158	Agriculture uPVC Pipe 40mm - Providing, Fixing, testing & commissioning 6 kg/ sq. cm Agriculture uPVC Pipe Selfit ISI marked brand as per IS 4985 complete including solvent cement jointing & hydraulic testing the joints	rmt	20.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	& pipes as mentioned in the specification etc. and making connection with down take wherever required to satisfaction of engr/ arch with proper care, protecting fittings & pipes till the final handing over etc as directed by E-I-C complete as per specifications & drawing provided for all places, all heights & all levels. (A) 40 mm diameter All product Make approved as per tender and architect selection.				
159	PVC Cowl 110mm - Providing & fixing PVC Cowl on PVC ventilating pipes and verticals for soil and waste Pipes & Rain water pipes at top level/ terrace level, as specified and required, etc. complete. (A) 110 mm diameter All product Make approved as per tender and architect selection.	no	7.00		
160	PVC Cowl 160mm - Providing & fixing PVC Cowl on PVC ventilating pipes and verticals for soil and waste Pipes & Rain water pipes at top level/ terrace level, as specified and required, etc. complete. (B) 160 mm diameter All product Make approved as per tender and architect selection.	no	7.00		
161	Stainless Steel Ball Valve 15mm - Providing, fixing, testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two-piece design lever operated of approved quality (screwed end): 15 mm diameter All product Make approved as per tender and architect selection.	no	8.00		
162	Stainless Steel Ball Valve 20mm - Providing, fixing, testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two-piece design lever operated of approved quality (screwed end) :20 mm diameter All product Make approved as per tender and architect selection.	no	8.00		
163	Stainless Steel Ball Valve 25mm - Providing ,fixing ,testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two piece design lever	no	5.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	operated of approved quality (screwed end) : 25 mm diameter All product Make approved as per tender and architect selection.				
164	Stainless Steel Ball Valve 32mm - Providing ,fixing ,testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two piece design lever operated of approved quality (screwed end) : 32 mm diameter All product Make approved as per tender and architect selection.	no	5.00		
165	Stainless Steel Ball Valve 40mm - Providing ,fixing ,testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two piece design lever operated of approved quality (screwed end) : 40 mm diameter All product Make approved as per tender and architect selection.	no	5.00		
166	Stainless Steel Ball Valve 50mm - Providing ,fixing ,testing commissioning and keeping in good condition until project Stainless Steel Ball Valve with two piece design lever operated of approved quality (screwed end) : 50 mm diameter All product Make approved as per tender and architect selection.	no	2.00		
167	Air Release Valve of 25mm - Providing, fixing, testing commissioning and keeping in good condition until project of heavy quality gun metal or brass Air Release Valve of 25mm size with screwed / flanged ends, factory tested, etc. complete as per specification and to the satisfaction of Project Manager. (Water Supply Riser) for all depth/ heights and lead. (zoloto / Honeywell) All product Make approved as per tender and architect selection.	no	2.00		
168	Ball valve - Providing, fixing, testing commissioning and keeping in good condition until project of gunmetal, male or female threaded isolation control valve (Ball valve), confirming to IS 778, PN 16, with necessary specials, union, nipples, insulation, etc., to complete the job. (For Internal Toilet Work) Valve Pressure Rating should be min PN16,	no	6.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Valve body should be forged brass type and full bore construction, Ball should be chrome plated forged brass type, Seat Should be of PTFE type, Handle should be of Chrome Plated Steel. All product Make approved as per tender and architect selection.				
169	Butterfly Valve 65 mm - Providing, fixing, testing commissioning and keeping in good condition until project of gunmetal, male or female threaded isolation control valve (Butterfly Valve, Wafer Type), confirming to latest IS, PN 16, with necessary specials, union, nipples etc., to complete the job. (For Terrace water Ring, Basement Ring & plumbing Shaft ) <b>65 mm dia</b> All product Make approved as per tender and architect selection.	no	2.00		
170	Butterfly Valve 80mm - Providing, fixing, testing commissioning and keeping in good condition until project of gunmetal, male or female threaded isolation control valve (Butterfly Valve, Wafer Type), confirming to latest IS, PN 16, with necessary specials, union, nipples etc., to complete the job. (For Terrace water Ring, Basement Ring & plumbing Shaft ) <b>80 mm dia.</b> All product Make approved as per tender and architect selection.	no	2.00		
171	Y' strainer 65mm - Providing, fixing, testing commissioning and keeping in good condition until project cast iron 'Y' strainer suitable to pipes of following dia. including flange. Min Pressure Rating should be PN 16. Body should be ductile Iron with Epoxy Coating & Gasket of EPDM material. Filter Screen: Stainless Steel, Medium Temperature: -10°C to 120 °C, End Connections: Flanged 65 mm dia All Product Make approved as per tender and architect selection.	no	2.00		
172	Y' strainer 80mm - Providing, fixing, testing commissioning and keeping in good condition until project cast iron 'Y' strainer suitable to pipes of following dia. including flange. Min Pressure Rating should be PN 16. Body should be ductile Iron with Epoxy Coating & Gasket of EPDM material. Filter Screen : Stainless Steel, Medium Temperature : -10°C to 120 °C, End Connections : Flanged 80 mm dia All product	no	8.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Make approved as per tender and architect selection.				
173	PVC SWR Nahni trap 100mm - Providing and fixing PVC SWR Nahni trap IS 14735 for drain - 100 mm diameter with jail of the following nominal diameter of self-cleaning design wit C.I scread down or hinged grating including the cost of cutting and making good the wall. All product Make approved as per tender and architect selection.	no	9.00		
174	PVC SWR Nahni trap 75mm - Providing and fixing PVC SWR Nahni trap IS 14735 for drain - 75 mm diameter with jali of the following nominal diameter of self-cleaning design with C.I scread down or hinged grating including the cost cutting and making good the wall. All product Make approved as per tender and architect selection.	no	25.00		
175	Grating 100mm - Providing and fixing 100mm sand cast iron Grating for gully, floor or Nahni trap. All product Make approved as per tender and architect selection.	no	18.00		
176	Stoneware pipe 100mm - Providing and laying (to level or slopes) and jointing with stiff mixture of Cement Mortar in proportion 1:1 Selt glazed Stoneware pipes including testing of pipes and joints complete. (A) 100mm dia. All product Make approved as per tender and architect selection.	rmt	25.00		
177	Stoneware pipe 150mm - Providing and laying (to level or slopes) and jointing with stiff mixture of Cement Mortar in proportion 1:1 Selt glazed stoneware pipes including testing of pipes and joints complete. (B) 150mm dia. All product Make approved as per tender and architect selection.	rmt	15.00		
178	Bedding for pipe 112mm thick - Providing and laying Cement concrete 1:5:10 (1-Cement : 5-Fine sand :10-Graded stone aggregate 40mm nominal size) bedding for stoneware pipes of following internal diameters with necessary formwork and curing complete. (A) 100 mm dia. (112 mm Ave. bed thickness) All product Make approved as per tender and architect selection.	rmt	15.00		
179	Bedding for pipe 166mm thick - Providing and	rmt	15.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	laying Cement concrete 1:5:10 (1-Cement : 5-Fine sand :10-Graded stone aggregate 40mm nominal size) bedding for stoneware pipes of following internal diameters with necessary formwork and curing complete. (B) 150mm dia. (166mm Ave. bed thickness) All product Make approved as per tender and architect selection.				
180	Gully Trap - Providing and fixing S.W. Gully Trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight. (i) Square mouth traps. (B) 150mm x 100mm size P or R type. All product Make approved as per tender and architect selection.	no	18.00		
181	Chamber 500mm x 450mm x 600mm - Constructing Brick Masonry Road Gully Chamber 500mm x 450mm x 600mm including 500mm x 450mm C.I. horizontal grating with frame complete. All product Make approved as per tender and architect selection.	no	5.00		
182	Inspection Chamber 600mm x 850mm x 450mm - Constructing brick masonry chamber for underground C.I. Inspection Chamber and bends with bricks having crushing strength not less than 35Kg. Cm <sup>2</sup> in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions' total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete. (iii) Inside dimensions 600mm x 850mm and 450mm deep for pipe lines with three or more inlets. All product Make approved as per tender and architect selection.	no	6.00		
183	Additional depth of 0.1 M - Extra over items for every additional depth of 0.1 M. of part thereof beyond 450mm depth for Brick Masonry Inspection Chamber. (iii) for 600mm x 850mm size. All product Make approved as	no	6.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	per tender and architect selection.				
184	Chamber 900mm x 1200mm x 1500mm - Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3-coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:5 (1-Cement : 5-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1-Cement :2-Coarse sand :4- stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) With 230mm thick walls of brick masonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (1) A type depth 0.90 Meter for 150mm diameter sewer. All product Make approved as per tender and architect selection.	no	4.00		
185	Core cutting 75mm - Providing and wet drilling accurate and clean holes of specified diameter in RCC walls, slabs, beam or any other RCC member without vibration by core cutting (diamond drilling) machine including scaffolding, safety majors, disposing the debris, cleaning for all levels/ all height as per structural consultant's drawing, after approval of engineer in charge etc. compete. Rate shall be inclusive of filling the hole with non shrink groutin good manner. Measurement shall be taken for the depth of holes in running meter for specified diameter. Holes shall have made by authorized approved agency. (51 to 75 mm dia). All product Make approved as per tender and architect selection.	rmt	1.00		
186	Core cutting 100mm - Providing and wet drilling accurate and clean holes of specified diameter in RCC walls, slabs, beam or any other RCC member without vibration by core cutting (diamond drilling) machine including scaffolding, safety majors, disposing the	rmt	1.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	debris, cleaning for all levels/ all height as per structural consultant's drawing, after approval of engineer in charge etc. compete. Rate shall be inclusive of filling the hole with nonshrink groutin good manner. Measurement shall be taken for the depth of holes in running meter for specified diameter. Holes shall make by authorized approved agency. (76 to 100 mm dia). All product Make approved as per tender and architect selection.				
187	Core cutting 150mm - Providing and wet drilling accurate and clean holes of specified diameter in RCC walls, slabs, beam or any other RCC member without vibration by core cutting (diamond drilling) machine including scaffolding, safety majors, disposing the debris, cleaning for all levels/ all height as per structural consultant's drawing, after approval of engineer in charge etc compete. Rate shall be inclusive of filling the hole with nonshrink groutin good manner. Measurement shall be taken for the depth of holes in running meter for specified diameter. Holes shall made by authorized approved agency. (101 to 150 mm dia) . All product Make approved as per tender and architect selection.	rmt	1.00		
188	Core cutting 200mm - Providing and wet drilling accurate and clean holes of specified diameter in RCC walls, slabs, beam or any other RCC member without vibration by core cutting (diamond drilling) machine including scaffolding, safety majors, disposing the debris, cleaning for all levels/ all height as per structural consultant's drawing, after approval of engineer in charge etc. compete. Rate shall be inclusive of filling the hole with nonshrink groutin good manner. Measurement shall be taken for the depth of holes in running meter for specified diameter. Holes shall made by authorized approved agency. (151 to 200 mm dia). All product Make approved as per tender and architect selection.	rmt	1.00		
189	Core cutting 100mm x 100mm: Providing and wet drilling accurate and clean holes of specified diameter in RCC walls, slabs, beam or any other RCC member without vibration by core cutting (diamond drilling) machine	rmt	1.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	including scaffolding, safety majors, disposing the debris, cleaning for all levels/ all height as per structural consultant's drawing, after approval of engineer in charge etc. compete. Rate shall be inclusive of filling the hole with nonshrink groutin good manner. Measurement shall be taken for the depth of holes in running meter for specified diameter. Holes shall made by authorized approved agency. (100 x 100 mm cut out in slab). All product Make approved as per tender and architect selection.				
<b>(D) LANDSCAPING WORK</b>					
190	Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan), including disposal of excavated earth, lead up to 50 m and lift up to 1.5 m, as per directions of Engineer in charge. All kinds of soil. All product Make approved as per tender and architect selection.	cmt	10.00		
191	Trenching by manual means in ordinary soil up to a depth of 60 cms. including removal and stacking of serviceable materials and then levelling within a lead of 50m and making up the trenched area to proper levels by filling with earth or earth mixed with manure including flooding trench with water (excluding cost of extra imported earth, sludge or manure but including cost of refilling of excavated good earth) All product Make approved as per tender and architect selection.	cmt	10.00		
192	Uprooting weeds from the trenched area after 10-15 days of its flooding with water including disposal of uprooted vegetation. All product Make approved as per tender and architect selection.	cmt	10.00		
193	Spreading of mixture of good earth and manure/ fertilizer in required thickness (cost of manure/ fertilizer and good earth to be paid separately) All product Make approved as per tender and architect selection.	cmt	10.00		
194	Supplying and stacking of good earth with PH value between 5.5 to 7.5 at site including	cmt	30.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	royalty and carriage up to site (good earth measured in stacked will be reduced by 20% for payment.) All product Make approved as per tender and architect selection.				
195	Preparation of beds for hedging and shrubbery by excavating 60 cm deep and trenching the excavated base to a further depth of 30 cm, refilling the excavated earth after breaking clods and mixing with sludge or manure in the ratio of 8:1 (8 parts of stacked volume of earth after reduction by 20% : one part of stacked volume of sludge or manure after reduction by 8%), flooding with water, filling with earth if necessary, watering and finally fine dressing, leveling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and leveling as directed, within a lead of 50 m, lift up to 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately) All product Make approved as per tender and architect selection.	cmt	10.00		
196	Digging of holes in ordinary soil and refilling the same with the excavated earth mixed with manure in ratio 2:1 (2 parts of excavated earth: 1 part of stacked volume of manure after reduction by 8%) flooding with water dressing including removal of rubbish & surplus earth if any with all leads & lift (cost of cow dung manure and extra imported earth to be paid separately). All product Make approved as per tender and architect selection.				
196.1	A) Holes size 0.6 m deep & 0.6 m dia.)	no	20.00		
196.2	B) Holes 90 cm dia, and 90 cm deep	no	20.00		
197	Supply and plantation of shrubs plants as per sample approved by architect. Plants should be quite healthy, disease free as per height and specification given below. Species can be changed as per site requirement and as per directions of architect. Rates shall be including maintenance, watering upto 60 daysShrubs assorted - Bauhinia, Beloperone, Lagerstroemia indicia, Malpighia coccigera, Nyctanthes arbor-tristis, Putranjiva roxburghii, Allamanda, Petrea volubilis. Katchnar,	no	100.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Mussanda, Amaranthus, Amaltas, Tabeubia, Hamelia, Ticoma, Tabernaemontana coronaria, Nerium Olender, Nerium Dwarf, Lavendra, Daffodil, Euphorbia, Calliandra, Tecoma gaudichaudi, Acalypha various, Lantana various, signonium various, assorted lilies, execaria bi colourm Vernonia elaeagnifolia, etc. in their assorted species height 60-75 cm. in earthen pot of size 20 cm/ in bag of size 25 cm				
198	Trees/ Exotic Plants: Supply and plantation of plants as per sample approved by the architect. Plants should be quite healthy, disease free as per height and specification given below. Species can be changed as per site requirement and as per directions of architect. Rates shall be including maintenance, watering up to 60 days	no	30.00		
199	Providing Circular Cement Concrete pots of specified size, cast with cement concrete of nominal mix 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 6 mm nominal size), reinforced with 7 Nos (3 nos horizontal & 4 nos vertical "U "shape) M.S. wires of 3.5 mm dia as per design, including required form work, finishing with cement punning on exposed surface, curing for specified period and stacking in required rows & height, all complete as per direction of architect. For Top inside dia 35 cm, outer bottom dia 25 cm, total height 35 cm with wall thickness of 25.4 mm All Product Make approved as per tender and architect selection.	no	10.00		
200	Providing Circular polypropylene pots made of 100% virgin material having wall thickness of about 2 mm with UV protection as per design shape all complete as per direction of architect. All product Make approved as per tender and architect selection.				
200.1	B) Top inside dia 43 cm total height 36 cm - 32 liter	no	5.00		
200.2	E) rectangle - top size 83 cm X 33 cm total height 28 cm - 52	no	5.00		
201	Supplying and plantation of ground covering plants of height 20-25 cm. full of branches well developed in 15 cm size of Earthen Pot/Plastic	no	100.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Pot and as per direction of the architect. Rates shall be including maintenance, watering up to 60 days. (Altranenthra 3 varieties, Iresine , Lavendra, Opiopogum, Wadelia, Verbena, Jade, asparagus var., chlorophytum, etc.(Species can be changed as per site requirement and as per direction of architect )				
202	Supplying of healthy disease free Creepers plants of of height 30 cm to 45 cm. in 20 cm size of Earthen pots / Plastic pots and as per direction of the architect. Rates shall be including maintenance, watering up to 60 days. (Jacoqmentia, Tecoma Grandflora, Almanda, Adenochlyma, Chameli yellow / white, Chlorodendron Splendence, Vernonia etc. (Species can be changed as per site requirement and as per direction of architect)	no	50.00		
203	Supplying and stacking well decomposed cow dung manure at site including royalty and carriage up to site and all leads and lifts. (cow dung measured in stacked will be reduced by 8% for payment.)	cmt	9.00		
204	Supplying, stacking at site of Narmada Neem De-oiled Cake following all appropriate steps for cultivation as specified by the manufacturer of including royalty and carriage with all leads and lifts (fertilizer to be brought in company sealed bags only)	50 kg bags	5.00		
205	Supplying, stacking at site of IFFCO NPK Liquid Consortia (Consortium of Rhizobium, Azotobacter and Acetobacter, PSB and KMB) following all appropriate steps for cultivation as specified by the manufacturer of including royalty and carriage with all leads and lifts (fertilizer to be brought in company sealed container only)	liter	10.00		
206	Supplying, stacking and utilizing Castor De-oiled Cake following all appropriate steps for cultivation as specified by the manufacturer of including royalty and carriage with all leads and lifts (fertilizer to be brought in company sealed bags only)	50 kg bags	5.00		
207	Supplying, stacking at site DAP following all appropriate steps for cultivation as specified by the manufacturer of including royalty and carriage with all leads and lifts (product to be	50 kg bags	5.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	brought in company sealed bag only)				
208	Formation of a Rockery including supplying of all relevant material like: earth manure, pebbles, stones, bricks, plants and all other allied items as required to a proper shape, size and height as directed by engineer and as per drawing. (cost of plants will be separately)	smt	15.00		
209	Filling of the following size empty pots with mixture of good earth & manure in the ratio as prescribed by architect and placing them on appropriate place including carriage of earth, manure and pots up to 50 meter as per direction of officer in charge including plantation of the plant and caring for the plant for 30 days including watering, pruning etc. (The cost of good earth, earthen pots, plant and manure/ fertilizer will be paid separately.)				
209.1	A) Size of Empty Pots up to 33 cm Top dia	no	10.00		
209.2	D) Size of Empty Pots 83 cm X 33 cm top	no	10.00		
<b>(E) ELECTRICAL WORK</b>					
	<b>Point Wiring</b>				
210	Point wiring for Light / Bell with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires, in following type of pipe to be erected concealed in/ on surface on wall/ceiling complete with 6A Modular type switch / bell push & accessories and earth continuity of following type, erected on PVC / Metallic box, single mounting base frame covered with textured/metallic front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D. Connector as directed. <b>(a) with medium class Rigid PVC pipe and accessories Cat. III</b>	Pt.	107.00		
211	<b>Point wiring for FAN</b> with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of .ISI marked 1.1 KV Grade FRLS PVC insulated multistrand copper wires, in following type of pipe to be erected concealed in / flushed on wall/ceiling complete with 6A Modular type switch and hum free EME four or more step type electronic fan regulator with separately mounted and accessories with earth continuity of following type erected on PVC / Metallic	Pt.	22.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	box, single mounting base frame covered with textured/metallic front plate modules erected on / in wall / ceiling as per pipe erected. with necessary ceiling rose / H.D. Connector as directed ( Replacing point wiring - 10 Pt.) <b>(a) with medium class Rigid PVC pipe and accessories Cat-III</b>				
212	Point wiring for <b>secondary light point</b> with 2-1.5 sq.mm & earthwire of 1.5 sq.mm (green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires, in following type of pipe to be erected concealed in / flushed on wall/ceiling, complete with earth continuity and necessary connection with primary light with accessories erected on Metal / PVC box covered with 3 mm thick PC (Polycarbonate) / Acrylic sheet for open / concealed wiring. with necessary Lamp holder / ceiling rose / H.D. Connector as directed. <b>Note:- Maximum up to 6 mtrs length, excess will be considered as Mains for Secondary Point.</b> <b>(a) with medium class Rigid PVC pipe and accessories</b>	Pt.	57.00		
213	Point wiring for <b>Two Way Controlled Light Point</b> with 2-1.5 sq.mm & earthwire of 1.5 sq.mm (green) both are of. ISI marked 1.1 KV grade FRLS PVC insulated multistrand copper wires, in following type of pipe to be erected concealed in / flushed on wall / ceiling, complete with 6A Modular type switches and following type of accessories erected on PVC / Metallic box, single mounting base frame covered with textured / metallic front plate modules erected on / in wall / ceiling as per pipe erected. with necessary batten/angle holder or ceiling rose or H.D. Connector as directed. <b>(a) with medium class Rigid PVC pipe and accessories. Cat. III</b>	Pt.	8.00		
214	Point wiring for Individual Plug with & earthwire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multistrand copper wires, in following type of to be erected concealed in / on surface of wall / ceiling complete with Modular type switch & 5 pin Plug erected on PVC / Metallic box covered with appropriate front plate modules	Pt.	78.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	erected on / in wall / ceiling as per pipe erected with following type of accessories. [I] <b>For 6A Plug with 2-1.5 sq.mm Cu. Wire. (a) with medium class Rigid PVC pipe and accessories. Cat. III</b>				
215	Point wiring for Individual Plug with & earthwire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multistrand copper wires, in following type of to be erected concealed in / on surface of wall / ceiling complete with Modular type switch & 5 pin Plug erected on PVC / Metallic box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories. [II] <b>For 16A Plug with 2-2.5 sq.mm Cu. Wire. (a) with medium class Rigid PVC pipe and accessories. Cat. III</b>	Pt.	17.00		
216	Point wiring for Individual Plug with & earthwire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multistrand copper wires, in following type of to be erected concealed in / on surface of wall / ceiling complete with Modular type switch & 5 pin Plug erected on PVC / Metallic box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories. [III] <b>For 16A Plug with 2-4 sq.mm Cu. Wire. (a) with medium class Rigid PVC pipe and accessories. Cat. III</b>	Pt.	9.00		
217	Providing following type of Modular Type Accessories mounted with pvc / metallic box, single mounting base frame covered with textured / metallic front plate, modules erected with necessary connection. As desired by Engineer In charge.				
217.1	(3) Two Pin/RJ-11 Telephone Socket. [B] For Two Gang. Cat.III	Ea.	5.00		
217.2	(4) TV Co-axial Socket outlet Cat.III	Ea.	7.00		
217.3	(5) Electronic hum Free four or more steps EME Fan regulator	Ea.	22.00		
217.4	(7) Blank Plate Single Cat.III	Ea.	25.00		
217.5	(8) Modem Jack for Computer Open RJ-45 Cat.III	Ea.	2.00		
218	<b>Call bell gong type suitable for 230 volts, 50</b>	Ea.	5.00		



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	c/s. AC supply complete Erected				
219	<b>Decorative call bell Ting-tong box</b> type 250 volts complete erected	Ea.	5.00		
	<b>Conduits &amp; Pipes</b>				
220	Providing and erecting ISI mark <b>Medium class RIGID PVC PIPES</b> of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed				
220.1	(b) 25 mm	Mtr.	120.00		
220.2	(c) 32 mm	Mtr.	60.00		
	<b>UPVC Trunking System</b>				
221	(A) Supplying and laying UPVC cable trunking system comprising unplasticised polyvinyl, chloride rigid material with ignition free & flame proof confirming BS .All necessary accessories and measuring of following sizes.				
221.1	(2) 100 mm x 50 mm trunking	Mtr.	45.00		
221.2	(B) UPVC COUPLER (2) For100 mm x 50 mm trunking	Ea.	5.00		
221.3	( C) UPVC ELBOW (2) For100 mm x 50 mm trunking	Ea.	5.00		
221.4	(D) UPVC TEE (2) For100 mm x 50 mm trunking	Ea.	3.00		
221.5	(2) For100 mm x 50 mm trunking	Ea.	5.00		
221.6	(F) UPVC EXTERNAL BEND (2) For100 mm x 50 mm trunking	Ea.	5.00		
221.7	(G) UPVC END CAP (2) For100 mm x 50 mm trunking	Ea.	5.00		
221.8	(H) SOCKET MOUNTING FRAME (2) For100 mm x 50 mm trunking	Ea.	3.00		
221.9	(I) UPVC TRUNKING DIVIDER (2) For100 mm x 50 mm trunking	Mtr.	35.00		
	<b>Wires &amp; Mains</b>				
221	Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green color for earth continuity of following size <b>(a) with medium class Rigid PVC pipe and accessories</b> <b>(b) 2 wire 2.5 sq. mm</b>	Mtr.	3040.00		
222	Mains with 1.1 KV grade FRLS PVC insulated ISI	Mtr.	908.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	marked stranded Copper conductor wire in following type of pipe to be erected in / on wall / ceiling with 2.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green color for earth continuity of following size. (a) with medium class Rigid PVC pipe and accessories (a) 2 wire 4 sq. mm				
	<b>Cable and Termination</b>				
223	Supplying & erecting XLPE(IS:7098) (I)-88 ISI <b>unarmoured copper cable</b> 1.1 KV grade to be erected as directed of following size. <b>(F) 3 core 4 Sq. mm</b>	Mtr.	396.00		
224	Providing and erecting XLPE(IS:7098) (I)-88 ISI <b>armoured cable multistrand Copper conductor</b> for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables				
224.1	(A-1) 4 core 4 Sq. mm	Mtr.	279.00		
224.2	(B) 4 core 6 Sq. mm	Mtr.	68.00		
224.3	(C) 4 core 10 Sq. mm	Mtr.	65.00		
225	Providing and erecting XLPE(IS:7098) (I)-88 ISI <b>armoured cable multistrand Aluminium conductor</b> for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables <b>(B) 3 1/2 core 50 Sq. mm ( 25 Sq.1/2 mm core)</b>	Mtr.	51.00		
226	Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete without going tails, insulating tape etc for following size of cables.				
226.1	(b) 2 to 4 core 4 Sq. mm	Ea.	12.00		
226.2	(c) 2 to 4 core 6 Sq. mm	Ea.	2.00		
226.3	(d) 2 to 4 core 10 Sq. mm	Ea.	2.00		
227	Providing and, fixing heavy duty <b>flange type brass cable gland</b> with rubber ring for PVC insulated armored cable complete without going tails, insulating tape etc for following size of cables. <b>(B) 3 &amp; 1/2 core 35/50 Sq. mm</b>	Ea.	2.00		
228	Solderless crimping type <b>Aluminum lugs</b> conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass /				

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	cadmium plated nut bolts in an approved manner.				
228.1	(A) 1.5/ 2.5/4/6 Sq.mm	Ea.	117.00		
228.2	(B) 10 Sq.mm	Ea.	8.00		
228.3	(E) 35/50 Sq.mm.	Ea.	8.00		
	<b>Distribution Board &amp; MCBs</b>				
229	Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, confirming to IS 13032 and BS 5486-1986 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used)				
229.1	(F) Single phase 8 way SS Double door	Ea.	2.00		
229.2	(N) Three phase 8 way SS Double door for horizontal single phase outgoing	Ea.	1.00		
230	Providing and erecting <b>Sheet Steel powder coated MCB distribution board</b> - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, confirming to IS 13032 and BS 5486-1986 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) <b>(1) Three Phase 12 way SS double door.</b>	Ea.	1.00		
231	Approved make <b>ELCBs / RCCBs</b> conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 6 KA and suitable for operation on single phase 240 V. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed. <b>(i) 25 Amps.DP Cat. III</b>	Ea.	8.00		
232	Approved make <b>ELCBs / RCCBs</b> conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 6 KA and suitable for operation on single phase 240 V. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed. <b>(i) 32 Amps.DP Cat. III</b>	Ea.	3.00		
233	Miniature circuit breaker <b>single pole 6A to 32A</b> suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected	Ea.	75.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	in existing box. confirming to IS 8828/1996 with ISI Mark				
<b>234</b>	Providing & erecting 415 V <b>MCB Four Pole</b> for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity				
<b>234.1</b>	(a) 6 to 32 Amp. Cat.III	Ea.	8.00		
<b>234.2</b>	(b)40 Amp. Cat.III	Ea.	3.00		
	<b>Cupboards</b>				
<b>235</b>	Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board having IP-64 protection made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S. sheet for internal partitions with necessary supporting angles, flats including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, with suitable size of inter connecting PVC copper wire / copper-aluminum strips, rubber grommets, rib, Bakelite control fuses for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket complete. The Panel shall be painted with epoxy powder coating. (The rates excludes the cost of switchgears, bus bars, inter connecting mains & Copper Aluminum strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall be supplied with following approved manufacturers with following size. (A) The standard companies switch gear shall be used and only manufacturers at CPRI approved factory and shall be certified by that company whose switch gears are used after fabrication for beneficial use (i) with 350mm depth	Sq.Mtr	2.50		
<b>236</b>	Approved make <b>Four pole moulded case circuit breaker</b> having breaking capacity ICU of 25 KA. at 415 V, having normal current rating up to <b>25 A to 100A.</b> with Fixed thermal &	Ea.	1.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	magnetic release suitable to work on A.C. supply 50 c/s. with all internal connections & complete erected in existing 16 G.M.S. housing. ICS=100% of ICU only- Cat III				
237	Providing & erecting 240 V <b>MCB double pole</b> switch for lighting Load (B Curve) having 10 KA breaking capacity & conforms to IS : 8828 in existing box having following capacity <b>(A) 6 to 32 Amp. Cat.III</b>	Ea.	8.00		
	<b>Fans &amp; Accessories</b>				
238	Providing & erecting Approved make Power Saving <b>50 Watt Ceiling Fan</b> with double ball bearing ISI mark with Condenser 230 volt A.C. 50 Hz 1200 mm sweep complete having 3blades with aluminum blades with, canopy & 30 cms. down rod erected with 24/ 0.2, 3 core flexible wire with earthing. (Make shall be approved by Engineer in charge))	Ea.	22.00		
239	Supplying and erecting <b>19 / 20 mm. nominal bore Medium Class M.S. Pipe</b> down rod erected duly painted for fan complete with necessary 24/ 0.20, 3 core flexible wire with earthing.	Mtr.	44.00		
240	Supplying & erecting <b>Fan Hook</b> of 10 mm M.S. Round bar grouted in RCC slab with Making the site as original.	Ea.	22.00		
241	Supplying & erecting <b>fan hook box</b> of 10 mm M.S. round bar bounded to the RCC bars up to 50mm length each side and pierced through a 16 Gauge M.S. box / Heavy Duty PVC box complete erected concealed in Ceiling with necessary finishing.	Ea.	22.00		
242	Providing <b>Fan clamp</b> of 30 x 5 mm flat of required length & 10 mm M.S. Bolt & Nuts erected with necessary hook of 10 mm M.S. Round Bar.	Ea.	22.00		
243	Providing 2.5mm.thick laminated <b>acrylic sheet</b> to cover the fan hook or Fan box.	Ea.	22.00		
244	Supplying & erecting approved make low noise <b>decorative exhaust fan</b> having size 200mm with 1350 RPM with square frame ABS body with inbuilt lowers & square frame.	Ea.	7.00		
	<b>Earthing System</b>				
245	Supplying & erecting earth pit of minimum bore dia.150mm size approved make <b>Earthing Electrode consisting Pipe-in-Pipe Technology</b>				

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	as per IS 3043-1987 made of corrosion free G.I. Pipes having Outer pipe dia of 50mm having 80-200 Micron galvanizing, Inner pipe dia of 25 mm having 200-250 Micron galvanizing, connection terminal dia of 12mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications.				
245.1	(b)For Electrical installation up to 11 KV in normal soil. <b>Length of Pipe : 2.00 mtrs</b> Back filling Compound :1 no. Bag of 25 Kg.	Ea.	3.00		
245.2	(c) For Electrical Installation covering Transformer Neutrals, Lightning arrester Earthing, A.C. Plant & Sensitive Computer System(like Automation, SCADA) i.e independent Earthing in normal soil. <b>Length of Pipe : 3.00 mtrs</b> Back filling Compound :2 nos Bags of 25 Kg.	Ea.	3.00		
246	Providing and erecting required size <b>Aluminum strip</b> for earthing of H.T. , OCB / ACB / Transformer, LT panel board, Motors etc. using copper clamp.	Kg.	21.00		
<b>Street Light Pole &amp; Fixtures</b>					
247	Supply of approved make <b>GRP / FRP Pole</b> having following specifications: GRP Light Pole made by CNC filament winding machine using thermoset resin polyester/epoxy resin system) having minimum 62% glass content. The pole should be in one piece and tapered round in shape, having smooth finish and should be totally free from corrosion as well as nonconductive & shock proof Pole should be provided with FRP Anchor Base and it should be heavy duty, or MS Material duly painted with Epoxy paint. Pole should be flame retardant as per IS 6746. Resin used shall be UV resistance and pigmented. A highly weather resistant polyurethane coating shall be applied to the pole after applying suitable primer system that ensures proper adhesion of the paint. Minimum coating thickness shall be 80 to 100 micron. Deflection of the pole shall not exceed more than 10% of the length of pole for the given load “? Pole should be	Ea.	15.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	generally made as per the dimensional data, performance criteria and some interchangeability features of poles as per standard ANSI C 136.20 latest version or ASTM D 4923/01. The size of pole and type of installation are as below. (1) Suitable for base plate mounting single arm Bracket. [D] Overall length of 4 Mtr. Average Thickness: 7mm. Top/ Bottom OD Dia A/F 89/145 mm ± 2mm approx. Approx. Weight of Pole 19 kg approx. (Without Base) Anchor Base (Size 250X250 & 12mm th.)				
248	Providing Aluminum <b>arm bracket</b> of having 2 sets of suitable SS304 hardware for fixing the brackets & spread of <b>1.2 Mtr</b> (Suitable for 89 to 114 mm pole top dia) <b>(a) Single arm bracket</b>	Ea.	15.00		
249	Providing <b>M-20 / 1:2:4 cement concrete foundation</b> & 70 % PCC from bottom including excavation for the pole of size 45 x 45 x 100 cms. Deep in below ground level with plinth of 45 cms x 45 cms (or 45 cms dia x 45 cms) high upper ground level with necessary curing and finishing in approved manner. ( for 4 & 6 mtr pole)	Ea.	35.00		
250	Supplying & erecting approved make SMC <b>press moulded composite FRP</b> . loop-in, loop-out approx. 2mm thick box complete with Bakelite connector strip 4way & hinged doors having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamps& earth bolt of following size of box. <b>(b) 250mm x 200mm x 100mm [deep]</b>	Ea.	26.00		
251	Supplying & erecting <b>power contactor for time switch</b> complete erected as per direction Cat III <b>[D] 4 pole 440V 40 Amp.</b>	Ea.	2.00		
252	Supplying and erecting Flexible <b>PVC insulated multistrand multicore</b> 1.1 kv grade ISI marked copper wires of following size to be erected as directed. <b>e) 1.50 Sq.mm 3 core round PVC sheathed.</b>	Mtr.	280.00		
253	Supplying & erecting approved make <b>time</b>	Ea.	8.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	<b>switch</b> with single pole air break contacts suitable for 230 V.15/16A.complete with self-starting motor driven clock 'ON' & 'OFF' automatic arrangement at any predetermined time during each 24 hours, With nickel cadmium rechargeable battery backup erected as directed.				
	<b>Lighting Fixtures</b>				
	<b>Outdoor Lighting</b>				
<b>254</b>	Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 1Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminum with diffuser and Polycarbonate optics/ lenses with company mark/name engraved or embossed 120 to 300 V, Power Factor more than 0.95, THD < 10 %, CCT 5000 K to 5700K, Uniformity ratio >0.45, Luminaire efficiency> 100 lumens/watt . LED driver efficiency > 85 %. CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/ Bridge Lux (U.S.A.) make LED used for luminaire. ( Each fittings required LM-79 & LM-80 certificates)				
<b>254.1</b>	(D) <b>Post Top Lantern LED</b> fitting comprises of Copper dust finish cast aluminum spigot and spun aluminum canopy fixed with opal polycarbonate, pipe arrangement for vertical mounting, open construction driver and accessories wired up to terminal block. (a) 40W Cat-III	Ea.	15.00		
<b>254.2</b>	F ) <b>Bollard LED</b> fittings mounted on 60 cms high rotomoulded LLDPE pillar duly grouted on a concrete base by means of four nos of M8 X 75 mm studs with necessary base ring. (b) <b>15 W</b> ,1275 Lumens, Surge -4KV	Ea.	20.00		
	<b>Indoor Lighting</b>				
<b>255</b>	Supplying and erecting <b>LED indoor fittings</b> with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA polyester powder coated and high U.V. & corrosion resistance with diffuser and/or				



ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Polycarbonate optics with company mark/name 120 to 300 V, Power Factor more than 0.9, THD < 10 %, CCT 4000 K to 6500K, Uniformity ratio >0.7, Luminaire efficiency> 100 lumens/watt, LED driver efficiency > 85 % CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL/Bridgelux (U.S.A.) make LED used for luminaire. (Each fitting required LM-79 & LM-80 Certificates)				
255.1	<b>(A) Tube Light</b> with integral/ non-integral driver (D) 20-22 Watts, Surge - 4KV,IP-20. Cat-III	Ea.	13.00		
255.2	© Square/ Circular Surface/Recessed Mounted <b>Downlight</b> with provision for spring loaded mounting clips complete. © 20-24 watts, Surge-4 KV. Cat-III	Ea.	113.00		
255.3	E) <b>LED Strip Light</b> (b) Minimum <b>7.2W</b> per meter, (2 wire, IP-65) without Driver complete. Cat-III	Mtr.	70.00		
255.4	<b>(F) Under Water Light</b> ,12V DC including Driver, IP-67 with die-cast/deep drawn housing with impact resistance clear toughened glass. <b>(b) 12 watts. Cat-III</b>	Ea.	15.00		
255.5	<b>(G) Spot Light</b> , 5W, 425 Lumens, Surge-2KV. <b>(b) 11 Watts. Cat-III</b>	Ea.	30.00		
255.6	<b>(H) Step Light</b> having fiber reinforced plastic housing. (a) 5 watts, Direct/Indirect luminaire. Cat-III	Ea.	53.00		
255.7	(I) Mirror Light 5 watt ,Wall mounted.	Ea.	10.00		
255.8	(B) <b>LED Lamps integral type</b> , cool white with PC diffuser suitable for B22 LAMP holder (b) 5 to 8 watts	Ea.	6.00		
256	Supplying and erecting <b>LED indoor fittings</b> with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA polyester powder coated and high U.V. & corrosion resistance with diffuser and/or Polycarbonate optics with company mark/name 120 to 300 V,Power Factor more than 0.9, THD < 10 %, CCT 4000 K to 6500K, Uniformity ratio >0.7, Luminaire efficiency> 100 lumens/watt ,				

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	LED driver efficiency > 85 % CREE / OSRAM / PHILIPS Lumileds / NICHIA / SEOUL / Bridgelux (U.S.A.) make LED used for luminaire. (Each fitting required LM-79 & LM- 80 Certificates)				
<b>256.1</b>	10-15 Watt Intermediate Light	Ea.	24.00		
<b>256.2</b>	36Watt Schendilier	Ea.	2.00		
<b>256.3</b>	50 Watt LED High Bay Decorative type fixture	Ea.	6.00		
<b>256.4</b>	10-12 Watt LED Button Light	Ea.	22.00		
	<b>Miscellaneous Items</b>				
<b>257</b>	Supplying <b>Water tight M.S. Box</b> of size 20 x 15 x 15 cms. to erect suitable kitkat fuse / MCB to be erected on polished wooden board inside the box with hinged/sliding door with rubber rings and erected on pole with suitable pole clamp, all duly painted with one coat of red oxide and two coats of paints. (Cost of Fuse / MCB shall be taken extra)	Ea.	15.00		
<b>258</b>	Supplying and erecting <b>Direct-on-line, Starter</b> with 15A.rating contractor and with 4-14A. range, directly operated thermal overload relay in sheet steel enclosure for 3phase 415V.50 c/s. A.C. motor up to <b>7.5 H.P.</b> complete erected on P.W. Block with necessary connection. Cat-III	Ea.	2.00		
<b>259</b>	Supplying & erecting approved make <b>self- priming domestic mono block water pump with 1.5 H. P motor</b> , suitable for operation on 230 volts, 50c/s. AC supply with metallic flange, and M.S. impeller delivery and following discharge 44 LPM at 32 Mtr head suitable 25 mm dia delivery. Cat. III	Ea.	1.00		
<b>260</b>	Supplying of single phase submersible pump set suitable for 100 mm size or more dia bore well having motor capacity and discharge as under with necessary panel box. <b>Note: - Add or less Rs. 450/- for Additional / Less Stage.(c) Motor rating 2 HP (17 stage) pump having capacity of 106 LPM at 40 mtr head suitable for 32 mm dia. delivery pipe</b>	Ea.	1.00		
<b>261</b>	<b>Making trench in soft soil</b> of suitable width of 90 cms deep for laying cable or locating the fault all over the run and backfilling the same and making the surface as normal ground.	Mtr.	406.00		
<b>262</b>	<b>Covering of cable with second class bricks</b> or cement tiles laid cover the cable crosswise &	Mtr.	203.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	also on both sides with covering of 7.5 Cms. layer of sand above & below cable (16 bricks per meter)				
<b>263</b>	Providing & laying approved make <b>Double walled corrugated pipes (DWC)</b> of polyethylene (conforming to IS 14930 II) with necessary connecting accessories of same material at required depth for laying of cable. below ground / road surface for enclosing cable and back filling the same to make ground as per original.				
<b>263.1</b>	(A)50 mm dia	Mtr.	406.00		
<b>263.2</b>	(B)90 mm dia	Mtr.	90.00		
	<b>TV &amp; Telephone Distribution System</b>				
<b>264</b>	Supplying, erecting, commissioning and testing <b>EPABX CMOS microprocessor based system</b> having common features with remote programming & remote dialling having following other common features. (Accord Matrix or equivalent approved make)- Auto Call Disconnecter- (Incoming - Local- STD) with programmable timing- External Call forward with DOSA- Walk in Class of service & trunk reservation- Boss ring & call back on No Reply last caller recall CLI- Hot Line with Delay & with No.- Unsupervised Conference- Serial DISA (DISA with option to dial another No. if Extn. is No Reply)- Programming Flexibility of all features related to timer (41 Timer)-10 Different group of outgoing call restriction like 95, 97, 98 etc. Having following capacity. <b>(E) 4 incoming junction line &amp; 12 extensions.</b>	Ea.	1.00		
<b>265</b>	Providing & Erecting approved make following size of <b>TV Co-axial flexible cable</b> comprising inner conductor of solid bare copper insulated with Foam PE & Secondary conductor made of poly - Aluminum film bonded Al. Braids @ suitable coverage overall sheathed with black PVC insulation. <b>b).RG-6</b>	Mtr.	301.00		
<b>266</b>	Supplying & erecting Delton or approved make <b>Telephone Cable</b> electrolytic copper conductor PE insulation twisted in two pairs, & wrapped with FRLS PVC tape & sheathed with FRLS PVC or HFFR outer Jacket suitable for telephone wiring & conforming to C-DOT				

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	erected in existing pipe. of following size of conductors & nos. of pairs. With necessary connections. [A] Conductor Size 0.5 mm (a) Unarmoured				
266.1	2) Two Pairs	Mtr.	336.00		
266.2	5) Ten Pairs	Mtr.	105.00		
267	Supplying & erecting approved make <b>LAN cable</b> of following size in existing pipe as per direction. <b>[D] CAT - 6 e</b>	Mtr.	282.00		
268	Providing & erecting <b>main Distribution (MDF)</b> indoor type, back mounted frame. <b>(a) Suitable for 10 pair</b>	Ea.	1.00		
	<b>CCTV System</b>				
269	Supply, Installation Testing and Commissioning of following items of <b>CCTV system</b> as per standard specification and details given by consultant.				
269.1	Supply, Installation, Testing and commissioning of <b>2 MP Dome Type Day Night IP Based camera (indoor type)</b> 1/3-inch color CCD, 540TVL, 0.1 lux (F1.2), DC iris varifocal 3.5 to 8mm, Internal Sync., DC12V, PAL including integrated outdoor IP 66 rated housing (C/CS mount type), Connectors, A.I.Lens, Camera Mounts, Power Supply and all Ancillary Equipment & all accessories. The camera shall be UL Listed	Ea.	2.00		
269.2	Supply, Installation, Testing and commissioning of <b>2 MP Bullet Type Day Night IP Based camera (outdoor type)</b> 1/3-inch color CCD, 540TVL, 0.1 lux (F1.2), DC iris varifocal 3.5 to 8mm, Internal Sync., DC12V, PAL including integrated outdoor IP 66 rated housing (C/CS mount type), Connectors, A.I.Lens, Camera Mounts, Power Supply and all Ancillary Equipment & all accessories. The camera shall be UL Listed	Ea.	6.00		
269.3	Supply, installation, testing and commissioning of <b>16 Port NVR</b> for CCTV system including all mounting and installation accessories and standard specifications.	Ea.	1.00		
269.4	Supply, installation, testing and commissioning of <b>16 Port POE switch</b> for CCTV system including all mounting and installation accessories and standard specifications.	Ea.	1.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
269.5	Supply, installation, testing and commissioning of <b>4 TB Hard Drive</b> for CCTV system including all mounting and installation accessories and standard specifications.	Ea.	1.00		
269.6	Supply, installation, testing and commissioning of <b>Rack 4U</b> for CCTV system including all mounting and installation accessories and standard specifications.	Ea.	1.00		
	<b>Solar Power Plant</b>				
270	Supply, Installation, Testing and Commissioning of <b>5 KW solar roof top system</b> including all accessories like Solar panel, AC / DC cables. Battery backup, Controller etc. and all other installation and commissioning work, Material loading & Unloading at site, and all type of supply and Labour work for Solar Power Plant. (Make of Material Solar Plates : Adani Goldi Wires : Polycab, Inverter : Ksolar)	Job	1.00		
271	Supplying, installing, testing & commissioning of <b>SOLAR WATER heating system</b> comprising of Solar flat lock collector, stainless steel hot water storage isolated tank with S.S. heat exchanger, absorber made of copper sheet & copper tube of following capacity in liter / day (LPD) with "B" size aluminum box collector with appropriate capacity electrical backup arrangement (Excluding inlet & outlet pipe lines). <b>[E] Capacity of 1000 LPD</b>	Ea.	1.00		
272	Supplying and erecting approved make <b>single phase servo controlled voltage stabilizer</b> suitable for input voltage range 180/250V. And output voltage ranges 225/235V. A.C. complete erected. <b>(1) 50 KVA CAPACITY</b>	Ea.	1.00		
	<b>Air Condition Unit</b>				
273	Providing and erecting approved make split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by means of proper insulated copper tubing up to 5 RMT suitable for (Cost includes M.S. Stand, Gas Charging & Internal Copper Wiring &	Ea.	7.00		

ITEM NO	DESCRIPTION	PER	QTY	RATE	AMOUNT
	Remote Control) <b>For 5 star rating. (A) for 1.5 ton capacity.</b>				
<b>274</b>	Providing and erecting approved make split air-conditioning unit consisting of condensing unit with fan motor, hermetically sealed rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by means of proper insulated copper tubing up to 5 RMT suitable for (Cost includes M.S. Stand, Gas Charging & Internal Copper Wiring & Remote Control) <b>For 5 star rating. (B) for 2 ton capacity.</b>	Ea.	2.00		

### 3.0 SUMMARY OF COST

Particulars	Total Quoted Amount (INR) as attached BOQ	
	In words	In Figures
Total Cost of Construction of Director's Bungalow at GNLU campus (including all taxes )		

- The estimated cost mentioned in NIT is based on the rates of item of works in R&B & GWSSB SOR and Non-R&B & GWSSB SOR items and these rates were inclusive of Sales Tax/ VAT, Octroi, Purchase Tax, Turnover Tax, Excise Duty and any other tax applicable. However, in view of implementation of GST w.e.f. 01.07.17 by Govt. of India, bidders are advised to quote their rates considering the positive (+ve) / negative (-ve) cost impact on their rates in present scenario.
- The quoted rate filled in Schedule of Quantities, should include all costs associated with the project including any out of pocket/mobilization expenses, Taxes if any applicable as per Govt. terms, shall be paid by the Contractor including Goods and Services Tax (GST). No extra payment on this account will be made to the contractor.
- It is mandatory to bidders to deposit GST within time limit framed by Govt. of India, if applicable.
- The tenderer shall quote rates up to zero decimal and as well as in words. In case of any discrepancy rate quoted in words shall prevail.

## 4.0 PAYMENT SCHEDULE

### 4.1 Back to back payment:

"The Associate /Sub-consultant / Sub-Contractor acknowledge that under the present Contract/Agreement/Work Order/Arrangement, WAPCOS is only working as intermediary between (Name of Client) being Principal Employer / Client and Associate / Sub-consultant / Sub-Contractor. Thus the Associate / Sub-consultant / Sub-Contractor unconditionally acknowledges that the payments under the present Contract/Agreement/Work Order / Arrangement shall be made proportionately by WAPCOS only on back to back basis i.e., after 21days' subject to receipt of payment from GNLU being Principal Employer / Client. The Associate / Sub-consultant / Sub-Contractor also unconditionally agree that in the event the payment or part thereof, under the present Contract / Agreement / Work Order / Arrangement is not received from (Name of Client) (Principal Employer/Client), then WAPCOS &/or any of its Employee/Officer shall not be responsible to pay any amount to Associate / Sub-consultant / Sub-Contractor. The said condition shall supersede any and all other conditions of Contract / Agreement / Work Order / Arrangement between the parties."

### 4.2 Payment Breakup

Stage	Sr. No.	Milestone	% payment	Cumulative Percentage payment
Stage-1	1.	Advance against submission of Bank Guarantee	5%	5%
Stage-2	2.	Against completion of foundation up to plinth level	15%	20%
	3.	Up to completion of Ground floor slab.	10%	30%
	4.	Up to completion of First floor slab.	10%	40%
	5.	On completion of plaster, electrical & plumbing works	10%	50%
	6.	On completion of flooring works	10%	60%
	7.	On completion of painting works	10%	70%
	8.	On completion of compound wall, Gate, security cabin, parking, landscaping work, Servant room	20%	90%
	9.	On completion of all work, & GRIHA Certification	7.5%	97.5%
Stage-3	10.	After completion of defect liability period	2.5%	100%

2.5% deduction from every bill, which shall be held as security deposit and shall be released after completion of work. The above Payment Breakup shall be reference as guiding factor only. However, the payment shall be made in accordance with the Clause 48: Payment of Section III: General Condition of Contract.





**WAPCOS**  
(A Government of India Undertaking)

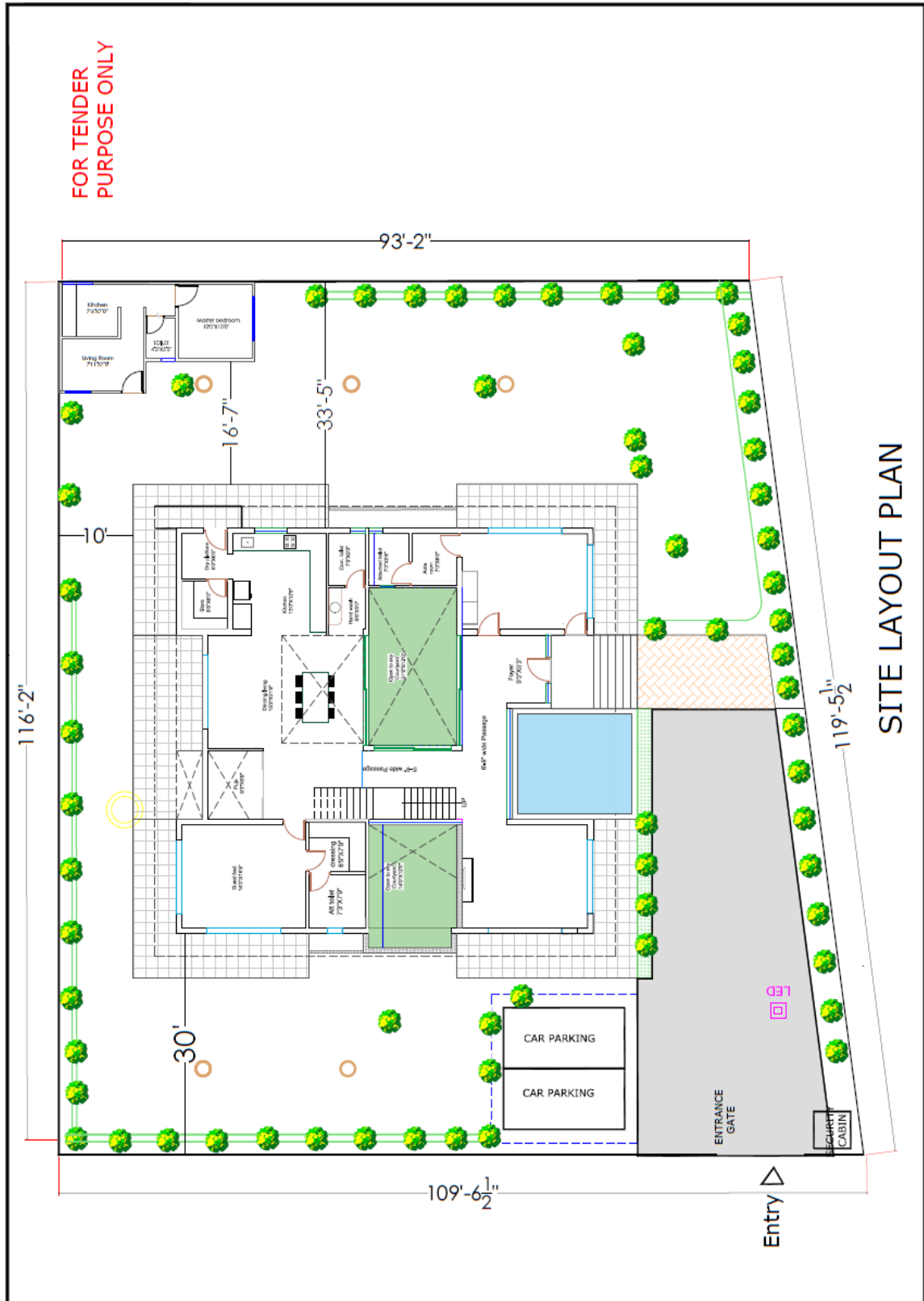
Selection of Contractor for Construction of  
Director's Bungalow at Gujarat National Law  
University Campus

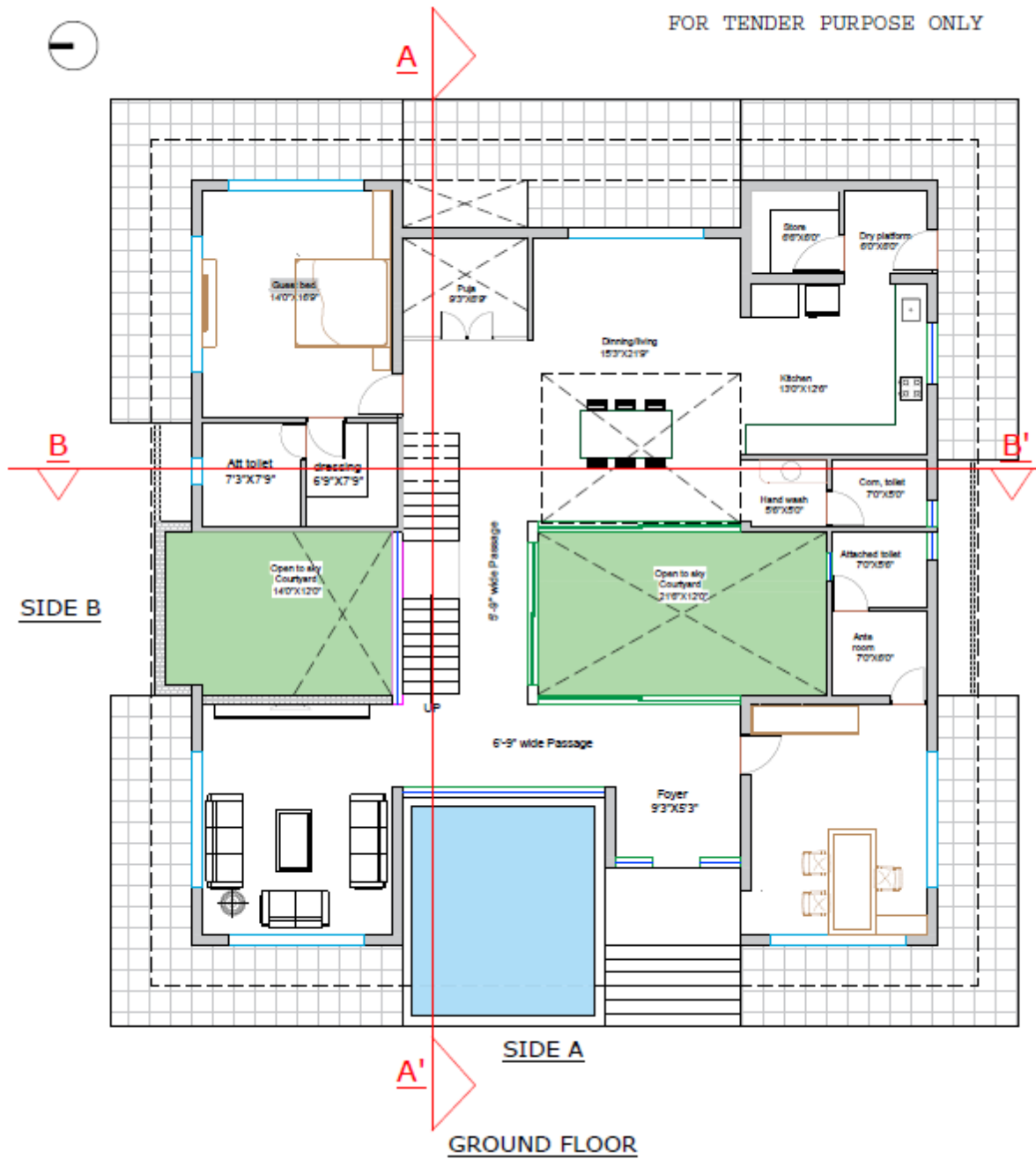
---

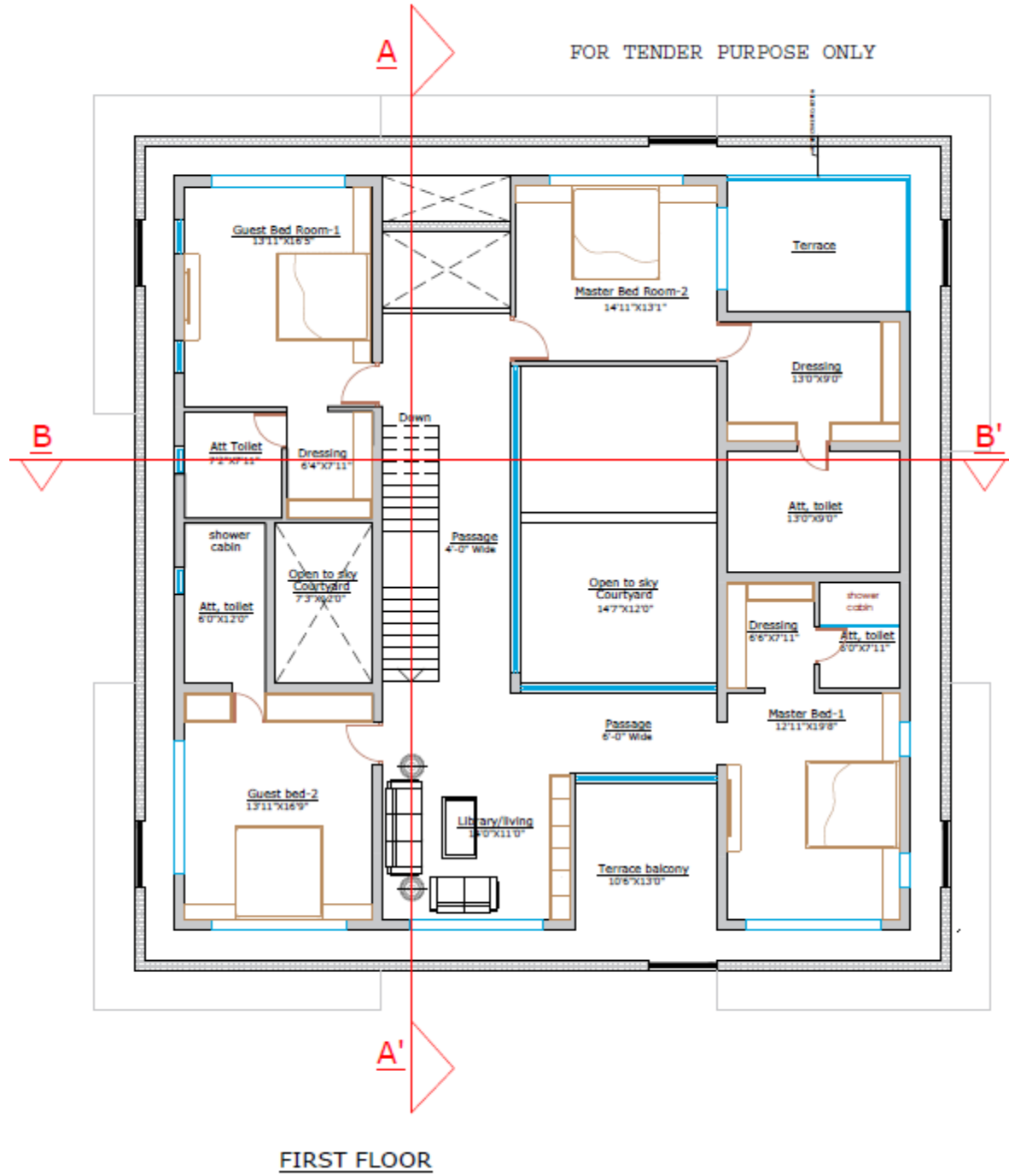
**VOLUME IV – DRAWINGS**

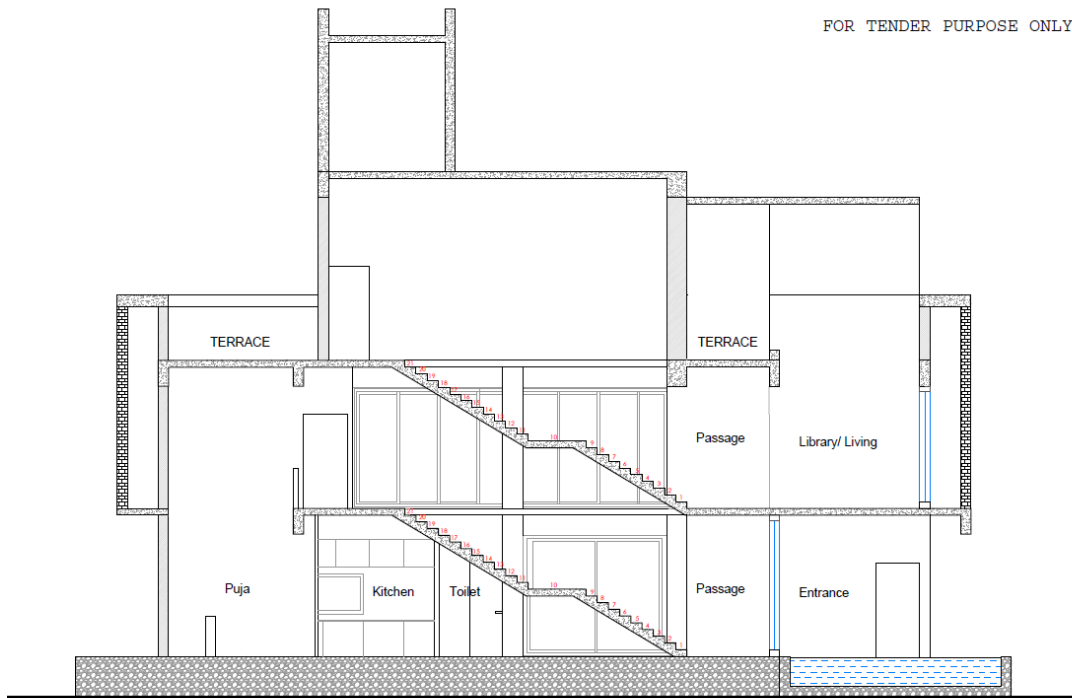
**WAPCOS LIMITED**

515, 5th Floor, Shree UGATI Corporate Park Opp. Pratik Mall, Koba-Gandhinagar Road,  
Kudasan, Dist: Gandhinagar, Gujarat-382421Tele: 079-23600292Tele fax: 079-23600352  
Email: [gandhinagar@wancos.co.in](mailto:gandhinagar@wancos.co.in)

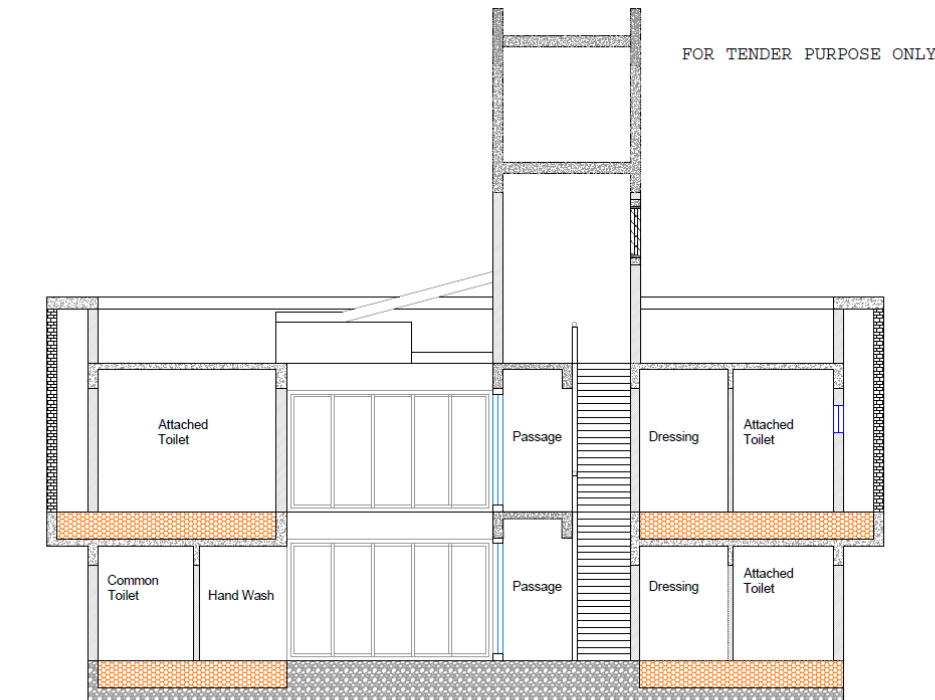




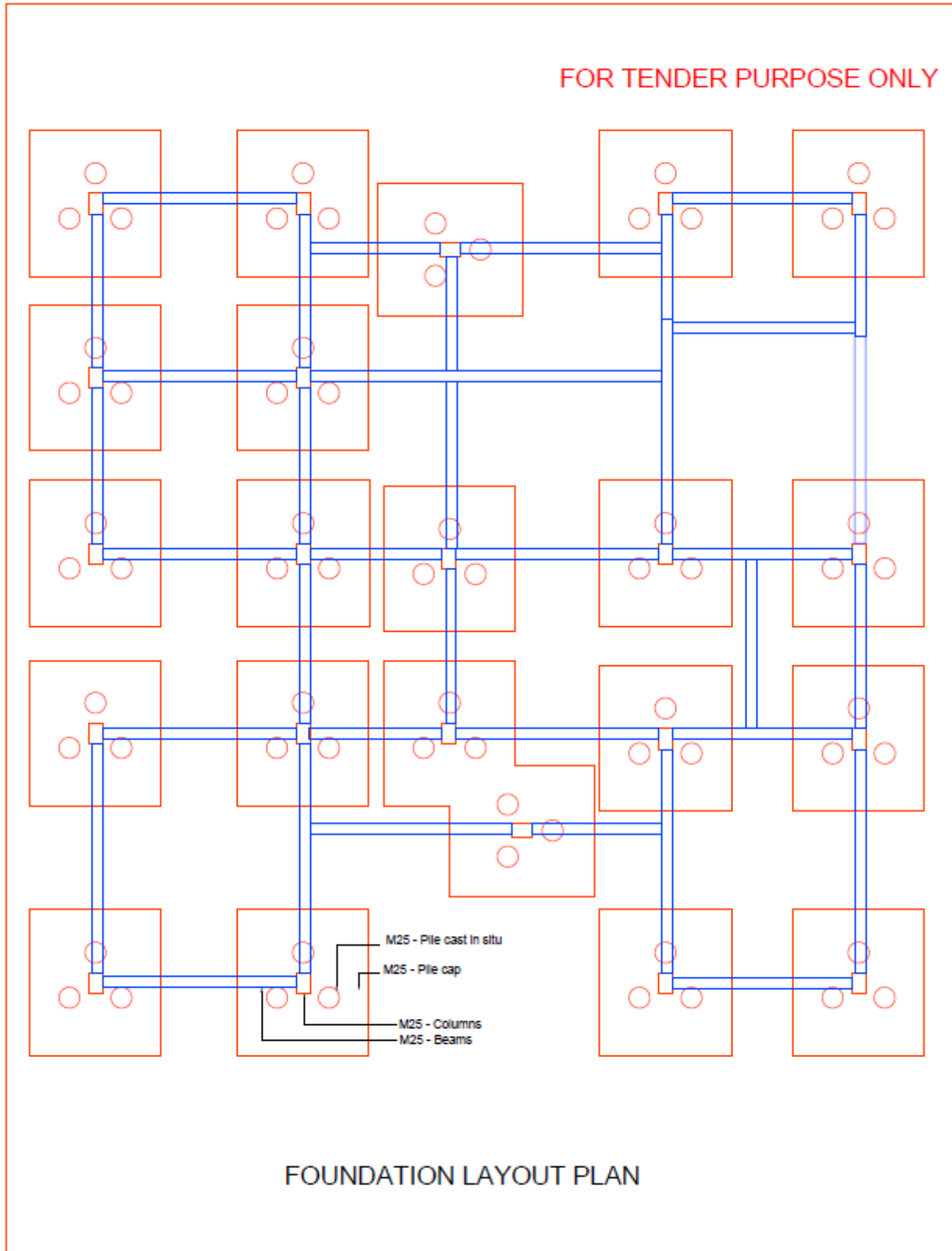


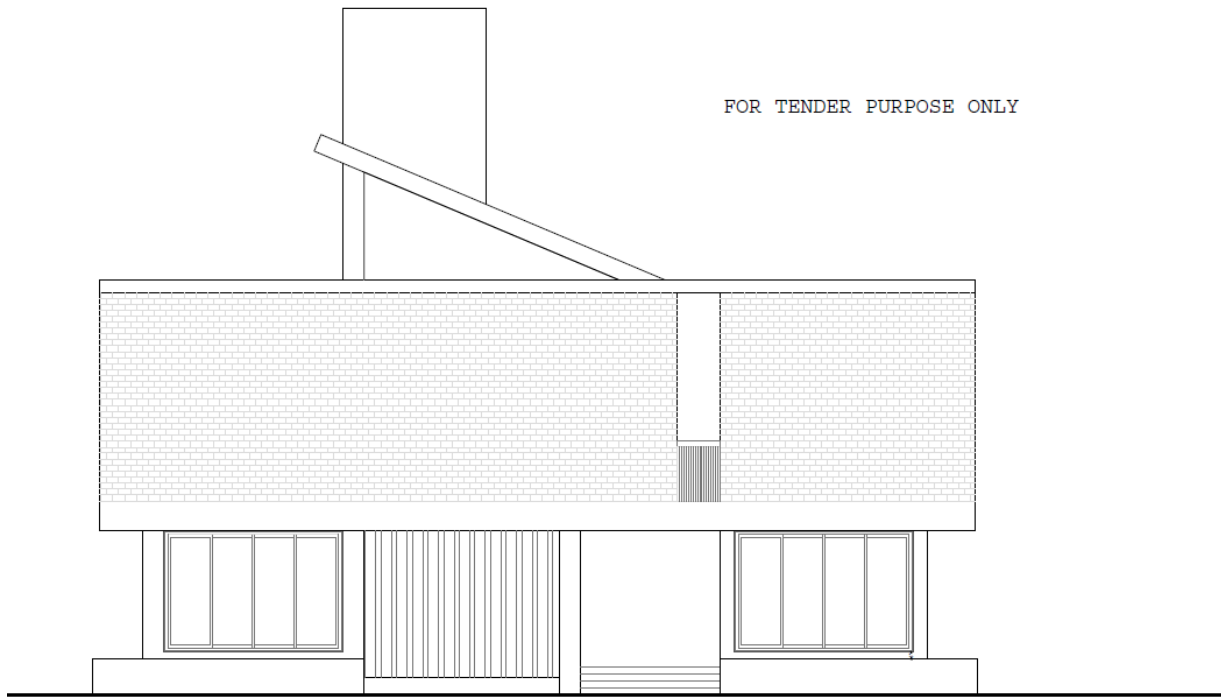


SECTION  
(AA')

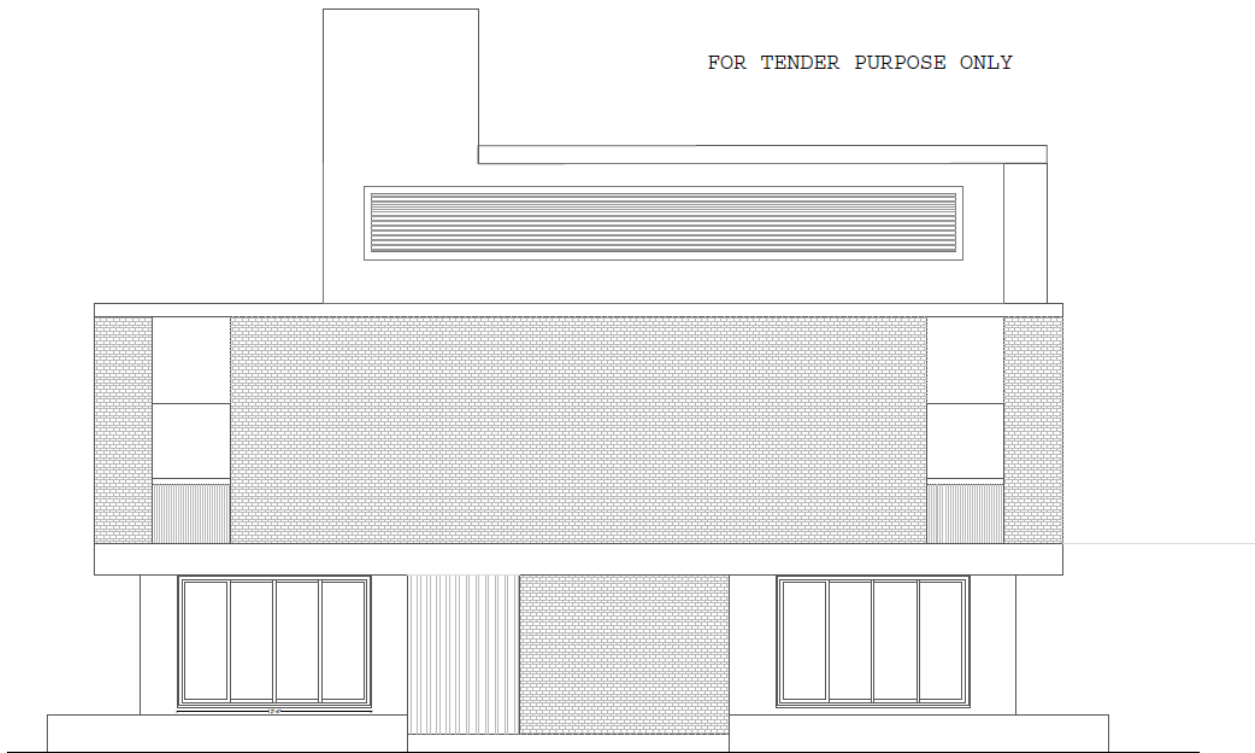


SECTION  
(BB')





ELEVATION A



ELEVATION B