

**Cost of Tender Form: Rs. 5000/-(Non Refundable)**

**EMD: Rs. 1,00,000/-**

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR**  
(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)  
NAAC Accredited with A++ Grade



**TENDER DOCUMENT**

**FOR**

**ROUTINE CIVIL MAINTENANCE WORKS**

**Tender, 2023-24**

**The Tender Document contains Pages (936) from Page No 1 to 936**

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**Name of work:** Routine civil maintenance works In the MITS campus

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# MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR

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## TENDER NOTICE

Sealed tenders are invited from eligible registered MPPWD/CPWD Contractors, having GST/PAN number and Income tax return Form.

Cat. No.	Category of Tenders	Earnest Money (Rs.)	Cost of Tender Form (Rs.)
1.	Routine Civil Maintenance Work	1,00,000/-	5000/-

The tender form can be obtained from the office of the Deputy Registrar, on or before 01-09-2023 up to 2:00 PM by depositing the cost of tender form in cash (Non-refundable) during Institute working hours. The last date for the submission of completed tender form is 01-09-2023 up to 3:00 PM and tenders will be opened on 01-09-2023 @ 4:00 PM in the presence of the tenderers or their representatives. The tender documents can be downloaded from the institute website [www.mitsgwalior.in](http://www.mitsgwalior.in). The tenders directly downloaded from the Institute website, must be attached with a demand draft of Rs 5000/- in favor of the Director, MITS, Gwalior, payable at Gwalior, as the cost of tender form.

DIRECTOR

**MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR**  
**(A Govt. Aided UGC Autonomous Institute Affiliated to RGPV, Bhopal)**  
**NAAC Accredited with A++ Grade**

**GENERAL TERMS & CONDITIONS**

1. The tender form can be obtained from the office of the Deputy Registrar, on or before 01-09-2023 up to 2:00 PM by depositing the cost of tender form in cash (Non-refundable) during Institute working hours
2. The tender documents directly downloaded from the institute website, must be attached with a demand draft of the tender cost in favour of Director, MITS, Gwalior payable to Gwalior. (Web site : [www.mitsgwalior.in](http://www.mitsgwalior.in) )
3. The EMD amount is Rs 1,00,000/- shall be submitted in terms of Demand Draft in favor of Director, MITS, Gwalior payable at Gwalior, No interest will be paid on the EMD Cost.
4. Earnest money deposit (EMD) is to be submitted along with the completed tender form duly sealed in 1<sup>st</sup> cover (Technical Bid).The EMD shall be in the form of **Demand Draft in favor of the Director, MITS, Gwalior, payable at Gwalior.**
5. Eligibility criteria for applying the tender.
  - (a) Contractor/Firm should be registered in MPPWD/CPWD or in the Govt. Undertaking dept.
  - (b) Valid GST Registration certificate and GST IN Number.
  - (c) Proof of the Latest Income Tax Return.
  - (d) Proof of past satisfactory assignment of the same nature of work done in the reputed departments in last one year of amount Rs 20 lacs.
  - (e) Valid Pan card

These certificates and DD (Rs. 5000/- and Rs.1,00,000/- ) are to be put inside the 1<sup>st</sup> envelope.

The tenderers shall submit the tender in two sealed envelopes **marked as 1<sup>st</sup> and 2<sup>nd</sup>**. **The first envelope should contain the EMD, Tender Cost (if downloaded from institute website) and copies of all relevant documents pertaining to eligibility criteria and second envelope should contain the tender form of the price bid.** In case, the 1<sup>st</sup> envelope is not annexed for eligibility criteria in the proper form as mentioned above in clause 5, and/or is without EMD, the envelope marked 2<sup>nd</sup> will not be opened at all and the same will be rejected and no representation shall be entertained in this regard. **These two envelopes are to be put inside the third separate envelope.**

6. **All sealed cover envelopes** must be super scribed **“Tender for Routine Civil Maintenance 2023-24 In the MITS Campus”** on the top of envelope.
7. The last date & time of submission of tender is (On or before) 01-09-2023 up to **3.00 p.m.**
8. First envelope will be opened on 01-09-2023 @ **4.00 p.m.** The second envelope of only the eligible **tenderers** will be opened on the same day.
9. Validity of the rates will be up to **one year** from the applicable date of the tenders.
10. Telegraphic/Fax and conditional tenders shall not be accepted.
11. Director, MITS, Gwalior, reserves the rights to accept or reject any or all tenders without assigning any reason thereof.
12. The rates should be F.O.R. at site (Institute Premises) & no extra charges on this account (For octroi, and surcharge etc.) shall be payable to the suppliers.
13. Our institute is exempted to pay excise duty.
14. The rates should include all materials, labour charges, profit and relevant taxes, if any.
15. The tenderers, whose tender is accepted, shall have to sign an agreement as per the given format.
16. Any amount due or becoming due for the tenders shall be covered from their bills.
17. The competent authority reserves the right to increase or decrease the quantity of any item during the execution of the work. The tenderers will be bound to comply with the order of the competent authority without any claim and compensation.



18. The competent authority will have the right of rejecting all or any part of the tender without assigning any reason; **even the lowest tender does not necessarily qualify for the order.**
19. The rates should be competitive and workable.
20. Any legal controversy will be subjected to disposal in Gwalior jurisdiction only.
21. O.P.C. Cement (Make: ACC/ULTRATECH) shall be used in RCC work and PCC Cement (Make: ACC/ULTRATECH) shall be used in remaining construction work until otherwise OPC Cement shall be used.
22. Steel shall be used only TATA/SAIL (Fe-500).
23. The whole supply and work should be satisfactorily executed within stipulated time from the date of issue of order. Time extension will not be permitted.
24. The Contractor shall execute the work as per specifications as mentioned in the tender documents.
25. The Contractor is binding himself to follow all the labour law & regulations.
26. Before making any supply of any materials to the Institute, the Contractor shall get the approval by the competent authority or his representative; otherwise the supply shall not be approved. To check the rest of supply, he should submit the approved sample in our office, if items do not belong to reputed or registered make.
27. The Contractor should satisfy himself regarding the magnitude of the supply & no claim on this account shall be entertained.
28. Warranty period should be clearly specified as per the latest term and condition of the original manufacturers and the parts and labour costs are to be included for the full warranty period.
29. The warranty period will be considered from the date of supply of the items.
30. A duly constituted committee of the Institute may inspect the work done by the Contractor at other places. The committee may also inspect infrastructure of those applicants who qualify the eligibility criteria in clause – 5, for satisfaction.
31. M.I.T.S. Gwalior will have the right to check the samples before supply and work.
32. Payment will be made after the successful and satisfactory supply and work.
33. A duly constituted committee of the Institute may inspect the completed work done by the Contractor in the last 3 financial years.
34. The contractor shall execute the work as per specifications given in the tender document which are based on MPSOR 2022 Vol 1 & 2 (For Building works) & relevant I.S. Codes.
35. Income Tax shall be deducted from the bill as per applicable rules.
36. The GST @ 18 % or as per current law will be payable on Gross amount of the Bill to the contractor.
37. 1% CGST and 1% SGST shall be deducted from the running bill.
38. 5% Security amount shall be deducted from the running bills.
39. 1% Electricity/Water charges shall be deducted from the running bills.
40. 1% Labour welfare Tax will be deducted.
41. If any miss happening takes place during construction work, responsibility of compensation will be binding to the contractor only.
42. Remaining terms and conditions of working in the MITS will be as per provision of MPPWD.

**(Dr. R.K Pandit)**  
**Director**

I have studied the above general terms & conditions of contract and shall abide by them.

**Signature with Seal of Contractor/Firm**

**Name:.....**

**Date :.....**

**FINANCIAL BID**  
(Percentage Rate Tender)

Sealed Tenders are invited on percentage rate basis based on the MPSOR 2022 Volume 1 & 2

S.No	SUB HEAD Description	Percentage Rate		Above/Below or at Par
		Figure	Words	
1	Carriage of Materials			
2	Earthwork			
3	Mortars			
4	Plain Cement Concrete			
5	Reinforced Cement Concrete			
6	Masonry Work			
7	Stone Work			
8	Aluminum Structural Glazing Composite Panel and Spider glazing			
9	Wood Work, PVC Work and UPVC Work			
10	Steel Work			
11	Flooring			
12	Roofing and Ceiling			
13	Finishing Work (Plastering and Painting )			
14	Repairs to Buildings and Structural Rehabilitation			
15	Dismantling and Demolishing			
16	Tube Well and Rain Water Harvesting			
17	Sanitary Installations			
18	Water Supply			
19	Drainage			
20	Pile Work			
21	Aluminum Work			
22	Water Proofing Work			
23	Modular Operation Theaters			
24	Steel Structure Pre-Fabricated Buildings			
25	Sanitary and Water Supply (Premium range Installation)			
26	Fire Fighting System			
27	Miscellaneous			
28	Landscaping and Horticulture			
29	DPR Preparation			
30	Sewage Treatment			
31	New Technologies and Material			

Date

Sign & Seal of Contractor/Firm/Agency

## NOTICE INVITING TENDER

The Director MITS, Gwalior invites percentage rate tenders from contractors who are registered in MP PWD/CPWD or in the Govt. undertaking dept. for the following work:

<b>Name of work &amp; Location</b>	THE ROUTINE CIVIL MAINTENANCE WORKS IN THE CAMPUS of MITS GWALIOR
<b>Estimated Budget</b>	Rs.1,00,00,000 /-
<b>Earnest Money</b>	Rs.1,00,000 /-
<b>Duration of Works</b>	12 (Twelve) months
<b>Last date &amp; time of submission of Bid, EMD and other documents as specified in the Tender Document.</b>	3 PM , 01-09-2023
<b>Time and date of opening of Technical &amp; Financial Bid of Tender</b>	4 PM , 01-09-2023

**NOTE:** Contractor/Agencies who take this tender document form from the institute need to download the MPSOR 2022 Vol-1 & 2 from this link ([http://wms.mppwd.gov.in/Sor\\_view.aspx](http://wms.mppwd.gov.in/Sor_view.aspx)), **duly signed it and attach with this tender document.**

**GOVERNMENT OF MADHYA PRADESH**

**PUBLIC WORKS DEPARTMENT**



**For**

**BUILDING WORK**

**(VOLUME-I)**

**In Force From September 15, 2022**

**Issued by :-**

**PROJECT DIRECTOR**

**MP Public Works Department (P.I.U)**

**BHOPAL**



**GOVERNMENT  
OF  
MADHYA PRADESH  
PUBLIC WORKS DEPARTMENT**

**SCHEDULE OF RATES (SOR)  
*For*  
BUILDING WORKS  
( **VOLUME-I** )**

**In force from September 15<sup>th</sup>, 2022**

*Issued by -*

**PROJECT DIRECTOR  
M.P. Public Works Department (P.I.U.)  
BHOPAL**



## FOREWORD

Schedule of Rates for Building is issued by the Project Director, Public Works Department, Project Implementation Unit (PIU) from time to time. Since its inception the Public Work Department has issued Schedule of Rates for Building works at several occasion. Last such exercise was done by the Project Director, PWD PIU, on 01-12-2020. Since this date, various amendments were required to be issued over the time. A part from this introduction of new item using new technologies and newer materials have necessitated the issuance of this new revised SOR. Due to increased size SOR is being released in two volumes (**Volume I & II**). Volume -I containing chapters 1 to 13 and Volume-II containing chapters 14 to 31.

Due care has been taken to frame this Schedule of Rates as correctly as possible. It is however, possible that some errors might have crept in. In case any error or omission if noticed, the same may be brought to the notice of this office. New chapter of “**New Technologies and Material**”, along with Preambles and Appendix have been included.

In order to simplify understanding of SOR, item name to each Item has been assigned. It is advised that cost abstract of the estimate may include only item number, item name, unit, rate, quantity and amount. This will enable easy at a glance reading of the estimate. However it always required to include full description of items in detailed estimate & BOQ.

Schedule of Testing Charges for Building Material (Civil) has also been added, which includes rates of testing of material from Departmental/Government Laboratory/National Accreditation Board for Testing and Calibration Laboratories (NABL).

The effort of **Mr. S. L. Suryavanshi, Additional Project Director, Bhopal, Mr. Anand Prakash Rane, Joint Project Director Bhopal, Mr. Praveen Nigam Executive Engineer (Design), Mrs. Shireen Khan Executive Engineer and Mrs. Amrita Singh Executive Engineer(SOR CELL), Mr. Abhay Malviya Assistant Engineer, and Mr. Ravi Prakash Chidar Assistant Engineer**, is highly appreciated who have taken this challenge of bringing out this Schedule of Rates (SOR) into effect in view of modern technologies and invention in the fields of Building & related fields as per latest National Building Code & other Standards.

I also extend my gratitude and thanks to **Mr. S.R. Baghel Additional Project Director Indore, Mr. R. K. Ahirwar Additional Project Director Jabalpur, Mr. V. K. Aarakh Additional Project Director Gwalior, Mr. Surendra Rao Gourkhede, Joint Project Director, Mr. R. D. Choudhary, Joint Project Director and Mr. Mukesh Manhar Chief Architect**.

Suggestion, if any, towards further improvement to this schedule of Rates for Building works shall be highly appreciated.

This Schedule of Rates (SOR) is available on the departmental website [www.mppwd.gov.in](http://www.mppwd.gov.in) and shall be in forced **w.e.f. September 15<sup>th</sup>, 2022**.

Place: Bhopal

Date: September 15<sup>th</sup>, 2022



(Er. G.P. Mehra)  
Project Director

MP Public Works Department P.I.U. Bhopal

## **GENERAL NOTES**

1. Reference mentioned herein shall be applicable to all sections to the extent the context permits and are intended to supplement the provisions in the particular section. In case of any discrepancy/ deviation, the provisions in the particular section shall take precedence.
2. In absence of any stipulation to the contrary, unit rates for various items of works are for completing works to the requirements of the specifications including full compensation for all operations and inclusive of all labour, materials, royalties, lease rent, wastages, temporary work, plant, equipment over head charges and profit, unless specified otherwise.

### **3. Interpretations**

- 3.1 The Project Director, Public works Department (Project Implementation Unit) Government of M.P. shall be the sole deciding authority as to the meaning, interpretation and implications for various provisions in this publication. His decision shall be final and binding.
- 3.2 Wherever any reference is made to any Indian Standard, it shall be taken as reference to the latest edition with all amendments issued thereto.
- 3.3 In the event of any variation between the CPWD specifications (adopted) and the Indian Standard, the former shall take precedence over the later.
- 3.4 Precedence of specification in SOR: - In case of any contradiction in the provisions of the CPWD specifications (adopted) and this document the provisions of this document would take precedence.
- 3.5 Precedence of Rate in SOR: - The rates as given in this schedule for all items are final, binding and conclusive. In case of doubt and printing mistakes if any, the decision of the Project Director, P.W.D. (P.I.U.) Government of M.P. shall be final and binding.

### **4. Definitions**

The following terms and expressions in the SOR shall have the meaning or implication hereby assigned to them unless otherwise specified elsewhere.

- 4.1 Specifications would refer to the Central Public Works Department (CPWD) specification as applicable as on date along with upto date amendments, addendums and errata.
- 4.2 Engineer-in-Charge: The “Engineer-in-Charge” means an engineer of the Executive Engineer rank in Building and Road (B&R) Division or Divisional Project Engineer of Project Implementation Unit (PIU), who shall supervise and be in-charge of the work.
- 4.3 IS: The standards, specification and code of practices issued by the Bureau of Indian Standards along with up to date amendments.
- 4.4 Superintending Engineer means officer in-charge of the circle in Building and Roads.
- 4.5 Chief Engineer means officer in-charge of Zone.
- 4.6 Additional Project Director means an officer of Chief Engineer level, in-charge of Zone in PWD (PIU)
- 4.7 Project Director MP PWD PIU means head of the department, an officer of E- in-C level, who heads Building wing of MPPWD.

- 4.8 Engineer-in-Chief means head of department who heads Building and Road wing of M.P. PWD.
- 4.9 Site: The 'site' shall mean the land/or other places on, in, into or through which the work is to be executed under the contract or any adjacent land, path or street through which the 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.
- 4.10 Best: The word 'best' when used shall mean that in the opinion of the Engineer- in-Charge, there is no superior material/ article and workmanship obtainable in the market and trade respectively. As far as possible the standard required shall be specified in preference to the word 'best'.
- 4.11 Department: "Department" mean Public Works Department of Govt. of M.P.

## 5. Floor and Levels of Building

- 5.1 **Floor 1:-** It is the lowest floor above the ground level in the building unless otherwise specified in a particular case. The floors above floor 1 shall be numbered in sequence as floor 2, floor 3 and so on the number shall increase upwards.
- 5.2 **Floor Level :** - For floor 1, top level of finished floor shall be the floor level and for all other floors above floor 1, top level of the structural slabs shall be the floor level.
- 5.3 **Plinth level:** -Floor 1 level or 1.2 m above the ground level whichever is lower shall be the plinth level.

## 6. Floor Levels of Special Structures

For structures like retaining walls, wing walls, chimneys, reservoirs/ tanks and other elevated structures, where elevations/ heights above a defined datum level have not been specified and identification of floors cannot be done as in case of building. Level, at 1.2 m above the ground level shall be the floor 1 level as well as plinth level. Level at a height of 3.6 m above floor 1 level will be reckoned as floor 2 level and level at a height of 3.6 m above the floor 2 level will be floor 3 level and so on. Where the total height above floor 1 level is not a whole number multiple of 3.6 metre, top most floor level shall be the next in sequence to the floor level below even if the difference in height between the two upper most floor levels is less than 3.6 metres.

## 7. Foundation and Plinth

The work in foundation and plinth shall include:

- 7.1 For buildings: All works up to 1.2 metre above ground level or up to floor 1(one) level whichever is lower.
- 7.2 For abutments, piers and well staining: All works upto 1.2metre above the bed level.
- 7.3 For retaining wall, wing walls, compound walls, chimneys, over head reservoirs/ tanks and other elevated structures: All works upto 1.2 metre above the ground level:
- 7.4 For reservoirs/tanks (other than overhead reservoirs /tanks): All works upto 1.2 metre above the ground level.
- 7.5 For basements: All works upto 1.2 metre above ground level or upto floor 1 (one) level whichever is lower.
- 7.6 For boundary walls: All works upto plinth beam or upto 1.2 metre above ground level whichever is lower.

## 8. Measurements

Mode of measurement shall be as per the provisions of the contract and as specified in the BOQ.

- 8.1 The order of dimensions shall be consistent and in the sequence of length, width and



height or depth or thickness (LBD).

8.2 Rounding off: Rounding off where required shall be done in accordance with IS:2-1960.

9. **Rates:** -The rates include elements of hire and running charges of all types of plants, machinery and equipment required to complete the work, unless specified otherwise. Due diligence for safety and health of workers shall be observed by the contractor by observing all necessary protocol as per law; cost of which shall be deemed to have been included in rates of SOR. The rates provided in this schedule of rates include cost of all materials lead, lift, water and electricity charges performance of all workmanship; providing erecting and removing centering, forms, scaffolding, benching ladders, templates, safety equipment tools and plants and all other applications etc, required for the proper execution of work unless otherwise specified inclusive charges of duty, royalty and insurance etc.as may be applicable but excluding GST, since all taxes such as VAT, entry taxes etc. have been subsumed now in GST, rate shall not include GST which shall be payable to the contractor at prevailing rate on gross amount of contractor's bill. Provisions for covering etc. necessary to protect the work/ structure from inclement weather etc. and damage arising from falling materials or other cause such as rain, fire etc. shall be the contractor's responsibility and cost of all such arrangements shall be deemed included in SOR rates. SOR rates are also inclusive of curing wherever required including arrangement of water and its lead or lift whatsoever. If there is any source of water like tube well, hand pump, well etc. under Govt. custody and if water from this source is provided free of cost for construction activity by the contractor then water charge will be deducted at the rate of 1% of the amount paid to the contractor from the items involving use of water. SOR rates are also inclusive of testing charges and provision for laboratory at site as well SOR rate are also inclusive of any certification to be obtained from statutory authority before putting the work machineries equipment fitment to use.

10. **Materials**

10.1 **Only Approved Material:** - The contract shall get approval from Engineer-in-Charge for Samples of all materials to be used on the work. The approved samples duly authenticated and sealed shall be kept in the custody of the Engineer-in-Charge till the completion of the work. All materials to be provided by the contractor shall be brand new and as per the samples approved by the Engineer-in-Charge. Contractor shall bring to site for use in construction only from list of approved make issued by the department. Engineer-in-Charge shall be final authority to make final selection from amongst branded makes of item. Items for which list of approved are not declared brand make are not by the department that shall be selected by the APD/CE/Engineer- in-Charge.

10.2 **Temporary Accommodation at site:** -For work, if the amount of contract exceeds Rs. 100.00 lacs, the contractor shall provide a temporary accommodation of atleast 20 sqm within boundaries of site where all the approved material shall be kept for display under lock and key of Engineer-in-Charge the after completion of work this accommodation could be further used as maintenance office . If the contract amount is more than Rs.500.00 lacs additional temporary site accommodation of 20 sqm shall also be provided by the contractor for SQC (Services for Quality Control) office use related to work.

- 103 **Vigilance by CCTV :** - For work, if the amount of contract exceeds Rs. 1000.00 lacs contractor shall install a CCTV setup covering whole site, the access to the vision should be given to Engineer-in-Charge along with its supervision team.
- 104 **Materials from approved source only:** -Materials obtained by the contractor from the sources approved by the department shall be subjected to the mandatory tests. Where such materials do not conform to the relevant specifications, the material shall be rejected notwithstanding the fact that the material / make is the approved make by the department.
- 105 **Sampling and Testing before use of materials:** - Samples, whether submitted for approval to government bulk supplies or required for testing before use or samples bearing 'standard mark', if required for testing, shall be provided free of cost by the contractor. All other incidental expenditure to be incurred for testing of samples  
e.g. packaging, sealing, transportation, loading, unloading etc. shall be borne by the contractor and shall deemed included in SOR.
- 106 **Protection of Material at site:** - Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric effects due to rain, sun, wind and moisture to avoid deterioration.
- 107 **Assistance for lease/permits:** - It will not be obligatory on the part of Engineer-In-Charge to provide any assistance in obtaining lease/permits for excavation of minor minerals. The contractor shall not be entitled to any excuse, whatsoever on account of any delay in obtaining permit etc. for minor minerals to be used on the work.
- 108 **Warranty:-** Warranty card shall be given of all the items which covered under warranty to Engineer-in-Charge at the time of execution, payment shall not be made for such items if warranty card/certificate is not given. The warranty card/certificate shall be given to the concern department at the time of handover of the building.

## 11. Testing

- 11.1 **SOR Rates include testing charges:-** The rates also include the element of testing of samples of various materials brought by the contractor for use on the work, as well as other necessary tests for items of work as stipulated in the specifications.
- 11.2 **Testing Frequency:** -Frequency of such tests to be carried out must not be less than the prescribed frequencies.
- 11.3 **Field Laboratory:** -The contractor shall have to establish a field laboratory at the site of work, if the amount of contract exceeds Rs. 100.00 lacs.
- 11.4 **Testing in Laboratory other than field laboratory:** -In other cases, testing of construction materials should be got done from any of the testing laboratories of the government works departments, and technical institutes, engineering college, etc. In case the contract provides for testing of material through third party like NABL accredited lab or any other lab directed by the Engineer-In-Charge, the cost of testing shall be borne by the contractor.
- 11.5 **Payment only after testing:** -The work shall not be accepted in any case, if the contractor fails to observe the instructions of the department, regarding testing of materials. Before making any payment, it will be the responsibility of the officers making payment to ensure that all testing as per prescribed frequencies, have been carried out, and shall certify that the test results are in conformity with the requirement. If tests are not conducted to the prescribed frequency, the Engineer-In-Charge should reject that part of the work. Duly certified (by the representative of Engineer-in-Charge) copies of registers, containing records of tests shall have to

be presented along with running account bills. Register (in original) shall have to be submitted along with the final bill. Tests shall have to be conducted by the contractor's engineer under the supervision of the Engineer-In-Charge or his authorized representatives.

12. **Acceptance at Reduced Rate:** -If any item of work is found not upto the prescribed standard but the Engineer-In-Charge is of the opinion that the same is structurally adequate and can be accepted at a reduced rate, then in such cases, the Engineer-In-Charge shall have to submit proposals for appropriate reduction of rates supported by an analysis, in justification thereof, through a D.O. letter to the territorial Superintending Engineer or Additional Project Director to obtain his approval expeditiously (ordinarily within 15 days). The approved analysis along with orders of the Superintending Engineer /Additional Project Director shall have to be appended to the bills of the contractor. Where Superintending Engineer is not the supervising authority of Engineer-in-Charge, proposal shall be submitted to the Chief Engineer or equivalent officer who is supervising him.
13. **The Site Order Book:** - The "Site Order Book" shall be in custody of departmental supervisory staff. In case of a work for which a separate agency for supervision of work has been engaged by the department, the site order book shall be in possession of the field staff of SQC agency. The Engineer-In-Charge or his authorized representative may record his instructions in this book, which shall be noted by the contractor or his authorized representative for compliance.
14. **Cement at Site:** - A duplicate cement register as per format here under shall be maintained at site of work. Extract certified copies of the entries for each month/each running bill shall be submitted to the Engineer-in-Charge by the Contractor. The original register shall also be submitted to the Engineer-in- Charge on completion of the work by the Contractor.

S. No.	Date of receipt of cement	No. of bags	Name and address of firm, from whom purchased	Signature of contractor or his authorised representative	Signature of authorised representative of Engineer-In-Charge	Result of test for initial and final setting time	Result of tests for compressive strength of cement	Remarks

15. **Only Tested Cement:** -Where contract provides for cement to be arranged by the contractor himself, only I.S. marked cement of relevant I.S. specifications shall be allowed to be used in the work subject to the following tests. :
- 15.1 Test for initial and final setting time as per IS: 3536 –1996, 1 Test for 10 tonnes or part thereof.
16. **Volumetric use of cement:** -When cement is used for mortar/volumetric mix etc. batch of one bag mix cement or its multiples shall be mixed and the measurement of box for metal, sand to be of 35 liters or multiples of it (convenient box size 40x35x25cm.). For design mix concrete batching shall be done by weight. 0020

17. **Aggregates:** -The aggregates to be used for all cement concrete items shall be crushed in the mechanical crushers. All concrete shall have to be mixed in power driven mixers having hoppers and capacity of mixing concrete mix of at least one bag of cement.
18. **Sand:** -Nothing extra shall be payable on account of use of Narmada sand or sand brought from any other quarry/river. Sand should conform to the requirements of IS: 1542 and IS: 2166 for using it in construction work.
19. **Rubbles from excavation:** -Rubble available from excavation of hard rock shall be the property of the contractor subject to recovery of Rs. 150/- per cum. of the quantity of the rock excavated.
20. **Ban on Teak wood:** -Teak wood shall not be used in any building work unless specific sanction of the State Government is obtained. Provision of teak wood shall not be made in any of the estimate without prior sanction of the state Government. Item such as teak wood beading, veneering, style and rail of flush door shall not be banned.
21. **Non SOR item in on-going agreement:** -If any new item is not included in SOR and is proposed to be executed in any on-going work, proposal with full justification thereof along with financial implication and detailed rate analysis must be submitted to Superintending Engineer of respective circle (B & R) or Additional Project Director, PWD, PIU for obtaining approval as on extra item.
22. In case of any difference in item description and rate between BOQ and SOR, the rate and description of BOQ shall be prevail on the other hand if there is difference in between rates only while description being the same in BOQ and SOR, rates of SOR with upto date amendment shall be prevail.
23. **Non SOR items for tendering:** -If any Non S.O.R. Item is to be executed in any proposed project, rate analysis with full justification thereof must be approved by the Technical Sanction Authority, PWD PIU, and shall be included in BOQ under sub head of non SOR items at the last. Tender shall be invited on amount inclusive of SOR and non SOR items and in such cases non SOR items shall become schedule (BOQ) items for that particular tender only. However it is made clear that such non SOR items shall not be assumed as sanctioned rates for other agreements.



(Er. G.P. Mehra)  
Project Director

MP Public Works Department (P.I.U.) Bhopal.

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**CHAPTER – 1.0**  
**CARRIAGE OF MATERIALS**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
1	IS 4082	Stacking and storage of construction materials and components at site – Recommendations
2	IS 1141	Seasoning of Timber – Code of Practice

S.No.	Sub Item No.	Item Name	Materials	Unit	Rate (Rs.)								Remarks
					1 km	2 km	3 km	4 km	5 km	Beyond 5 km up to 10 km per km	Beyond 10 km up to 20 km per km	Beyond 20km per addl. Km.	
1			2	3	4	5	6	7	8	9	10	11	12
1.1		Transportation by mechanical means	Transportation By Mechanical Transport including loading, unloading and stacking.										
	1.1.1	Moorum,	Lime, moorum, building rubbish	cum	111.50	125.60	139.46	152.75	165.63	11.38	10.30	7.27	The rates will be applicable to net quantities after deduction of prescribed percentage for voids mentioned in the specification under subhead "Carriage of materials"
	1.1.2	Earth	Earth	cum	139.47	157.00	174.33	190.94	207.04	14.23	12.88	9.08	
	1.1.3	Manure	Manure of sludge	cum	121.20	136.52	151.59	166.03	180.03	12.38	11.20	7.90	
	1.1.4	Rock	Excavated rock	cum	223.16	251.21	270.93	305.50	331.27	22.77	20.61	14.54	
	1.1.5	Aggregate <40 mm	Sand stone aggregate below 40 mm nominal size	cum	111.50	125.60	139.46	152.75	165.63	11.38	10.30	7.27	
	1.1.6	Aggregate >40 mm	Stone aggregate 40 mm nominal size and above	cum	121.20	136.52	151.59	166.03	180.03	12.38	11.20	7.90	
	1.1.7	Stone	Stone soling	cum	101.43	114.10	126.79	138.86	150.57	10.35	9.37	6.60	
	1.1.8	Bricks	Bricks	1000 Nos.	297.55	334.95	371.92	407.34	441.69	30.36	27.48	19.38	
	1.1.9	Pipes	Cement, stone blocks, G.I...C.I., A.C., & C.C. pipes below 100 mm dia and other heavy materials	tonne	99.18	111.65	123.97	135.78	147.23	10.12	9.16	6.46	
	1.1.10	Steel	Steel	tonne	99.18	111.65	123.97	135.78	147.23	10.12	9.16	6.46	
	1.1.11	Timber	timber	cum	127.52	143.55	159.39	174.57	189.30	13.01	11.78	8.31	



Item No.	Sub Item No.	Item Name	Descriptions	Unit	Rate (In Rs.)
1	2	3	4	5	6
1.2		Transportation by manual means	Transportation by manual labour including loading, unloading and stacking for lead up to <b>50 metre.</b>		
	1.2.1	Moorum	Lime, moorum, building rubbish	cum	53.43
	1.2.2	Earth	Earth	cum	66.78
	1.2.3	Manure	Manure or sludge	cum	58.07
	1.2.4	Rock	Excavated rock	cum	106.85
	1.2.5	Aggregate <40 mm	Sand, stone aggregate below 40mm nominal size	cum	66.78
	1.2.6	Aggregate >40 mm	Stone aggregate 40mm nominal size and above	cum	72.20
	1.2.7	Stone	Stone soling	cum	78.57
	1.2.8	Bricks	Bricks	1000 Nos.	124.66
	1.2.9	S.W. Pipes	S.W. Pipes		
	1.2.9.1	100 mm dia	100 mm dia	100 m	96.94
	1.2.9.2	150 mm dia	150 mm dia	100 m	164.95
	1.2.9.3	200 mm dia	200 mm dia	100 m	230.57
	1.2.9.4	250 mm dia	250 mm dia	100 m	384.35
	1.2.9.5	300 mm dia	300 mm dia	100 m	549.07
	1.2.9.6	350 mm dia	350 mm dia	100 m	768.70
	1.2.9.7	400 mm dia	400 mm dia	100 m	960.87
	1.2.9.8	450 mm dia	450 mm dia	100 m	1164.70
	1.2.9.9	500 mm dia	500 mm dia	100 m	1423.52
	1.2.9.10	600 mm dia	600 mm dia	100 m	1747.05
	1.2.10	Other Pipes	R.C.C. pipes, Steel cylinder, R.C. pipes, C.I. pipes, and unreinforced cement pipes		

	1.2.10.1	100 mm dia	100 mm dia	100 m	135.49
	1.2.10.2	125 mm dia	125 mm dia	100m	165.79
	1.2.10.3	150 mm dia	150 mm dia	100 m	190.91
	1.2.10.4	200 mm dia	200 mm dia	100 m	286.47
	1.2.10.5	250 mm dia	250 mm dia	100 m	503.52
	1.2.10.6	300 mm dia	300 mm dia	100 m	630.09
	1.2.10.7	350 mm dia	350 mm dia	100 m	900.82
	1.2.10.8	400 mm dia	400 mm dia	100 m	1048.23
	1.2.10.9	450 and 500 mm dia	450 and 500 mm dia	100 m	1397.64
	1.2.10.10	600, 700, 750 and 800 mm dia	600, 700, 750 and 800 mm dia	100 m	1537.41
1.3		Add extra for additional lead by manual means	Add extra for every additional lead of 50 metre or part thereof.		
	1.3.1	Moorum	Lime, moorum, building rubbish	cum	11.63
	1.3.2	Earth	Earth	cum	14.54
	1.3.3	Manure	Manure or sludge	cum	12.64
	1.3.4	Rock	Excavated rock	cum	23.27
	1.3.5	Aggregate <40 mm	Sand, stone aggregate below 40mm nominal size	cum	14.54
	1.3.6	Aggregate >40 mm	Stone aggregate 40mm nominal size and above	cum	15.72
	1.3.7	Stone	Stone soling	cum	17.11
	1.3.8	Bricks	Bricks	1000 Nos.	27.14
	1.3.9	S.W. Pipes	S.W. Pipes		
	1.3.9.1	100 mm dia	100 mm dia	100 m	14.21
	1.3.9.2	150 mm dia	150 mm dia	100 m	24.19

	1.3.9.3	200 mm dia	200 mm dia	100 m	33.81
	1.3.9.4	250 mm dia	250 mm dia	100 m	56.36
	1.3.9.5	300 mm dia	300 mm dia	100 m	80.51
	1.3.9.6	350 mm dia	350 mm dia	100 m	112.71
	1.3.9.7	400 mm dia	400 mm dia	100 m	140.89
	1.3.9.8	450 mm dia	450 mm dia	100 m	170.78
	1.3.9.9	500 mm dia	500 mm dia	100 m	208.73
	1.3.9.10	600 mm dia	600 mm dia	100 m	256.17
	1.3.10	Other Pipes	R.C.C. pipes, Steel cylinder, R.C. pipes, C.I. pipes, and unreinforced cement pipes		
	1.3.10.1	100 mm dia	100 mm dia	100 m	19.87
	1.3.10.2	125 mm dia	125 mm dia	100m	24.31
	1.3.10.3	150 mm dia	150 mm dia	100 m	27.99
	1.3.10.4	200 mm dia	200 mm dia	100 m	42.00
	1.3.10.5	250 mm dia	250 mm dia	100 m	73.83
	1.3.10.6	300 mm dia	300 mm dia	100 m	92.39
	1.3.10.7	350 mm dia	350 mm dia	100 m	132.09
	1.3.10.8	400 mm dia	400 mm dia	100 m	153.70
	1.3.10.9	450 and 500 mm dia	450 and 500 mm dia	100 m	204.93
	1.3.10.10	600, 700, 750 and 800 mm dia	600, 700, 750 and 800 mm dia	100 m	225.43

**CHAPTER – 2.0**  
**EARTHWORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 632	Gamma – BHC (Lindane) emulsifiable concentrates
2	IS 1200 (Part-1)	Method of measurement of earth work
3	IS 1200 (Part-27)	Method of measurement of earth work (by Mechanical Appliances)
4	IS 4081	Safety code for Blasting and related drilling operation
5	IS 4988 (Part-IV)	Excavators
6	IS 6313 (Part-II)	Anti-Termite measures in buildings (pre -constructional)
7	IS 6313(Part-III)	Anti-Termite Measures in Buildings for existing buildings
8	IS 6940	Methods of test for pesticides and their formulations
9	IS 8944	Chlorpyrifos emulsifiable concentrates
10	IS 8963	Chlorpyrifos – Technical specifications
11	IS 12138	Earth moving Equipment

**PREAMBLE**  
**EARTHWORK**  
**(CHAPTER: 2.0)**

**2.1 CLASSIFICATION OF EARTH WORK:**

The earthwork shall be classified under the following categories and measured separately for each category:

- (A) **All kind of soils:** Generally any strata, such as sand, gravel, loam, clay, mud, black cotton moorum, shingle, river or nallah bed boulders, siding of roads, paths etc. and hard core, macadam surface of any description (water bound, grouted tarmac etc.), lime concrete mud concrete and their mixtures which for excavation yields to application of picks, showels, jumper, sacrifiers, ripper and other manual digging implements.
- (B) **Ordinary rock:** Generally any rock which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means for excavation such as lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level. If required light blasting may be resorted to for loosening the materials but this will not in any way entitle the material to be classified as 'Hard rock'.
- (C) **Hard rock:** Generally any rock or boulder for the excavation of which blasting is required such as quartzite, granite, basalt, reinforced cement concrete (reinforcement to be cut through but not separated from concrete) below ground level and the like.
- (D) **Hard rock (blasting prohibited):** Hard rock requiring blasting as described under (c) but where the blasting is prohibited for any reason and excavation has to be carried out by chiseling, wedging, use of rock hammers and cutters or any other agreed method.

**2.2 FOUL CONDITION:**

Filthy and unhygienic conditions where physical movements are hampered such as soil mixed with sewage or night soil.

**2.3 LEAD:**

All distances shall be measured over the shortest practical route and not necessarily the route actually taken. Route other than shortest practical route may be considered in cases of unavoidable circumstances and approved by Engineer-in-charge along with reasons in writing.

**2.4 LIFT:**

The vertical distance for removal with reference to the ground level. The excavation up to 1.5 metres depth below the ground level and depositing the excavated materials up to 1.5 metres above the ground level are included in the rate of earth work. Lifts inherent in the lead due to ground slope shall not be paid for.

**2.5 PROTECTIONS:**

Excavation where directed by the Engineer-in-Charge shall be securely barricaded and provided with proper caution signs, conspicuously displayed during the day and properly illuminated with red lights and/or written using fluorescent reflective paint as directed by engineer in charge during the night to avoid accident.

The Contractor shall take adequate protective measures to see that the excavation operations do not damage the adjoining structures or dislocate the services. Water supply pipes, sluice valve chambers, sewerage pipes, manholes, drainage pipes and chambers, communication cables, power supply cables etc. met within the course of excavation shall be properly

supported and adequately protected, so that these services remain functional. However, if any service is damaged during excavation shall be restored in reasonable time, for which no extra payment shall be admissible.

Excavation shall not be carried out below the foundation level of the adjacent buildings until underpinning; shoring etc. is done as per the directions of the Engineer-in-Charge for which payment shall be made separately.

Any damages done by the contractor to any existing work shall be made good by him at his own cost. Existing drains pipes, culverts, overhead wires, water supply lines and similar services encountered during the course of execution shall be protected against damage by the contractor. The contractor shall not store material or otherwise occupy any part of the site in manner likely to hinder the operations of such services.

## **2.6 EXCAVATION IN ALL KINDS OF SOIL:**

All excavation operations manually or by mechanical means shall include excavation and 'getting out' the excavated materials. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one metre or half the depth of excavation, whichever is more, clear off the edge of excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified. The subsequent disposal of the excavated material shall be either stated as a separate item or included with the items of excavation stating lead.

During the excavation the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or undercutting shall not be done.

In firm soils, the sides of the trenches shall be kept vertical up to a depth of 2 metres from the bottom. For greater depths, the excavation profiles shall be widened by allowing steps of 50 cm on either side after every 2 metres from the bottom. Alternatively, the excavation can be done so as to give slope of 1:4 (1 horizontal: 4 vertical). Where the soil is soft, loose or slushy, the width of steps shall be suitably increased or sides sloped or the soil shored up as directed by the Engineer-in-Charge. It shall be the responsibility of the contractor to take complete instructions in writing from the Engineer-in-Charge regarding the stepping, sloping or shoring to be done for excavation deeper than 2 metres.

The excavation shall be done true to levels, slope, shape and pattern indicated by the Engineer-in-Charge. Only the excavation shown on the drawings with additional allowances for centering and shuttering or as required by the Engineer-in-Charge shall be measured and recorded for payment.

In case of excavation for foundation in trenches or over areas, the bed of excavation shall be to the correct level or slope and consolidated by watering and ramming. If the excavation for foundation is done to a depth greater than that shown in the drawings or as required by the Engineer-in-Charge, the excess depth shall be made good by the contractor at his own cost with the concrete of the mix used for levelling/ bed concrete for foundations. Soft/defective spots at the bed of the foundations shall be dug out and filled with concrete (to be paid separately) as directed by the Engineer-in-Charge.

While carrying out the excavation for drain work care shall be taken to cut the side and bottom to the required shape, slope and gradient. The surface shall then be properly dressed. If the excavation is done to a depth greater than that shown on the drawing or as required by the Engineer-in-Charge, the excess depth shall be made good by the contractor at his own cost with stiff clay puddle at places where the drains are required to be pitched and with ordinary earth, properly watered and rammed, where the drains are not required to be pitched. In case

the drain is required is to be pitched, the back filling with clay puddle, if required, shall be done simultaneously as the pitching work proceeds. The brick pitched storm water drains should be avoided as far as possible in filled-up areas and loose soils.

In all other cases where the excavation is taken deeper by the contractor, it shall be brought to the required level by the contractor at his own cost by filling in with earth duly watered, consolidated and rammed.

In case the excavation is done wider than that shown on the drawings or as required by the Engineer-in-Charge, additional filling wherever required on the account shall be done by the contractor at his own cost.

The excavation shall be done manually or by mechanical means as directed by Engineer-in-charge considering feasibility, urgency of work, availability of labour /mechanical equipments and other factors involved. Contractor shall ensure every safety measures for the workers. Neither any deduction will be made nor will any extra payment be made on this account.

## **2.7 EXCAVATION IN ORDINARY/HARD ROCK**

All excavation operations shall include excavation and 'getting out' the excavated matter. In case of excavation for trenches, basements, water tanks etc. 'getting out' shall include throwing the excavated materials at a distance of at least one metre or half the depth of excavation, whichever is more, clear off the edge or excavation. In all other cases 'getting out' shall include depositing the excavated materials as specified. The subsequent disposal of the excavated material shall be either stated as a separate item or included with the item of excavation stating lead.

During the excavation, the natural drainage of the area shall be maintained. Excavation shall be done from top to bottom. Undermining or under cutting shall not be done.

Where hard rock is met with and blasting operations are considered necessary, the contractor shall obtain the approval of the Engineer-in-Charge in writing for resorting to the blasting operations. Blasting operations shall be done as specified in subsequent para and chiseling shall be done to obtain correct levels, slopes, shape and pattern of excavation as per the drawings or as required by the Engineer-in-Charge and nothing extra shall be payable for chiseling.

Where blasting operations are prohibited or are not practicable, excavation in hard rock shall be done by chiseling.

In ordinary rock excavation shall be carried out by crowbars, pick axes or pneumatic drills and blasting operation shall not be generally adopted. Where blasting operations are not prohibited and it is practicable to resort to blasting for excavation in ordinary rock, contractor may do so with the permission of the Engineer-in-Charge in writing but nothing extra shall be paid for this blasting. Blasting shall be done as specified.

If the excavation for foundations or drains is done to a depth greater than that shown in the Drawings or as required by the Engineer-in-Charge. The excess depth shall be made good by the contractor at his own cost with the concrete of the mix used for levelling/ bed concrete for foundations. Soft/ defective spots at the bed of foundations shall be dug out and filled with concrete (to be paid separately) as directed by the Engineer-in-Charge.



## 2.8 BLASTING

Where hard rock is met with and blasting operations are considered necessary, the contractor shall obtain the approval of the Engineer-in-Charge in writing for resorting to blasting operation.

**Note:** In ordinary rock blasting operations shall not be generally adopted. However, the contractor may resort to blasting with the permission of the Engineer-in-charge, but nothing extra shall be paid for such blasting operations. The contractor shall obtain license from the competent authority for undertaking blasting work as well as for obtaining and storing the explosive as per the Explosive Act, 1884 as amended up to date and the Explosive Rules, 1983. The contractor shall purchase the explosives fuses, detonators, etc. only from a licensed dealer. The contractor shall be responsible for the safe transportation, storage and custody as per explosive rules and proper accounting of the explosive materials. Fuses and detonators shall be stored separately and away from the explosives. The Engineer-in-Charge or his authorized representative shall have the right to check the contractor's store and account of explosives. The contractor shall provide necessary facilities for this. The contractor shall be responsible for any damage arising out of accident to workmen, public or property due to storage, transportation and use of explosive during blasting operation.

Blasting operations shall be carried out under the supervision of a responsible authorized agent of the contractor (referred subsequently as agent only), during specified hours as approved in writing by the Engineer-in-Charge. The agent shall be conversant with the rules of blasting. In case of blasting with dynamite or any other high explosive, the position of all the bore holes to be drilled shall be marked in circles with white paint. These shall be inspected by the contractor's agent. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the agent shall inspect the holes to ensure that drilling has been done only at the marked locations and no extra hole has been drilled. The agent shall then prepare the necessary charge separately for each bore hole. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Only cylindrical wooden tamping rods shall be used for tamping. Metal rods or rods having pointed ends shall never be used for tamping. One cartridge shall be placed in the bore hole and gently pressed but not rammed down. Other cartridges shall then be added as may be required to make up the necessary charge for the bore hole. The top most cartridges shall be connected to the detonator which shall in turn be connected to the safety fuses of required length. All fuses shall be cut to the length required before being inserted into the holes. Joints in fuses shall be avoided. Where joints are unavoidable a semi-circular notch shall be cut in one piece of fuse about 2 cm deep from the end and the end of other piece inserted into the notch. The two pieces shall then be wrapped together with string. All joints exposed to dampness shall be wrapped with rubber tape. The maximum of eight bore holes shall be loaded and fired at one occasion. The charges shall be fired successively and not simultaneously. Immediately before firing, warning shall be given and the agent shall see that all persons have retired to a place of safety. The safety fuses of the charged holes shall be ignited in the presence of the agent, who shall see that all the fuses are properly ignited.

Careful count shall be kept by the agent and others of each blast as it explodes. In case all the charged bore holes have exploded, the agent shall inspect the site soon after the blast but in case of misfire the agent shall inspect the site after half an hour and mark red crosses (X) over the holes which have not exploded. During this interval of half an hour, nobody shall approach the misfired holes. No driller shall work near such bore until either of the following operations have been done by the agent for the misfired boreholes.

- (a) The contractor's agent shall very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper and withdraw the fuse, primer and detonator. After this a fresh detonator, primer and fuse shall be placed in the misfired holes and fired, or

- (b) The holes shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15 cm away and parallel to it. This hole shall be charged and fired. The misfired holes shall also explode along with the new one. Before leaving the site of work, the agent of one shift shall inform the agent relieving him for the next shift, of any case of misfire and each such location shall be jointly inspected and the action to be taken in the matter shall be explained to the relieving agent. The Engineer-in-Charge shall also be informed by the agent of all cases of misfires, their causes and steps taken in that connection.

## 2.9 RATES

### **Rates for Earthwork shall include the following:**

- (a) Excavation and depositing excavated material as specified.
- (b) Handing of antiquities and useful material as specified.
- (c) Protection as specified.
- (d) Site clearance as specified.
- (e) Setting out and making profiles as specified.
- (f) Bailing out or pumping of rain water from excavations.
- (g) Initial lead of 50 m and lift of 1.5 m.
- (h) Blasting operations for hard rock as specified.
- (I) Lead beyond 50 metre shall be payable in accordance with chapter -1- Transportation.

**Anti-termite:** - Contractor shall procure the chemical of required concentration in sealed original containers directly from the reputed and authorized dealers; chemical shall be kept in the custody of the Engineer-in Charge or his authorized representatives and issued for use to meet the day's requirements. Empty containers after washing and concentrated chemical left unused at the end of the day's work shall be returned to the Engineer-in-Charge or his authorized representative.

## 2.10 ANTIQUITIES AND USEFUL MATERIALS

- Any finds of archaeological interest such as relics of antiquity, coins, fossils or other articles of value shall be delivered to the Engineer-in-Charge and shall be the property of the Government.
- Any material obtained from the excavation which in the opinion of the Engineer-in-Charge is useful shall be stacked separately in regular stacks as directed by the Engineer-in-Charge and shall be the property of the Government.
- Shoring in wells, foundations and trenches will not be payable without obtaining prior approval of concern Superintending Engineer/ APD.
- Black cotton soil shall not be permitted for back filling and or under floors.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.1		Surface dressing	Surface dressing of the ground including removing vegetation and inequalities not exceeding 15 cm deep and disposal of rubbish, lead up to 50 m and lift up to 1.5 m. in all kinds of soil.	100 sqm	803.00
2.2		Jungle clearing	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth up to 30 cm measured at a height of 1 m above ground level and removal of rubbish up to a distance of 50 m outside the periphery of the area cleared.	100 sqm	414.00
2.3		Grass clearing	Clearing grass and removal of the rubbish up to a distance of 50 m outside the periphery of the area cleared.	100 sqm	213.00
2.4		Trees felling	Felling trees of the girth (measured at a height of 1 m above ground level) including cutting of trunks and branches removing the roots and stacking of serviceable material and disposal of unserviceable material.		
	2.4.1	>30 cm < 60 cm dia	beyond 30 cm girth up to and including 60 cm girth	each	129.00
	2.4.2	>60 cm < 120 cm dia	beyond 60 cm girth up to and including 120 cm girth	each	565.00
	2.4.3	>120 cm < 240 cm dia	beyond 120 cm girth up to and including 240 cm girth	each	2601.00
	2.4.4	>240 cm dia	above 240 cm girth	each	5224.00
2.5		Excavation surface	Earth work in surface excavation not exceeding 30 cm in depth but exceeding 1.5 m in width as well as 10 sqm on plan including disposal of excavated earth up to 50 m lead and lift up to 1.5 m, disposed soil to be levelled and neatly dressed, All kinds of soil	sqm	43.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.6		Excavation soil	Earth work in excavation by mechanical means (Hydraulic excavator) / manual means over areas (exceeding 30cm in depth. 1.5m in width as well as 10 sqm on plan) including dressing of sides and ramming of bottom disposal of excavated earth, lead up to 50m and lift up to 1.5m, disposed earth to be levelled and neatly dressed. (No extra lift is payable if work is done by mechanical means) All kinds of soil	cum	129.00
2.7		Excavation rock	Earth work in excavation/ by mechanical means (Hydraulic Excavator)/ manual means over areas (exceeding 30 cm in depth, 1.5m in width as well as 10 sqm on plan) including dressing of sides and ramming of bottom disposal of excavated earth, lead up to 50 m and liftup to 1.5 m, disposed earth to be levelled and neatly dressed.		
	2.7.1	OR	Ordinary rock	cum	287.00
	2.7.2	HR (blasting)	Hard rock (requiring blasting)	cum	519.00
	2.7.3	HR (blasting prohibited)	Hard rock (blasting prohibited)	cum	828.00
2.8		Excavation rock in narrow areas	Earth work in excavation by mechanical means (Hydraulic Excavator)/ manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan) including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m. (No extra lift is payable if work is done by mechanical means)	cum	131.00
	2.8.1	OR	Ordinary rock	cum	216.00
	2.8.2	HR	Hard rock (requiring blasting)	cum	452.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	2.8.3	HR (blasting prohibited)	Hard rock (blasting prohibited)	cum	593.00
2.9		Excavation trenches soil up to 1.5 depth	Excavating trenches of required width for pipes, cables, etc. including excavation for sockets, and dressing of sides, ramming of bottoms, depth up to 1.5 m including getting out the excavated soil, and then returning the soil as required, in layers not exceeding 20 cm in depth including consolidating each deposited layer by ramming, watering, etc. and disposing of surplus excavated soil as directed, within a lead of 50 m : (No extra lift is payable if work is done by mechanical means) in all kinds of soil		
	2.9.1	<80mm dia	Pipes, cables etc., not exceeding 80 mm dia.	metre	96.00
	2.9.2	>80mm dia/ <300mm dia	Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	metre	156.00
	2.9.3	>300mm dia	Pipes, cables etc. exceeding 300 mm dia but not exceeding 600 mm.	metre	244.00
2.10		Extra for excavation trenches soil 1.5 to 3.0 m depth	Extra for excavating trenches for pipes, cables etc. in all kinds of soil for depth exceeding 1.5 m, but not exceeding 3 m. (Rate is over corresponding basic item for depth up to 1.5 metre).	metre	134%
2.11		Extra for excavation trenches 3m to 4.5 m depth	Extra for excavating trenches for pipes, cables, etc., in all kinds of soil for depth exceeding 3 m in depth, but not exceeding 4.5 m. (Rate is over corresponding basic item for depth up to 1.5 metre.)	metre	345%
2.12		Excavation trenches rock up to 1.5 m depth	Excavating trenches of required width for pipes, cables, etc., including excavation for sockets, depth up to 1.5 m including getting out the excavated materials, refiling the soil as required in layers not exceeding 20 cm in depth including consolidating each deposited layers by ramming, watering etc. stacking serviceable material for		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			measurements and disposal of unserviceable material as directed, within a lead of 50m :		
	2.12.1	OR	Ordinary rock :		
	2.12.1.1	up to 80mm dia	Pipes, cables etc. not exceeding 80 mm dia.	metre	139.00
	2.12.1.2	>80mm to 300 mm dia	Pipes, cables etc. exceeding 80 mm dia but not exceeding 300 mm dia.	metre	344.00
	2.12.1.3	>300mm dia	Pipes, cables exceeding 300 mm dia but not exceeding 600mm dia	metre	395.00
	2.12.2	HR (blasting)	Hard rock (requiring blasting)		
	2.12.2.1	up to 80mm dia	Pipes, cables etc. not exceeding 80 mm dia.	metre	251.00
	2.12.2.2	>80 mm to 300mm dia	Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	metre	621.00
	2.12.2.3	>300mm to 600 mm dia	Pipes, cables etc. exceeding 300 mm dia but not exceeding 600mm dia	metre	715.00
	2.12.3	HR (blasting prohibited)	Hard rock (blasting prohibited)		
	2.12.3.1	up to 80mm dia	Pipes, cables etc. not exceeding 80 mm dia.	metre	270.00
	2.12.3.2	>80 to 300mm dia	Pipes, cables etc. exceeding 80 mm dia. but not exceeding 300 mm dia.	metre	670.00
	2.12.3.3	>300mm to 600 mm dia	Pipes, cables etc. exceeding 300 mm dia but not exceeding 600mm dia.	metre	770.00
2.13		Extra for excavation trenches in rock from 1.5 m to 3.0 m	Extra for excavating trenches for pipes, cables, etc. in ordinary/hard rock exceeding 1.5 m in depth but not exceeding 3 m. (Rate is over corresponding basic item for depth up to 1.5 metre.)	metre	102%
2.14		Extra for excavation trenches in rock from 3.0 m to 4.5 m	Extra for excavating trenches for pipes, cables, etc. in ordinary/hard rock exceeding 3m in depth but not exceeding 4.5 m. (Rate is over corresponding basic item for depth up to 1.5 metre.)	metre	252%

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.15		Close timbering trenches	Close timbering in trenches including strutting, shoring and packing cavities (wherever required) complete. (Measurements to be taken of the face area timbered).		
	2.15.1	Upto 1.5 m depth	Depth not exceeding 1.5 m.	sqm	118.00
	2.15.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	122.00
	2.15.3	>3.0m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	130.00
2.16		Close timbering shafts	Close timbering in case of shafts, wells, cesspits, manholes and the like including strutting, shoring and packing cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered).		
	2.16.1	Upto 1.5 m depth	Depth not exceeding 1.5 m.	sqm	120.00
	2.16.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	128.00
	2.16.3	>3.0m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	136.00
2.17		Close timbering over areas	Close timbering over areas including strutting, shoring and packing, cavities (wherever required) etc. complete. (Measurements to be taken of the face area timbered) :		
	2.17.1	Up to 1.5 m depth	Depth not exceeding 1.5 m.	sqm	105.00
	2.17.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	109.00
	2.17.3	>3.0 m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	114.00
2.18		Extra for leaving permanently in position in trenches	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	sqm	1558.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.19		Open timbering trenches	Open timbering in trenches including strutting and shoring complete (measurements to be taken of the face area timbered):		
	2.19.1	Up to 1.5 m depth	Depth not exceeding 1.5 m.	sqm	59.00
	2.19.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	62.00.
	2.19.3	>3.0m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	66.00
2.20		Open timbering shafts	Open timbering in case of shafts, wells, cesspits, manholes and the like including strutting and shoring complete (Measurements to be taken of the face area timbered):		
	2.20.1	Upto 1.5 m depth	Depth not exceeding 1.5 m.	sqm	55.00
	2.20.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	59.00
	2.20.3	>3.0m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	53.00
2.21		Open timbering over areas	Open timbering over areas including strutting, shoring etc. complete. (Measurements to be taken of the face area timbered):		
	2.21.1	Upto 1.5 m depth	Depth not exceeding 1.5 m.	sqm	32.00
	2.21.2	>1.5m to 3.0m depth	Depth exceeding 1.5 m but not exceeding 3 m.	sqm	35.00
	2.21.3	>3.0m to 4.5 m depth	Depth exceeding 3 m but not exceeding 4.5 m.	sqm	39.00
2.22		Extra for leaving planking	Extra for planking and strutting in open timbering if required to be left permanently in position. (Face area of	sqm	784.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		permanently in position	the timber permanently left to be measured)		
2.23		Extra for under water and foul position	Extra rates for quantities of works, executed:		
	2.23.1	Under water	In or under water and/or liquid mud, including pumping out water as required.	metre depth	20%
	2.23.2	In foul condition	In or under foul position, including pumping out water as required.	metre depth	25%
			<b>Note:</b> - The extra percentage rate is applicable in respect of each item but limited to quantities of work executed in these difficult conditions. The unit, namely, metre depth, to be considered for payment, shall be the depth measured from the sub soil water level up to the Centre of gravity of the quantity executed in difficult conditions. The depth shall be reckoned correct to 0.1 metre. 0.05 metre or more shall be taken as 0.1 metre and less than 0.05 metre ignored.		
2.24		Filling available excavated earth	Filling available excavated earth (excluding hard rock/Ordinary rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.	cum	72.00
2.25		Extra for additional lift	Extra for every additional lift of 1.5 m or part thereof in excavation. (No extra lift is payable if work is done by mechanical means)		
	2.25.1	Soil	All kinds of soil.	cum	30.00
	2.25.2	Rock	Ordinary or hard rock.	cum	53.00
2.26		Under floor filling stone dust	Supplying and filling in plinth with crusher stone dust / coarse sand under floors including, watering, ramming and compacting in layers not exceeding	cum	672.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			20cm in depth and dressing complete <b>Note:</b> - Maximum thickness of this layer shall be 20 cm.		
2.27		Under floor filling	Supplying and filling in plinth under floors including watering ramming consolidating in layers not exceeding 20cm in depth and dressing complete.		
	2.27.1	Hard muram hard copra	With hard muram having CBR >12 % at under floors including watering, ramming and compacting (minimum compaction 95% of MDD) in layers not exceeding 20cm in thickness and dressing complete. ( <b>Note:-</b> maximum thickness of this layer to be provided shall be 30cm)	cum	300.00
	2.27.2	Selected soil	Supplying and filing in plinth with soil (other than BC soil ) having MDD not less than 1.85 t/m <sup>3</sup> under floors including watering, ramming and compacting (minimum compaction 95% of MDD) in layers not exceeding 15cm depth and dressing complete.	cum	250.00
2.28		Excavating holes	Excavating holes more than 0.10 cum & upto 0.5 cum including getting out the excavated soil, then refiling the soil as required in layers not exceeding 20 cm in depth, including consolidating each deposited layer by ramming, watering etc., disposing of surplus excavated soil; as directed within a lead of 50 m and lift upto 1.5m.		
	2.28.1	Soil	All kinds of soil.	each	42.00
	2.28.2	OR	Ordinary rock	each	68.00
	2.28.3	HR (blasting)	Hard rock (requiring blasting)	each	138.00
	2.28.4	HR (blasting prohibited)	Hard rock (blasting prohibited)	each	151.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.29		Supplying chemical emulsion	Supplying chemical emulsion in sealed containers including delivery as specified. (Chlorpyrifos/ Lindane emulsifiable concentrate of 20%)	liter	174.00
2.30		Post-constructional anti-termite treatment	Diluting and injecting chemical emulsion for POST-CONSTRUCTIONAL anti-termite treatment (excluding the cost of chemical emulsion) :		
	2.30.1	Trenching along existing external wall	Along external wall where the apron is not provided using chemical emulsion @ 7.5 liters / sqm of the vertical surface of the substructure to a depth of 300mm including excavation channel along the wall and rodding etc. complete, with Chlorpyrifos/ Lindane E.C. 20% with 1% concentration.	metre	36.00
	2.30.2	Drilling plugging holes along existing external wall	Along the external wall below concrete or masonry apron using chemical emulsion @ 2.25 litres per linear metre including drilling and plugging holes etc. With Chlorpyrifos/ Lindane E.C. 20% with 1% concentration.	metre	42.00
	2.30.3	Existing floor	Treatment of soil under existing floors using chemical emulsion @ one litre per hole, 300 mm apart including drilling 12 mm diameter holes and plugging with cement mortar 1 :2 (1 cement : 2 sand) to match the existing floor, With Chlorpyrifos/ Lindane E.C. 20% with 1% concentration.	sqm	199.00
	2.30.4	Existing masonry	Treatment of existing masonry using chemical emulsion @ one litre per hole at 300 mm interval including drilling 10mm dia and 200mm deep holes at 45 degree and plugging them with cement mortar 1:2 (1 cement : 2 sand) to the full depth of the hole, with Chlorpyrifos/ Lindane E.C. 20% with 1% concentration.	metre	50.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	2.30.5	Existing wood work	Treatment at points of contact of wood work by chemical emulsion Chlorpyrifos/ Lindane (in oil or kerosene based solution) @ 0.5 litres per hole by drilling 6 mm dia holes at downward angle of 45 degree at 150mm centre to centre and sealing the same.	metre	201.00
2.31		Deduct for not levelled soil	Deduct for disposed soil not levelled and neatly dressed.	cum	22.00
2.32		Preconstruction antitermite treatment	Preconstruction antitermite treatment to the building under construction by providing.	sqm	136.00
			<b>Stage 1:</b> Treating the bottom and the sides (upto 30 cm height of the excavated trench @ 5 liters per sqm of the surface area.		
			<b>Stage 2:</b> After masonry/RCC work, the backfill in the immediate contact with the foundation structure treatment @ 7.5 liters per sqm. Of the vertical surface of the substructure for each side.		
			<b>Stage 3:</b> surface treatment by spreading emulsion over the plinth area before laying the base concrete under floors @ 5.0 litres/Sqm.		
			<b>Stage 4:</b> Pumping the emulsion in plinth masonry on filling side at floor junction @ 7.5 litres/Sqm.		
			<b>Stage 5:</b> Pumping the emulsion from outer side of the plinth below ground around the masonry @ 5.0 litres/Sqm as per I.S. 8944 Emulsion. (1Chlorpyrifos: 19 water) with five years service guarantee (Measurements to be taken for plinth area)		
			<b>Note</b> – Treatment should start when foundation trenches and pits are ready to take bed concrete or leveling course in foundations. Laying of bed concrete should start when the chemical emulsion has been absorbed by the soil and the surface is reasonably dry. Treatment should not be carried out when it is		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			raining or when soil is wet with rain or subsoil water. This also applies to fill up soil within the plinth area before laying the subgrade for flooring.		
2.33		Bore holes for dowel bars	Making bore holes for providing dowel bars at designed depth in rock foundation by drilling 40 mm dia bore hole in rock including necessary bending hooking, in position and grouting with cement slurry etc. complete as per drawing and specification. (Steel to be paid separately).	metre	205.00
2.34		Excavation & loading by hydraulic excavator	Excavation in soil using hydraulic excavator and including cutting and loading in tippers, trimming bottom and side slopes in accordance with requirements of lines, grades and cross-section, and transporting to the appropriate ground contour, location and levelling and dressing earth neatly withall lifts and lead upto 1000 metre.	cum	55.00
2.35		Rough excavation banking/filing excavated earth	Earth work in rough excavation by any means and banking\filling excavated earth in layers not exceeding 20cm in depth, breaking clods, watering rolling each layer with 1/2 tonne roller or wooden or steel rammers etc. and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal bank and guide bank of filling up ground depression within campus, lead upto 50m and all lift. All kinds of soil.	cum	130.00
2.36		Banking/filing excavated earth in layers	Banking\filling excavated earth in layers not exceeding 20cm in depth, breaking clods, watering rolling each layer with 1/2 tonne roller or wooden or steel rammers etc. and rolling every 3rd and top-most layer with power roller of minimum 8 tonnes and dressing up, in embankments for roads, flood banks, marginal bank and guide bank etc. lead upto 50m and lift upto 1.5m. All kinds of soil.	cum	80.00
2.37		Deduct for not rolling	Deduct for not rolling with power roller of minimum 8 tonnes for banking\filling excavated earth in layers not exceeding 20cm in depth.	cum	19.00
2.38		Deduct for not watering	Deduct for not watering with the excavated earth for banking\filling	cum	15.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
2.39		Anti-termite pipe system	Providing and laying of permanent piping technology anti-termite treatment before flooring work by installing LLDP (Low linear density polyethylene) tube of 8 mm O.D. & 6.4 mm I.D.with inbuilt pressurecompensation chip at every 30 cminterval in the tube, having working pressure of 2 kg/cm <sup>2</sup> and release rate of 1.9 ltr/hour fixed by P-clips and nails. The LLDP pipe shall be installed at the entire periphery of the building and at internal network of building at a depth of 20 to 200 mm under floor at every 2 to 3 mtr. c/c distance (adjusted as per building layout) & Ends of loop pass through a PVC elbow of minimum 32mm ID at junction box of wall and floor level, entering into a steel reinforced grooved flexible pipe of minimum 22 mm ID leading into Junction box and the loops shall terminate in junction boxes & test every junction during injecting chemicals for termite control treatment. The anti-termite chemical Imidacloprid 30.5% SC mix as per IS-6313, (part III) shall be injected by the pressure pump diluted with water @ 10.5ml/5 ltr of water at the rate of 2 kg/sq.cm. @ 5Ltr/SMT.The contractor shall submit approved line plan for piping system and junction boxes dully approved by Engineer-in-charge with bond of 5 year warranty.		
	2.39.1	Pipe system	Permanent piping system with Junction boxes	sqm	113.00
	2.39.2	Chemical injection	Anti-termite chemical injected area	sqm	53.00
2.40		Ploughing of existing ground	Ploughing the existing ground to a depth of 15 cm to 25 cm and watering the same. (All kinds of soil)	sqm	13.00
2.41		Brick bats 250 mm thick,	Providing , laying, spreading, and compacting, brick bats in uniform thickness 250 mm with hand packing rolling, with vibratory roller 8-10 tonnes in stages to proper grade, watering and compacting to required density.	sqm	897.00

**CHAPTER – 3.0**  
**MORTARS**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 269	Specification for 33 grade ordinary Portland cement
2	IS 383	Specification for coarse and fine aggregate from natural Source for concrete.
3	IS 455	Specification for Portland slag cement.
4	IS 460 (Part-I)	Specification for test sieves: wire cloth test sieves.
5	IS 650	Specification for standard sand for testing of cement
6	IS 1269	Specification for 53 grade ordinary Portland cement
7	IS 1344	Specification for calcined clay Pozzolana.
8	IS 1489	Specification for Portland pozzolana cement
9	IS 1542	Specification for sand for plaster
10	IS 1727	Methods of Test for Pozzolanic materials
11	IS 2116	Specification for sand for masonry mortar.
12	IS 2250	Code of practice for preparation and use of masonry Mortar.
13	IS 2386 (Part-I)	Method of test for aggregate for concrete (Particle size and shape)
14	IS 2386 (Part -II)	-Do- Estimation of deleterious materials and organic impurities.
15	IS 2386 (Part -III)	-Do- Specific gravity, density, voids, absorption and bulking.
16	IS 3025	Method of sampling and test for water
17	IS 3406	Specification for masonry cement.
18	IS 3812 (Part-I)	Specification for fly ash for use as pozzolana in cement mortar and concrete
19	IS 3812 (Part-II)	Specification for fly ash for use as admixture in cement mortar and concrete
20	IS 4031 (Part-I) to (Part-XIII)	Method of Physical test for hydraulic cement
21	IS 4032	Method of chemical analysis of Hydraulic cement.
22	IS 8041	Rapid hardening Portland cement.
23	IS 8042	Specification for white cement
24	IS 8043	Hydrophobic Portland cement
25	IS 8112	Specification for 43 grade ordinary Portland cement
26	IS 11652	Woven HDPE sacks for packing cement
27	IS 11653	Woven polypropylene sacks for packing cement
28	IS 12174	Jute synthetic union bags for packing cement



**LIST OF MANDATORY TESTS**

<b>Material</b>	<b>Clause</b>	<b>Test</b>	<b>Field/ laboratory test</b>	<b>Test Procedure</b>	<b>Min. quantity of material for carrying out the test</b>	<b>Frequency of testing</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
Water	3.1.1	(i) pH Value (ii) Limits of Acidity (iii) Limits of Alkalinity (iv) Percentage of solids (a) Chlorides (b) Suspended matter (c) Sulphates (d) Inorganic solids (e) Organic solids	Lab Lab Lab Lab Lab Lab Lab Lab	IS 3025	-	Water from each source shall be got tested before the commencement of work and thereafter once in every three months till the completion of the work. Water from municipal source need be tested only once in six months. Number of Tests for each source shall be 3
Cement	3.1.2	(a) Physical requirement (i) Fineness (ii) Soundness (iii) Setting time (Initial and Final) (iv) Compressive strength (v) Consistency of standard cement paste	Lab Lab Lab Lab Lab	IS 4031 (Part II) IS 4031 (Part III) IS 4031 (Part V) IS 4031 (Part VI) IS 4031 (Part VI)	Each lot	Every 50 tonnes or part Thereof. Each brand of cement brought to site shall be tested as per This frequency.
Sand	3.1.3.1	Organic Impurities	Field	Appendix 'A'	20 cum	Every 20 cum or part thereof or more frequently as decided By Engineer-in-Charge.
	3.1.3.2	Silt Content	Field	Appendix 'A'	20 cum	-do-
	3.1.3.4	Particle size distribution a,b,c,d and e	Field or Laboratory as decided by the Engineer-Incharge	Appendix B	40 cum	40 cum or part thereof
Sand	3.1.3.5	Bulking of Sand	Field	Appendix D	20 cum	Every 20 cum or part thereof or more frequently as decided By Engineer-in-Charge.

**PREAMBLE**  
**MORTAR**  
**(CHAPTER: 3.0)**

### 3.1 Water

Water used for mixing and curing shall be clean and free from injurious quantities of alkalies, acids, oils, salts, sugar, organic materials, vegetable growth or other substance that may be deleterious to bricks, stone, concrete or steel. Potable water is generally considered satisfactory for mixing. The Ph value of water shall be not less than 6.

Water found satisfactory for mixing is also suitable for curing. However, water used for curing shall not produce any objectionable stain or unsightly deposit on the surface. Sea water shall not be used for mixing or curing.

Water from each source shall be tested before the commencement of the work and thereafter once in every three months till the completion of the work. In case of ground water, testing shall also be done for different points of drawdown. Water from each source shall be got tested during the dry season before monsoon and again after monsoon.

### 3.2 Cement

The cement used shall be any of the following grade and the type selected should be appropriate for the intended use.

- (a) 33 grade ordinary Portland cement conforming to IS 269.
- (b) 43 grade ordinary Portland cement conforming to IS 8112.
- (c) 53 grade ordinary Portland cement conforming to IS 12269.
- (d) Rapid hardening Portland cement conforming to IS 8041.
- (e) Portland slag cement conforming to IS 455.
- (f) Portland Pozzolana cement (fly ash based) conforming to IS 1489 (Part 1).
- (g) Portland Pozzolana cement (calcined clay based) conforming to IS 1489 (part 2).
- (h) Hydrophobic cement conforming to IS 8043
- (i) Low heat Portland cement conforming to IS 12600.
- (j) Sulphate resisting Portland cement conforming to IS 12330
- (k) White cement conforming to IS 8042

Different types of cement shall not be mixed together. In case more than one type of cement is used in any work, a record shall be kept showing the location and the types of cement used. **Caution in Use of Cement Grade 53 in Construction:** Because of the faster hydration process, the concrete releases heat of hydration at a much faster rate initially and release of heat is the higher in case of Grade. 53. The heat of hydration being higher, the chances of micro-cracking of concrete is much greater. Thus, during initial setting period of concrete, the higher heat of hydration can lead to damaging micro-cracking within the concrete which may not be visible at surface. This cracking is different from shrinkage cracks which occurs due to faster drying of concrete in windy conditions. The situation can be worse when we tend to increase the quantity of the cement in the concrete with a belief that such increases are better for both strength and durability of concrete. Thus, it is very essential to be forewarned that higher grade cement specially grade 53 should be used only where such use is warranted for making higher strength concrete and also where good Quality Assurance measures are in place, by which proper precaution are taken to relieve the higher heat of hydration through chilling of aggregates or by proper curing of concrete. There are

instances where higher grade cement is being used even for low strength concrete, as, mortar or even for plastering. This can lead to unnecessary cracking of concrete/ surfaces. Another issue to be cautioned against is the tendency of the manufacturers to project Grade 53 cement as stronger cement, whereas Grade 33 or 43 are enough to produce the concrete of desired characteristic strength. The scenario of method of production of cement by various manufacturers should also be kept in mind while ordering various grades of cement. The ability to produce cements of particular fineness get fixed by the machinery installed by the manufacturers, and thus the ability to produce other various grades of cement by a particular manufacturer also gets limited. Whereas tendency today is to supply the consumer what he orders for by the manufacturers by simply stamping such grades on the bags. Thus, it is often observed that cement bags marked as grade 33 or 43 may really be containing cements of much higher grade.

**Compressive Strength:** Compressive strength requirement of each type of cement for various grades when tested in accordance with IS 4031 (part 6) shall be as under:

Sample	Strength in N/mm <sup>2</sup> not less than for		
	Gr. 33	Gr. 43	Gr. 53
Age at testing			
72 + 1 hr	16	23	27
168 + 2 hrs	22	33	37
672 + 4 hrs	33	43	53

**Setting Time:** Setting time of cement of any type of any grade when tested by Vicat apparatus method described in IS 4031 shall conform to the following requirement:

- (a) Initial setting time: Not less than 30 minutes.
- (b) Final setting time: Not more than 600 minutes.

### 3.3 Fine Aggregate

Aggregate most of which passes through 4.75 mm IS sieve is known as fine aggregate. Fine aggregate shall consist of natural sand, crushed stone sand, crushed gravel sand stone dust or marble dust, fly ash. It shall be hard, durable, chemically inert, clean and free from adherent coatings, organic matter etc. and shall not contain any appreciable amount of clay balls or pellets and harmful impurities e.g. iron pyrites, alkalies, salts, coal, mica, shale or similar laminated materials in such form or in such quantities as to cause corrosion of metal or affect adversely the hardening, the strength, the durability or the appearance of mortar, plaster or concrete. The sum of the percentages of all deleterious material shall not exceed 5%. Fine aggregate must be checked for organic impurities such as decayed vegetation humps, coal dust etc. in accordance with the procedure prescribed in Appendix 'A'

**Silt Content:** The maximum quantity of silt in sand as determined by the method prescribed in Appendix 'C' shall not exceed 8%. Fine aggregate containing more than allowable percentage of silt shall be washed as many times as directed by Engineer-in-charge so as to bring the silt content within allowable limits for which nothing extra shall be paid.

**Grading:** On the basis of particle size, fine aggregate is graded in to four zones. The grading when determined in accordance with the procedure prescribed in Appendix 'B' shall be within the limits given in Table 3.1 below. Where the grading falls outside the limits of any particular grading zone of sieves, other than 600 micron IS sieve, by a total amount not exceeding 5 per cent, it shall be regarded as falling within that grading zone.

**TABLE 3.1**  
**Fine Aggregates**

<i>IS Sieve</i>	<i>Percentage passing for</i>			
	<i>Grading Zone I</i>	<i>Grading Zone II</i>	<i>Grading Zone III</i>	<i>Grading Zone IV</i>
10 mm	100	100	100	100
4.75 mm	90-100	90-100	90-100	95-100
2.36 mm	60-95	75-100	85-100	95-100
1.18 mm	30-70	55-90	75-100	90-100
600 microns	15-34	35-59	60-70	80-100
300 microns	5-20	8-30	12-40	15-50
150 microns	0-10	0-10	0-10	0-15

**Marble dust:** Marble dust shall be obtained by crushing marble. Its grading shall fall within the limits of Grading Zone IV of Table 3.1. Grading of Marble dust for use in Mortar shall be as per following table.

**Table 3.2**  
**Grading of Marble Dust**

<i>IS Sieve</i>	<i>Percentage Passing</i>
10 mm	100
4.75 mm	95-100
2.36 mm	95-100
1.18 mm	90-100
600 micron	80-100
300 micron	15-50
150 micron	0-15

**Bulking:** Fine aggregate, when dry or saturated, has almost the same Volume but dampness causes increase in volume. In case fine aggregate is damp at the time of proportioning the ingredients for mortar or concrete, its quantity shall be increased suitably to allow for bulkage, which shall be determined by the method prescribed in Appendix 'D' Table 3.3 gives the relation between moisture content and percentage of bulking for guidance only.

**Table 3.3**  
**Variation of Bulking with Moisture Content**

<i>Moisture content % age</i>	<i>Bulking % age (by volume)</i>
2	15
3	20
4	25
5	30

### 3.4 Mixing

The mixing of mortar shall be done in mechanical mixers operated manually or by power as decided by Engineer-in-Charge. The Engineer-in-Charge may, however, permit hand mixing at his discretion taking into account the nature, magnitude and location of the work and practicability of the use of mechanical mixers or where item involving small quantities are to be done or if in his opinion the use of mechanical mixer is not feasible. In cases,

where mechanical mixers are not to be used, the contractor shall take permission of the Engineer-in-Charge in writing before the commencement of the work.

- (a) **Mechanical Mixing:** Cement and sand in the specified proportions shall be mixed dry thoroughly in a mixer. Water shall then be added gradually and wet mixing continued for at least three minutes. Only the required quantity of water shall be added which will produce mortar of workable consistency but not stiff paste. Only the quantity of mortar, which can be used within 30 minutes of its mixing, shall be prepared at a time. Mixer shall be cleaned with water each time before suspending the work.
- (b) **Hand Mixing:** The measured quantity of sand shall be leveled on a clean masonry platform and cement bags emptied on top. The cement and sand shall be thoroughly mixed dry by being turned over and over, backwards and forwards, several times till the mixture is of a uniform colour. The quantity of dry mix which can be used within 30 minutes shall then be mixed in a masonry trough with just sufficient quantity of water to bring the mortar to a stiff paste of necessary working consistency.

**Precautions:** Mortar shall be used as soon as possible after mixing and before it begins to set, and in any case within half hour, after the water is added to the dry mixture.

Item No.	Sub Item No	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
3.1		Cement mortar 1:1	Cement mortar 1:1 (1 cement: 1 sand)	cum	7539.00
3.2		Cement mortar 1:2	Cement mortar 1:2 (1 cement: 2 sand).	cum	5929.00
3.3		Cement mortar 1:3	Cement mortar 1:3 (1 cement: 3 sand).	cum	5127.00
3.4		Cement mortar 1:4	Cement mortar 1:4 (1 cement: 4 sand).	cum	4361.00
3.5		Cement mortar 1:5	Cement mortar 1:5 (1 cement: 5 sand).	cum	3948.00
3.6		Cement mortar 1:6	Cement mortar 1:6 (1 cement: 6 sand).	cum	3595.00
3.7		Cement mortar 1:2	Cement mortar 1:2 (1 cement: 2 stone dust).	cum	5497.00
3.8		Cement mortar 1:2	Cement mortar 1:2 (1 cement: 2 marble dust).	cum	5516.00
3.9		White cement mortar 1:2	White cement mortar 1:2 (1 white cement: 2 marble dust).	cum	9189.00
3.10		Cement mortar 1:5	Cement mortar 1:5 (1 cement: 5 marble dust).	cum	3637.00
3.11		White cement mortar 1:3	White cement mortar 1:3 (1 white cement: 3 marble dust).	cum	7416.00
3.12		White cement mortar 1:5	White cement mortar 1:5 (1 white cement: 5 marble dust).	cum	5158.00
3.13		Mortar in lime, surkhi, marble	Mortar in lime , surkhi (50% red and 50% light yellow) and marble dust 1:1.5:0.5	cum	4024.00

**CHAPTER – 4.0**  
**PLAIN CEMENT CONCRETE**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S. No.	I.S. No.	Subject
1	IS 383	Specification for coarse and fine aggregate from natural Source for concrete.
2	IS 456	Plain and reinforced concrete - Code of practice
3	IS 516	Method of test for strength of concrete
4	IS 1199	Method of sampling and analysis of concrete
5	IS 1200 (Part-II)	Method of measurement of building and civil engineering work (concrete work)
6	IS 1322	Specification for bitumen felt for water proofing and damp proofing.
7	IS 1791	General requirements for batch type concrete mixers
8	IS 2386	Method of test for aggregates for concrete (a) Part I - Particle size and shape (b) Part II - Estimation of deleterious materials and organic impurities (c) Part III - Specific gravity, density, voids absorption and bulking. (d) Part IV - Mechanical properties. (e) Part V – Soundness
9	IS 2505	General requirements for concrete vibrators - immersion type
10	IS 2506	General requirements for concrete vibrators - screed board concrete vibrators
11	IS 2645	Specification for integral water proofing compounds for cement mortar and concrete
12	IS 3068	Specification for broken brick (burnt clay) coarse aggregate for use in concrete.
13	IS 3812	Specification for fly ash for use as pozzolana and admixture in cement mortar and concrete.
14	IS 4656	Specification for form vibrators for concrete.
15	IS 7861 (Part-I)	Code of practice for extreme weather concreting (Part-I) recommended practice for hot weather concreting.
16	IS 7861 (Part-II)	Code of practice for extreme weather concreting (Part-II) recommended
17	IS 9103	Specification for concrete admixtures



## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
1	2	3	4	5	6	7
Stone Aggregate	4.1.2.2	(a) Percentage of soft or deleterious material	Field or Laboratory-Test as Required	IS 2386-Part II	As required by Engineer in-charge	For all quantities
	4.1.2.3	Particle size	Field/ Lab	Appendix 'E'	45 cum	For every 45 cum or part thereof for RCC work only. For rest of items as decided by Engineer-in charge
	4.1.2.5	(a) Estimation of organic impurities	Field/ Lab	IS 2386-Part II	10 cum	For every 40 cum or part thereof
		(b) Surface moisture	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
		(c) Determination of 10% fine value	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
		(d) Specific gravity	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
		(e) Bulk density	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
		(f) Aggregate crushing strength	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
		(g) Aggregate impact value	Field/ Lab	IS 2386	10 cum	For every 40 cum or part thereof
Concrete	4.2.2	Slump test	Field	Appendix 'F'	10 cum	15 cum or part thereof

**PREAMBLE**  
**PLAIN CEMENT CONCRETE**  
**(CHAPTER: 4.0)**

**4.1 Material**

Water, cement, fine aggregate or sand shall be as specified in Chapter 3.0 – Mortar.

**4.2 Coarse Aggregate**

**General:** Aggregate most of which is retained on 4.75 mm IS Sieve and contains only as much fine material as is permitted in IS 383 for various sizes and grading is known as coarse aggregate. Coarse aggregate shall be specified as stone aggregate and it shall be obtained from approved/ authorized sources.

- (a) **Stone Aggregate:** It shall consist of naturally occurring (uncrushed, crushed or broken) stones. It shall be hard, strong, dense, durable and clean. It shall be free from veins, adherent coating, and injurious amounts of disintegrated pieces, alkali, vegetable matter and other deleterious substances. It shall be roughly cubical in shape. Flaky and elongated pieces shall be avoided. It shall conform to IS 383 unless otherwise specified.

**Deleterious Material:** Course aggregate shall not contain any deleterious material, such as pyrites, coal, lignite, mica, shale or similar laminated material, clay, alkali, soft fragments, sea shells and organic impurities in such quantity as to affect the strength or durability of the concrete. Coarse aggregate to be used for reinforced cement concrete shall not contain any material liable to attack the steel reinforcement. Aggregates which are chemically reactive with alkalies of cement shall not be used. The maximum quantity of deleterious material shall not be more than 5% of the weight of coarse aggregate when determined in accordance with IS 2386.

**Size and Grading**

Stone aggregate: It shall be either graded or single sized as specified. Nominal size and grading shall be as under:-

- (a) Nominal sizes of graded stone aggregate or gravel shall be 40, 20, 16, or 12.5 mm as specified. For any one of the nominal sizes, the proportion of other sizes shall be in accordance with Table 4.1.

**TABLE 4.1**  
**Graded Stone Aggregate or Gravel**

<i>IS Sieve Designation</i>	<i>Percentage passing (by weight) for nominal size of</i>			
	<i>40 mm</i>	<i>20mm</i>	<i>16mm</i>	<i>12.5mm</i>
80mm	100	-	-	-
63mm	-	-	-	-
40 mm	95 to 100	100	-	-
20 mm	30 to 70	95 to 100	100	100
16 mm	-	-	90 to 100	-
12.5 mm	-	-	-	90 to 100
10 mm	10 to 35	25 to 55	30 to 70	40 to 85
4.75 mm	0 to 5	0 to 10	0 to 10	0 to 10

- (b) Nominal sizes of single sized stone aggregate or gravel shall be 63, 40, 20, 16, 12.5 or 10 mm as specified. For any one of the nominal size, the proportion of other sizes as determined by the method prescribed.

**TABLE 4.2**  
**Single Sized (Ungraded) Stone Aggregate or Gravel**

<i>IS Sieve Designation</i>	<i>Percentage passing (by weight) for nominal size of</i>					
	<i>63 mm</i>	<i>40 mm</i>	<i>20mm</i>	<i>16mm</i>	<i>12.5mm</i>	<i>10mm</i>
80mm	100	-	-	-	-	-
63mm	85-100	100	-	-	-	-
40 mm	0-30	85-100	100	-	-	-
20 mm	0-5	0-20	85-100	100	-	-
16 mm	-	-	-	85-100	100	-
12.5 mm	-	-	-	-	85-100	100
10 mm	0-5	0-5	0-20	0-30	0-45	85-100
4.75 mm	-	-	0-5	0-5	0-10	0-20
2.36 mm	-	-	-	-	-	0-5

### 4.3 Fly Ash

Fly ash is finely divided residue resulting from the combustion of pulverized coal in boilers. Fly ash is the pulverized fuel ash extracted from the flue gases by any suitable process such as cyclone separation or electrostatic precipitation. The ash collected from the bottom of boilers is termed as bottom ash. Fly ash is finer than bottom ash. Siliceous fly ash (ASTM Class F) containing calcium oxide less than 10% by mass is normally produced from burning anthracite or bituminous coal and possesses pozzolanic properties. Calcareous fly ash (ASTM Class C) is produced by burning lignite or sub-bituminous coal and contains calcium oxide more than 10% by mass; the content could be as high as 25%. This fly ash has both hydraulic and pozzolanic properties. It shall be clean and free from any contamination of bottom ash, grit or small pieces of pebbles. It is obligatory on the part of supplier/ manufacturer that the fly ash conforms to the requirements if mutually agreed upon and shall furnish a certificate to this effect to the purchaser or his representative.

**Characteristics:** The physical requirements of fly-ash shall be as specified in Appendix 'G'. The chemical properties of fly ash shall be as per IS 3812 (part 1 and 2) depending on the usage.

### 4.4 Cement Concrete

#### 4.5 Grades of Cement Concrete

The concrete shall be in grade designated as under:

**TABLE 4.3**  
(As per BIS 456-2000)

### Grades of Concrete

Group	Grade Designation	Specified characteristic compressive strength of 150 mm Cube at 28 Days In N/mm <sup>2</sup>
1	2	3
Ordinary Concrete	M-10	10
	M-15	15
	M-20	20
Standard Concrete	M-25	25
	M-30	30
	M-35	35
	M-40	40
	M-45	45
	M-50	50
	M-55	55
High Strength Concrete	M-60	60
	M-65	65
	M-70	70
	M-75	75
	M-80	80

#### 4.6 Mixing

Concrete shall be mixed in mechanical batch type concrete mixers conforming to IS 1791 having two blades and fitted with power loader (lifting hopper type). Half bag mixers and mixers without lifting hoppers shall not be used for mixing concrete. In exceptional circumstances, such as mechanical breakdown of mixer, work in remote areas or power breakdown and when the quantity of concrete work is very small, hand mixing may be done with the specific prior permission of the Engineer-in-Charge in writing subject to adding 10% extra cement. When hand mixing is permitted, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency. Stone aggregate shall be washed with water to remove, dirt, dust and other foreign materials. For guidance, the mixing time may be 1<sup>1</sup>/<sub>2</sub> to 2 minutes, for hydrophobic cement it may be taken as 2<sup>1</sup>/<sub>2</sub> to 3 minutes.

**Machine Mixing:** The mixer drum shall be flushed clean with water. Measured quantity of coarse aggregate shall be placed first in the hopper. This shall be followed with measured quantity of fine aggregate and then cement. In case fine aggregate is damp, half the required quantity of coarse aggregate shall be placed in the hopper, followed by fine aggregate and cement. Finally the balance quantity of coarse aggregate shall be fed in the hopper, and then the dry materials are slipped into the drum by raising the hopper. The dry material shall be mixed for at least four turns of the drum. While the drum is rotating, water shall be added gradually to achieve the water cement ratio as specified or as required by the Engineer-in-

Charge. After adding water, the mixing shall be continued until concrete of uniform colour, uniformly distributed material and consistency is obtained. Mixing shall be done for at least two minutes after adding water. If there is segregation after unloading from the mixer, the concrete should be remixed.

The drum shall be emptied before recharging. When the mixer is closed down for the day or at any time exceeding 20 minutes, the drum shall be flushed cleaned with water.

**Transportation and Handling:** Concrete shall be transported from the mixer to the place of laying as rapidly as possible by methods which will prevent the segregation or loss of any of the ingredients and maintaining the required workability. During hot or cold weather, concrete shall be transported in deep containers, other suitable methods to reduce the loss of water by evaporation in hot weather and heat loss in cold weather may also be adopted.

#### 4.7 Placing

The concrete shall be deposited as nearly as practicable in its final position to avoid rehandling. It shall be laid gently (not thrown) and shall be thoroughly vibrated and compacted before setting commences and should not be subsequently disturbed. Method of placing shall be such as to preclude segregation. Care shall be taken to avoid displacement of reinforcement or movement of form work and damage due to rains. As a general guidance, the maximum free fall of concrete may be taken as 1.5 metre.

#### 4.8 Compaction

Concrete shall be thoroughly compacted and fully worked around embedded fixtures and into corners of the form work. Compaction shall be done by mechanical vibrator of appropriate type till a dense concrete is obtained. The mechanical vibrators shall conform to IS 2505, IS 2506, IS 2514 and IS 4656. To prevent segregation, over vibration shall be avoided.

Compaction shall be completed before the initial setting starts. For the items where mechanical vibrators are not to be used, the contractor shall take permission of the Engineer-in-Charge in writing before the start of the work. After compaction the top surface shall be finished even and smooth with wooden trowel before the concrete begins to set.

#### 4.9 Construction Joints

Concreting shall be carried out continuously upto construction joints. The position and arrangement of construction joints shall be as shown in the structural drawings or as directed by the Engineer-in-Charge. Number of such joints shall be kept minimum. Joints shall be kept as straight as possible. Construction joints should comply with IS 11817.

When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean and thoroughly wetted. For vertical joints, neat cement slurry, of workable consistency by using 2 kg of cement per sqm shall be applied on the surface before it is dry. For horizontal joints, the surface shall be covered with a layer of cement mortar 1:1 about 10-15 mm thick composed of cement and sand in the same ratio as the cement and sand in concrete mix. This layer of cement slurry or mortar shall be freshly mixed and applied immediately before placing of the concrete.

Where the concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of particles of coarse aggregate. The surface shall be thoroughly wetted and all free water removed. The surface shall then be coated with neat cement slurry @ 2 kgs of cement per sqm. On this surface, a layer of concrete not exceeding 150 mm in thickness shall first be placed and shall be well rammed against old work particular attention being paid to corners and close spots; work, thereafter, shall proceed in the normal way.

#### 4.10 Concreting under Special Conditions

**Work in Extreme Weather Conditions:** During hot and cold weather, the concreting shall be done as per the procedure set out in IS 7861 (Part-I)-1975 and IS 7861 (Part II)-1981 respectively. Concreting shall not be done when the temperature falls below 4.5°C. In cold weather, the concrete placed shall be protected against frost. During hot weather, it shall be ensured that the temperature of wet concrete does not exceed 38°C.

**Under Water Concreting:** Concrete shall not be deposited under water if it is practicable to dewater the area and place concrete in the regular manner. When it is necessary to deposit concrete under water, the methods, equipment, materials and proportions of the mix to be used shall be submitted to and approved by the Engineer-in-Charge before the work is started. Under-water concrete should have a slump recommended. The water-cement ratio shall not exceed 0.6 and may need to be smaller, depending on the grade of concrete or the type of chemical attack. For aggregates of 40 mm maximum particle size, the cement content shall be at least 350 kg/m<sup>3</sup> of concrete.

#### 4.11 Curing

Curing is the process of preventing loss of moisture from the concrete. The following methods shall be employed for effecting curing.

**Moist Curing:** Exposed surfaces of concrete shall be kept continuously in a damp or wet condition by ponding or by covering with a layer of sacking, canvas, Hessian or similar materials and kept constantly wet for at least 7 days from the date of placing concrete in case of ordinary Portland cement and at least 10 days where mineral admixtures or blended cements are used. The period of curing shall not be less than 10 days for concrete exposed to dry and hot weather conditions. In the case of concrete where mineral admixtures or blended cements are used, it is recommended that above minimum periods may be extended to 14 days.

**Membrane Curing:** Approved curing compounds may be used in lieu of moist curing with the permission of the Engineer-in-Charge. Such compound shall be applied to all exposed surfaces of the concrete as soon as possible after the concrete has set. Impermeable membrane such as polythene sheet covering the concrete surface may also be used to provide effective barrier against the evaporation.

Freshly laid concrete shall be protected from rain by suitable covering.

Over the foundation concrete, the masonry work may be started after 48 hours of its compaction but the curing of exposed surfaces of cement concrete shall be continued along with the masonry work for at least 7 days. And where cement concrete is used as base concrete for flooring, the flooring may be commenced before the curing period of base concrete is over but the curing of base concrete shall be continued along with top layer of flooring for a minimum period of 7 days.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.1		C.C. upto plinth level	Providing and laying in position cement concrete of specified grade excluding the cost of centering and shuttering - All work upto plinth level :		
	4.1.1	With 20mm metal	With 20mm nominal size graded stone aggregate.		
	4.1.1.1	M-25	M-25 – Grade concrete	cum	6338.00
	4.1.1.2	M-20	M-20 – Grade concrete	cum	4933.00
	4.1.1.3	M-15	M-15 – Grade concrete	cum	4471.00
	4.1.1.4	M-10	M-10Nominal (Mix-1 Cement : 3 sand : 6 graded stone aggregate )	cum	3890.00
	4.1.2	With 40 mm metal	With 40mm nominal size graded stone aggregate.		
	4.1.2.1	M-15	M-15 - Grade concrete	cum	4403.00
	4.1.2.2	M-10	M-10 Nominal (Mix -1 Cement : 3 sand : 6 graded stone aggregate)	cum	3808.00
	4.1.2.3	M-7.5	M-7.5 Nominal Mix -1 Cement : 4 sand : 8 graded stone aggregate	cum	3474.00
	4.1.3	With fly ash	With fly ash.		
	4.1.3.1	1:2:3½:9	1:2:3½:9 (1 ordinary Portland cement : 2 Fly ash : 3½ sand: 9 graded stone aggregate 40 mm nominal size)	Cum	3459.00
	4.1.3.2	1:2½:4:11	1:2½:4:11 (1 ordinary Portland cement : 2½ fly ash : 4 sand : 11 graded stone aggregate 40 mm nominal size)	Cum	3150.00
			<b>Note:</b> No fly ash is to be added to Portland Pozzolona cement in any case which itself contains fly ash.		
4.2		C.C. upto floor two level	Providing and laying cement concrete in retaining walls, return walls, walls (any thickness) including attached pilasters, columns, pillars, posts, struts, buttresses, string or lacing courses, parapets, coping, bed blocks, anchor blocks, plain window sills, fillets etc. upto floor two level, excluding the cost of centering, shuttering and finishing :		
	4.2.1	With 20mm metal	With 20mm nominal size graded stone aggregate		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	4.2.1.1	M-25	M-25 – Grade concrete	Cum	6582.00
	4.2.1.2	M-20	M 20 – Grade concrete	Cum	5177.00
	4.2.1.3	M-15	M 15 – Grade concrete	Cum	4714.00
	4.2.1.4	M-10	M-10 Nominal Mix -1 Cement : 3 sand : 6 graded stone aggregate	Cum	4134.00
	4.2.2	With 40mm metal	With 40mm nominal size graded stone aggregate		
	4.2.2.1	M-15	M-15 - Grade concrete	cum	4647.00
	4.2.2.2	M-10	M-10 Nominal Mix -1 Cement : 3 sand : 6 graded stone aggregate	cum	4052.00
4.3		Centering and shuttering	Centering and shuttering including strutting, propping etc. and removal of form work for :		
	4.3.1	Upto plinth	Upto plinth: Foundations, footings, bases for columns, plinth beams, curtain walls, columns below plinth.	Sqm	169.00
	4.3.2	Above plinth	above plinth: Retaining walls, return walls, walls (any thickness) including attached pilasters, buttresses, and string courses fillets etc.	sqm	267.00
	4.3.3	Above plinth in columns	Above plinth: Columns, pillars, posts and struts.	Sqm	356.00
4.4		C.C. kerbs, steps	Providing and laying cement concrete in kerbs, steps and the like at or near ground level excluding the cost of centering, shuttering and finishing.		
	4.4.1	M-15	M-15 (With 20mm nominal size graded stone aggregate)	cum	4471.00
	4.4.2	M-10	M-10 (With 20mm nominal size graded stone aggregate) Nominal Mix -1 Cement : 3 sand : 6 graded stone aggregate	cum	3890.00
4.5		Precast C.C. in kerbs & edgings M-15	Providing and fixing at or near ground level precast cement concrete in kerbs, edgings etc. as per approved pattern and setting in position with cement mortar 1:3 (1 Cement : 3 sand) including the cost of required centering, shuttering and finishing smooth with 6mm thick cement plaster 1:3 (1 cement : 3 sand) on exposed surfaces complete. (With 20mm nominal size graded stone aggregate)	cum	4702.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.6		Precast C.C. upto floor two level i/c shuttering	Providing and fixing upto floor two level precast cement concrete string or lacing courses, copings, bed plates, anchor blocks, plain window sills, shelves, louvers, steps, stair cases, etc. Including hoisting and setting in position with cement mortar 1:3 (1 Cement : 3 sand), including cost of required centering, shuttering and finishing smooth with 6mm thick cement plaster 1:3 (1Cement : 3 sand) on exposed surfaces complete.		
	4.6.1	M-25	M-25 (With 20mm nominal size graded stone aggregate)	cum	5095.00
	4.6.2	M-20	M-20 (With 20mm nominal size graded stone aggregate)	cum	5558.00
	4.6.3	M-15	M-15 (With 20mm nominal size graded stone aggregate)	cum	5095.00
	4.6.4	M-10	M-10 (With 20mm nominal size graded stone aggregate) Nominal Mix -1 Cement: 3 sand: 6 graded stone aggregate.	cum	4515.00
4.7		Precast C.C. solid block	Providing and fixing upto floor two level precast cement concrete solid block including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 sand), cost of required centering, shuttering and finishing smooth with 6mm thick cement plaster 1:3 (1 cement : 3 sand) on exposed surfaces complete :		
	4.7.1	M-15	M-15 (With 20mm nominal size graded stone aggregate)	cum	7057.00
	4.7.2	M-10	M-10 (M 10) (With 20mm nominal size graded stone aggregate) Nominal Mix -1 Cement : 3 sand : 6 graded stone aggregate	cum	6477.00
4.8		Precast C.C. hollow block	Providing and Fixing upto floor two level precast concrete hollow block including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 sand), cost of required centering, shuttering and finishing smooth with 6mm thick cement plaster 1:3 (1 cement : 3 sand) on exposed surfaces complete.		
	4.8.1	M-15	M-15 (With 20mm nominal size graded stone aggregate)	cum	5339.00
	4.8.2	M-10	M-10 (With 20mm nominal size graded stone aggregate) Nominal Mix -1 Cement: 3 sand: 6 graded stone aggregate.	cum	5072.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.9		Extra for C.C. above floor II	Add extra for item no. 4.6, 4.7 and 4.8 above floor two level for every additional floor or part there of	cum	1%
4.10		DPC 40mm thick	Providing and laying damp-proof course 40mm thick with cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 12.5mm nominal size).	Sqm	200.00
4.11		DPC 50mm thick	Providing and laying damp-proof course 50mm thick with cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size).	sqm	247.00
4.12		Extra for water proofing in c.c	Extra for providing and mixing water proofing material as per IS standard in cement concrete work quantity as prescribed by the manufacturer.	Per bag of 50 kg of cement	44.00
4.13		Bitumen coat for DPC	Applying a coat of residual petroleum bitumen of penetration 80/100 of approved quality using 1.7kg per square metre on damp proof course after cleaning the surface with brushes and finally with a piece of cloth lightly soaked in kerosene oil.	Sqm	124.00
4.14		Extra for C.C. work in superstructure	Extra for concrete work in superstructure above floor two level for each floors or part thereof	cum	1%
4.15		Extra for C.C. in or under water	Extra for laying concrete in or under water and/or liquid mud including cost of pumping or bailing out water and removing slush etc. complete. <b>Note for item No. 4.15:-</b> The quantity will be calculated by multiplying the depth measured from the sub-soil water level upto centre of gravity of concrete under sub-soil water level with quantity of concrete in cum executed under sub-soil water. The depth of centre of gravity shall be reckoned correct to 0.1m. 0.05m or more shall be taken as 0.1m and less than 0.05m ignored.	cum per meter depth	297.00
4.16		Extra for c.c. under foul positions	Extra for laying concrete in or under foul positions.	cum	109.00
4.17		Plinth protection by C.C.	Making plinth protection 50mm thick of cement concrete grade M10 over 75mm bed of dry metal ballast 40mm nominal size well rammed and consolidated and filled with sand including finishing the top smooth (with 20mm nominal size graded stone aggregate.)	sqm	351.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.18		Extra for fibre in C.C.	Extra for addition of synthetic polyestertriangular fiber of length 12 mm, effective diameter 10-40 microns and specific gravity of 1.34 to 1.40 in cement concrete/RCC/Flooring/ Water retaining structures by using 125 gms of synthetic polyester triangular fibre for 50 kgs cement used as per directions of Engineer-in-Charge.	per bag of 50 kg of cement	45.00
4.19		Precast bollards	Precasting and placing in position 125 mm dia Bollards 600 mm high of required shape including providing M.S. Pipe Sleeve 50 mm dia 300 mm long in the Bollard and M.S. Pipes 40 mm dia and 450 mm long with 150x150x6mm M.S. plate welded at bottom and embedded 150mm in cement concrete 1:3:6 (1 Cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) including necessary excavation of size 250x250x450mm deep for the same in bitumen/concrete pavement at specified spacing.	each	485.00
4.20		Precast string/lacing courses, copings etc M-20	Providing and fixing up to floor two level precast cement concrete string or lacing courses, copings, bed plates, anchor blocks, plain window sills, shelves, louvers, steps, stair cases, etc., including hoisting and setting in position with cement mortar 1:3 (1 Cement : 3 coarse sand), cost of required Centering complete. 1:1.5:3 (1 cement : 1.5 coarse sand(zone-III) : 3 graded stone aggregate 20mm nominal size)	cum	6583.00
4.21		Precast solid block M-20	Providing and fixing up to floor two level precast cement concrete solid block, including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete . 1:1.5:3 (1 cement : 1.5 coarse sand(zone-III) : 3 graded stone aggregate 20mm nominal size)	cum	9843.00
4.22		Precast hollow block M-20	Providing and fixing up to floor two level precast cement concrete hollow block, including hoisting and setting in position with cement mortar 1:3 (1 cement : 3 coarse sand), cost of required centering, shuttering complete. 1:1.5:3 (1 cement : 1.5 coarse sand(zone-III) : 3 graded stone aggregate 20mm nominal size)	cum	7469.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.23		RMC with fly ash	Providing and laying in position ready mixed plain cement concrete, using fly ash and cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centering, shuttering and finishing, including cost of curing, 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. Note : (1) Fly ash conforming to grade I of IS 3812 (Part-1) only be used as part replacement of OPC as per IS : 456. Uniform blending with cement is to be ensured in accordance with clauses 5.2 and 5.2.1 of IS: 456 -2000 in the items of BMC and RMC.		
	4.23.1	Upto plinth	All works up to plinth level:		
	4.23.1.1	M-15	M-15 grade plain cement concrete (cement content considered @ 240 kg/cum)	cum	5720.00
	4.23.1.2	M-10	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)	cum	5592.00
	4.23.2	Above plinth	All works above plinth and upto floor two level		
	4.23.2.1	M-15	M-15 grade plain cement concrete (cement content considered @ 240 kg/cum)	cum	6086.00
	4.23.2.2	M-10	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)	cum	5958.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
4.24		RMC	Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, excluding the cost of centering, shuttering and finishing, including cost of curing, 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.		
	4.24.1	Upto plinth	All works up to plinth level:		
	4.24.1.1	M-15	M-15 grade plain cement concrete (cement content considered @ 240 kg/cum)	cum	5869.00
	4.24.1.2	M-10	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)	cum	5740.00
	4.24.2	Above plinth	All works above plinth and upto floor two level		
	4.24.2.1	M-15	M-15 grade plain cement concrete (cement content considered @ 240 kg/cum)	cum	6235.00
	4.24.2.2	M-10	M-10 grade plain cement concrete (cement content considered @ 220 kg/cum)	cum	6106.00
4.25		Plum Cement concrete	Plum Cement concrete 1:2:4 with 75% graded metal of maximum size 40 mm and 25% plum of 150mm size.	cum	3509.00
4.26		RCC for sunken floor	Providing and laying cement concrete in sunken floors of WC, Toilets, Wash Areas etc with 1:5:10 (1 cement:5 coarse sand (zone-III) :10 graded stone aggregate 40 mm nominal size) excluding the cost of centering and shuttering.	cum	3140.00
4.27		Dewatering by Trimix process	Labour charge for Trimix vacuum dewatering process for concrete and cost of fixing, removing of "C" Channel formwork including using vacuum dewatering machine machine finished as directed including light brooming and curing including making construction joint by cutting of joint of by using of concrete cutter machine.		
	4.27.1	100 mm	For 100 mm thickness.	sqm	115.00
	4.27.2	150 mm	For 150 mm thickness.	sqm	121.00

**CHAPTER – 5.0**  
**REINFORCED CEMENT CONCRETE**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 226	Structural Steel
2	IS 432 (Part I)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement part-I mild steel and medium tensile steel bars.
3	IS 432 (Part II)	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement – Part-II hard drawn steel wire.
4	IS 456	Code of Practices for plain and Reinforced concrete.
5	IS 516	Method of test for strength of concrete.
6	IS 716	Specification for pentachlorophenol
7	IS 1199	Method of sampling and analysis of concrete.
8	IS 1200 (Part II)	Method of measurement of building and civil engineering work – concrete work
9	IS 1200 (Part V)	Method of measurement of building and civil engineering work – concrete work (Part 5- Form work)
10	IS 1566	Specification for hard drawn steel wire fabric for concrete requirement
11	IS 1599	Method for bend test
12	IS 1343	Code of Practice for Prestressed Concrete
13	IS 1608	Method for tensile testing of steel products
14	IS 1786	Specification for high strength deformed steel and wires for concrete reinforcement.
15	IS 1791	Specification for batch type concrete mixes
16	IS 2502	Code of practice for bending and fixing of bars for concrete Reinforcement.
17	IS 2751	Recommended practice for welding of mild steel plain and deformed bars for reinforced construction
18	IS 4925	Batch plants specification for concrete batching and mixing plant
19	IS 4926	Ready – Mixed Concrete
20	IS 6523	Specification for precast reinforced concrete door, window frames
21	IS 10262	Recommended guidelines for concrete mix design
22	IS 13311 (Part I)	Indian standard for non-destructive testing of concrete. Method of test for ultrasonic pulse velocity
23	IS 13311 (Part II)	Indian standard for non-destructive testing of concrete. Method of testing by rebound hammer.

## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
1	2	3	4	5	6	7
Reinforced cement concrete (Nominal Mix)	5.4.1	(a) Slump Test	Field/ Lab	Appendix 'F'	(i) 5 cum in case of column (ii) 20 cum for slabs, beams and connected columns (iii) 20 cum for other R.C.C. work for all other small items and where R.C.C. done in a day is less than 5 cum test may be carried out as required by Engineer in- Charge	(i) Every 5 cum of part thereof (ii) Every 20 cum or part thereof  (iii) -Do-
	5.4.9.1	(b) Cube Test	Lab	Appendix 'H'	(i) 5 cum in case of column (ii) 20 cum for slabs, beams and Connected columns (iii) 20 cum for other R.C.C. work for all other small items and where R.C.C. done in a day is less than 5 cum test may be carried out As required by Engineer in- Charge.	(i) Every 5 cum or part thereof (ii) Every 20 cum or part thereof  (iii) -Do



Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
1	2	3	4	5	6	7
Reinforced Cement Concrete (Design Mix)	Coarse Aggregates				50 cum or part thereof and also on each change of source	
	Fine Aggregates				50 cum or part thereof and also on each change of source	
	Cement				50 MT or on each change of source	
	Fresh Concrete	(a) Slump Test	Field	Appendix 'F'	10 cum	50 cum for R.C.C. work including in all other small location. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
	Fresh Concrete	(b) Cube Test	Lab	Appendix 'H'	10 cum or part Thereof	50 cum or 10 Batches of 5-7 cum each for R.C.C. work in all location taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
Reinforced Cement Concrete (Ready Mix)	Coarse Aggregates				50 cum or part thereof and also on each change of source	
	Fine Aggregates				50 cum or part thereof and also on each change of source	
	Cement				50 MT or on each change of source	

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carryin g out the test	Frequency of testing
1	2	3	4	5	6	7
	Fresh Concrete	(a) Slump Test	Field/ Lab	Appendix 'F'	10 cum	50 cum for R.C.C. work including in all other small location. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
	Fresh Concrete	(b) Cube Test	Lab	Appendix 'H'	10 cum or part thereof	50 cum or 10 batches of 5-7 cum each for R.C.C. work in all location – taken together. R.C.C. done in a day is less than 50 cum test may be carried out as required by Engineer-in-Charge
Steel for Reinforced cement concrete	5.1.3	(A) Physical Test and chemical tests				<p>(a) For consignment below 100 tonnes</p> <p>(i) under 10 mm dia, one sample for each 25 tonnes or part thereof</p> <p>(ii) 10 mm to 16 mm dia one sample for each 35 tonnes or part thereof</p> <p>(iii) over 16 mm dia one sample for each 45 tonnes or part thereof</p> <p>(b) For consignment over 100 tonnes</p> <p>(i) Under 10 mm dia, one sample for each 40 tonnes or part thereof</p> <p>(ii) 10 mm to 16 mm, one sample for each 45 tonnes or part thereof</p> <p>(iii) over 16 mm dia, one sample for each 50 tonnes or part thereof</p>

**PREAMBLE**  
**REINFORCED CEMENT CONCRETE**  
**(CHAPTER: 5.0)**

### 5.1 General

IS 456- 2000 Code of Practice for Plain and Reinforced Concrete (as amended up to date) shall be followed in regard to Concrete Mix Proportion and its production as under:

- (a) The concrete mix design shall be done as “Design Mix Concrete” as prescribed in clause-9 of IS 456 mentioned above.
- (b) Concrete shall be manufactured in accordance with clause 10 of above mentioned IS 456 covering quality assurance measures both technical and organizational, which shall also necessarily require a qualified Concrete Technologist to be available during manufacture of concrete for certification of quality of concrete.

Minimum M -20 grade of concrete shall be used in all structural elements made with RCC both in load bearing and framed structure.

### 5.2 Materials

Water, cement, fine and coarse aggregate shall be as specified under respective clauses of chapter 03 mortars and chapter 04 concrete work as applicable.

### 5.3 Steel for Reinforcement

The steel used for reinforcement shall be any of the following types:

- (a) Mild steel and medium tensile bars conforming to IS 432 (Part I)
- (b) High strength deformed steel bars conforming to IS 1786
- (c) Hard drawn steel wire fabric conforming to IS 1566
- (d) Structural steel conforming to Grade aof IS 2062
- (e) Thermo-mechanically treated (TMT) Bars/Thermax poweredTMX Bars.

Elongation percent on gauge length is  $5.65 \sqrt{A}$  where A is the cross sectional areas of the test piece.

Mild steel is not recommended for the use in structures located in earthquake zone subjected to severe damage and for structures subjected to dynamic loading (other than wind loading) such as railway and highway bridges.

Welding of reinforcement bars covered in this SOR shall be done in accordance with the requirements of IS 2751.

**Nominal mass/weight :** The tolerance on mass/ weight for round and square bars shall be the percentage given in Table 5.1 of the mass/ weight calculated on the basis that the masses of the bar/ wire of nominal diameter and of density  $7.85 \text{ kg/ cm}^3$  or  $0.00785 \text{ kg/mm}^3$ . Or  $7850 \text{ kg per m}^3$

**TABLE 5.1****Tolerance on Nominal Mass/ Weight**

Nominal size in mm	Tolerance on the Nominal Mass per cent		
	Batch	Individual sample +	Individual sample for coil (x)
(a) Upto and including 10	±7	-8	±8
(b) Over 10, upto and including 16	±5	-6	±6
(c) Over 16	±3	-4	±4

A. High strength deformed bars and wires shall conform to IS 1786. The physical properties for all sizes of steel bars are mentioned below.

**TABLE 5.2**  
**Physical Properties of Bars and Wires as per IS 1786**

Sl. No	Property	Fe 415	Fe 415D	Fe 500D	Fe 550D
1	0.2 Per cent Proof stress/ yield stress, Min, N/mm <sup>2</sup>	415.0	415.0	500.0	550.0
2	Elongation, per cent, Min. on gauge length $5.65 \sqrt{A}$ , where A is the cross-sectional area of the test piece.	14.5	18.0	16.0	14.5
3	Tensile strength, Min	10 Per cent more than the actual 0.2 per cent proof stress/ yield stress but not less than 485.0 N/mm <sup>2</sup>	12 Per cent more than the actual 0.2 per cent proof stress/ yield stress but not less than 500.0 N/mm <sup>2</sup>	10 Per cent more than the actual 0.2 per cent proof stress/ yield stress but not less than 565.0 N/mm <sup>2</sup>	8 Per cent more than the actual 0.2 per cent proof stress/ yield stress but not less than 600.0 N/mm <sup>2</sup>
4	Total elongation at maximum force, percent, Min on gauge length $5.65 \sqrt{A}$ , where A is the cross-sectional Area of the test piece.	-	5	5	5

## B. ThermoMechanically Treated Reinforcement Bars:

- (a) There is no BIS code for TMT bars. The available code BIS 1786 pertains to HSD Bars. Therefore there should be no stipulation that TMT bars should conform to relevant BIS code.
- (b) The TMT/TMX bars are being produced under valid license from either of the firms namely Temporal, ThermexEvcon Turbo and Turbo Quench. These firms have acquired patents and are giving licenses to various producers to produce TMT Bars.
- (c) The TMT bars shall conform to IS 1786 pertaining to Fe 415 D or Fe 500 D or Fe 550 grade of steel as specified.
- (d) In design and construction of reinforced concrete building in seismic zone III and above, steel reinforcement of Grade Fe 415 D shall be used. However, high strength deformed steel bars, produced by thermomechanical treatment process of grade Fe 415, Fe 500 and Fe 550 having elongation more than 14.5. % and conform to other requirements of Fe 415 D, Fe 500 D and Fe 550 D respectively of IS 1786 may also be used for reinforcement

All reinforcement shall be free from loose mill scales, loose rust and coats of paints, oil, mud or other coatings which may destroy or reduce bond.

The Contractor shall have to produce Test Certificate in the proforma prescribed approved by B.I.S. from the manufacturer for every batch of steel brought to site of work.

**Table 5.3**

### Mechanical Properties of High Yield Strength Deformed (HYSD) Bars and Wires and compression with recommended value in relevant IS Code

SI No.	Property	Fe 415	Fe 415S	Fe 500	Fe 500D	Fe 500S	Fe 550	Fe 550 D	Fe 600
(1)	(2)	(3)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
i)	0.2 percent proof stress/yield stress, Min, N/mm <sup>2</sup>								
ii)	0.2 percent proof stress/yield stress,Max, N/mm <sup>2</sup>								
iii)	TS/YS ratio <sup>1)</sup> , N/mm <sup>2</sup>								
iv)	Elongation, percent, min. on gauge length $5.65\sqrt{A}$ , where A is the cross-sectional area of the test piece (see 3.9) <sup>2)</sup>								

**Table 5.4**  
**Chemical Composition of High Yield Strength Deformed (HYSD) Bars and Wires**

Constituent	Percent, Maximum						
	Fe 415	Fe 415D	Fe 500	Fe 500D	Fe 550	Fe 550D	Fe 600
Carbon							
Sulphur							
Phosphorus							
Sulphur and phosphorus							

**Table 5.5**  
**Chemical Composition of High Yield Strength Deformed (HYSD) Bars and Wires**

Particulars Chemical Requirements	Test Results	Requirements as per relevant IS Code for cement
1. $\frac{CaO - 0.7SO_3}{2.8 SiO_2 + 1.2Al_2O_3 + 0.65 Fe_2O_3}$		
2. $Al_2O_3 / Fe_2O_3$		
3. Insoluble Residue (% by mass)		
4. Magnesia (% by mass)		
5. Sulphuric Anhydride (% by mass)		
6. Total Loss on Ignition (% by mass)		
7. Total Chlorides (% by mass)		
<b>PHYSICAL REQUIREMENTS</b>		
1. Fineness ( $m^2/kg$ ) 2. Standard Consistency (%) 3. Setting Time (minutes) <ul style="list-style-type: none"> <li>a. Initial</li> <li>b. Final</li> </ul> 4. Soundness <ul style="list-style-type: none"> <li>a. Le-Chat Expansion (mm)</li> <li>b. Autoclave Expansion (%)</li> </ul> 5. Compressive Strength (MPa) <ul style="list-style-type: none"> <li>a. 72+/- 1hr. (3 days)</li> <li>b. 168+/- 2hr. (7 days)</li> <li>c. 672+/- 4hr. (28 days)</li> </ul> 6. Performance Improver (%) <ul style="list-style-type: none"> <li>a. Limestone</li> <li>b. Fly Ash</li> <li>c. Granulated Slag</li> </ul>		
The above cement complies with the requirements of IS: <b>12269-1987</b> for Grade Ordinary Portland cement.		

Before commencement of use of steel, from any batch brought to site of work by the contractor, the Engineer-in Charge shall arrange to get samples tested for nominal mass, tensile strength, bend test and rebend test from any Laboratory of his choice at the cost of Contractor. The selection of test specimens and frequency shall be as per relevant I.S. specification and of steel used.

#### **5.4 Form Work**

Form work shall include all temporary or permanent forms or moulds required for forming the concrete which is cast-in-situ, together with all temporary construction required for their support.

#### **5.5 Material for Form Work**

**Propping and Centering:** All propping and centering should be either of steel tubes with extension pieces or built up sections of rolled steel.

**Centering/Staging :** Staging should be as designed with required extension pieces as approved by Engineer-in-Charge to ensure proper slopes, as per design for slabs/ beams etc. and as per levels as shown in drawing. All the staging to be either of Tubular steel structure with adequate bracings as approved or made of built up structural sections made form rolled structural steel sections.

**Shuttering:** Shuttering used shall be of sufficient stiffness to avoid excessive deflection and Joints shall be tightly butted to avoid leakage of slurry. If required, rubberized lining of material as approved by the Engineer-in-Charge shall be provided in the joints. Steel shuttering used or concreting should be sufficiently stiffened. The steel shuttering should also be properly repaired before use and properly cleaned to avoid stains, honey combing, seepage of slurry through joints etc.

- (a) Runner Joists: RSJ, MS Channel or any other suitable section of the required size shall be used as runners.
- (b) Assembly of beam head over props. Beam head is an adopter that fits snugly on the head plates of props to provide wider support under beam bottoms.
- (c) Only steel shuttering shall be used, except for unavoidable portions and very small works for which 12 mm thick water proofing ply of approved quality may be used.

Form work shall be properly designed for self-weight, weight of reinforcement, weight of fresh concrete, and in addition, the various live loads likely to be imposed during the construction process (such as workmen, materials and equipment). In case the height of centering exceeds 3.50 metres, the prop may be provided in multi-stages. Form work shall be checked by an officer of rank not below Assistant Engineer before permitting lying of concrete.

#### **5.6 Design and Tolerance in Construction for Form work**

Form work shall be designed and constructed to the shapes, lines and dimensions shown on the drawings with the tolerance given below.

**Table 5.6**  
**Tolerance in Construction of Form Work**

(a)	Deviation from specified dimension of cross section of columns and beams	+12 mm - 6mm
(b)	Deviation from dimensions of footings	
	(i) Dimension in Plan	+ 50 mm -12 mm
	(ii) Eccentricity in plan	0.02 times the width of the footing in the direction of deviation but not more than 50 mm.
	(iii) Thickness	+ 0.05 times the specified thickness.

**Note-** These tolerances apply to concrete dimensions only, and not to positioning of vertical steel or dowels.

### 5.7 General Requirement for Form work

It shall be strong enough to withstand the dead and live for form workloads and forces caused by ramming and vibrations of concrete and other incidental loads, imposed upon it during and after casting of concrete. It shall be made sufficiently rigid by using adequate number of ties and braces, screw jacks or hard board wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete.

Form shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections, care shall be taken to see that no piece is keyed into the concrete.

- (a) In case of structures with two or more floors, the weight of concrete, centering and shuttering of any upper floor being cast shall be suitably supported on one floor below the top most floor already cast.
- (b) Form work and concreting of upper floor shall not be done until concrete of lower floor has set at least for 14 days.

**Camber:** Suitable camber shall be provided in horizontal members of structure, especially in cantilever spans to counteract the effect of deflection. The form work shall be so assembled as to provide for camber. The camber for beams and slabs shall be 4 mm per metre (1 to 250) or as directed by the Engineer-in-Charge, so as to offset the subsequent deflection, for cantilevers the camber at free end shall be 1/50th of the projected length or as directed by the Engineer-in-Charge.

**Removal of Form work (Stripping Time):** In normal circumstance and where various types of cements are used, forms, may generally be removed after the expiry of the following periods:



**Table 5.7**  
**Removal of Form Work**

Type of Form work	Minimum period Before Striking Form work for OPC 33 grade	Minimum period Before Striking Form work for OPC 43 grade	Minimum period Before Striking Form work for PPC
(a) Vertical form work to columns, walls, beams	16-24 h	16-24 h	24-36 h
(b) Soffit form work to slabs(Props to be refixed immediately after removal of formwork)	3 days	3 days	4 days
(c) Soffit form work to beams (Props to be refixed immediately after removal of formwork)	7 days	7 days	10 days
(d) Props to slabs: (1) Spanning upto 4.5m (2) Spanning over 4.5m	7 days 14 days	7 days 14 days	10 days 20 days
(e) Props to beams and arches: (1) Spanning upto 6m (2) Spanning over 6m	14 days 21 days	14 days 21 days	20 days 30 days

### 5.8 Placing of Concrete

Concreting shall be commenced only after Engineer-in-Charge has inspected the centering, shuttering and reinforcement as placed and passed the same. Shuttering shall be clean and free from all shavings, saw dust, pieces of wood, or other foreign material and surfaces shall be treated with oil or lubricant as prescribed.

In case of concreting of slab and beams, wooden plank or cat walks of chequerred MS plated or bamboo chalties or any other suitable material supported directly on the centering by means of wooden blocks or lugs shall be provided to convey the concrete to the place of deposition without disturbing the reinforcement in any way. Labour shall not be allowed to walk over the reinforcement.

In case of columns and wall, it is desirable to place concrete without construction joints. The progress of concreting in the vertical direction shall be restricted to one metre per hour.

The concrete shall be deposited in its final position in a manner to preclude segregation of ingredients. In deep trenches and footings concrete shall be placed through chutes or as directed by the Engineer-in-Charge. In case of columns and walls, the shuttering shall be so adjusted that the vertical drop of concrete is not more than 1.5 metres at a time.

During cold weather, concreting shall not be done when the temperature falls below 4.5<sup>0</sup>C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone.

During hot weather precaution shall be taken to see that the temperature of wet concrete does not exceed 38<sup>0</sup>C. No concrete shall be laid within half an hour of the closing time of the day, unless permitted by the Engineer-in-Charge.

It is necessary that the time between mixing and placing of concrete shall not exceed 30 minutes so that the initial setting process is not interfered with.

## 5.9 Compaction

It shall be as specified in chapter IV sub-head of Concrete Work of this S.O.R.

## 5.10 Finishing

In case of roof slabs the top surface shall be finished even and smooth with wooden trowel, before the concrete begins to set. Sprinkling of dry cement while finishing shall not be resorted to.

Immediately on removal of forms, the R.C.C. work shall be examined by the Engineer-in-Charge, before any defects are made good.

- (a) The work that has sagged or contains honey combing to an extent detrimental to structural safety or architectural concept shall be rejected.
- (b) Surface defects of minor nature may be accepted. On acceptance of such a work by the Engineer-in-Charge, the same shall be rectified as follows:  
Surface defects which require repair when forms are removed, usually consist of bulged due to movement of forms, ridges at form joints, honey-combed areas, damage resulting from the stripping of forms and bolt holes, bulges and ridges are removed by careful chipping or tooling and the surface is then rubbed with a grinding stone. Honey-combed and other defective areas must be chipped out, the edges being cut as straight as possible and perpendicularly to the surface, or preferably slightly under cut to provide a key at the edge of the patch.
- (c) The surface which is to receive plaster or where it is to be joined with brick masonry wall, shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing the concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give bond between concrete and plaster. RCC work shall be done carefully so that the thickness of plaster required for finishing the surface is not more than 6 mm.
- (d) The surface of RCC slab on which the cement concrete or mosaic floor is to be laid shall be roughened with brushes while the concrete is green. This shall be done without disturbing the concrete.

## 5.11 Strength of Concrete

The compressive strength on the work tests for different mixed shall be as given in Table 5.6

## 5.12 Ready Mixed Concrete (as per IS 4926) RMC

### Materials

- **Selection and Approval of Materials:** Materials used should satisfy the requirements for the safety, structural performance durability and appearance of the finished structure, taking full account of the environment to which it will be subjected. The selection and use of materials shall be in accordance with IS 456. Materials used shall conform to the relevant Indian Standards applicable. Where materials are used which are not covered by the provisions of the relevant Indian Standard, there should be satisfactory data on their

suitability and assurance of quality control. Records and details of performance of such materials should be maintained. Account should be taken of possible interactions and compatibility between IS 4926 and materials used. Also, prior permission of the purchaser shall be obtained before use of such materials.

**Cement:** Cement used for concrete shall be in accordance with the requirements of IS 456.

**Mineral Admixtures:** Use of mineral admixtures shall be permitted in accordance with the provisions of IS 456.

**Aggregates:** Aggregates used for concrete shall be in accordance with the requirement of IS 456. Unless otherwise agreed testing frequencies for aggregates in plant shall be as given IS 4926.

#### **Chemical Admixtures**

- (i) Use of chemical admixtures shall be permitted in accordance, with the provisions of IS 456 and IS 9103.
- (ii) It shall be the responsibility of the producer to establish compatibility and suitability of any admixture with the other ingredients of the mix and to determine the dosage required to give the desired effect.
- (iii) Admixtures should be stored in a manner that prevents degradation of the product and consumed within the time period indicated by the admixture supplier. Any vessel containing an admixture in the plant or taken to site by the producer shall be clearly marked as to its content.
- (iv) When offering or delivering a mix to a purchaser it should be indicated if such a mix contains an admixture or combination of admixtures or not. The admixtures may be identified generically and should be declared on the delivery ticket.
- (v) The amount of admixture added to mix shall be recorded in the production record. In special circumstances, if necessary, additional dose of admixture may be added at project site to regain the workability of concrete with the mutual agreement between the producer and the purchaser.

**Water:** Water used shall be in accordance with the requirement of IS 456. The use of recycled water is encouraged as long as concrete of satisfactory performance can be produced and steps are taken to monitor the build up of chlorides in any recirculated water and that any subsequent adjustments to the mix design are made to ensure that any overall limit on chloride contents is satisfied. The addition of any recycled water shall be monitored and controlled to meet these requirements. The total amount of water added to the mix shall be recorded in the production record. The water content of concrete shall be regulated by controlling its workability or by measuring and adjusting the moisture contents of its constituent materials. The producer's production staff and truck-mixer, drivers shall be made aware of the appropriate responses to variations in concrete consistency of a particular mix caused by normal variations in aggregate moisture content or grading.

### **5.13 General Requirements for RMC**

**Basis of Supply:** Ready-mixed concrete shall be supplied having the quality and the quantity in accordance with the requirement agreed with the purchaser or his agent. Notwithstanding this, the concrete supplied shall generally comply with requirements of IS 456. All concrete will be supplied and invoiced in terms of cubic metres (full or part) of compacted fresh concrete. All proportioning is to be carried out by mass except water and admixture, which may be measured by volume.

**Transport of Concrete:** Ready-mixed concrete shall be transported from the mixer to the point of placing as rapidly as practicable by methods that will maintain the required workability and will prevent segregation, loss of any constituents or ingress of foreign matter or water. The concrete shall be placed as soon as possible after delivery, as close as practicable to its final position to avoid re-handling or moving the concrete horizontally by vibration. If required by the purchaser the producer can utilize admixtures to slow down the rate of workability loss; however this does not remove the need for the purchaser to place the concrete as rapidly as possible. The purchaser should plan his arrangements so as to enable a full load of concrete to be discharged within 30 minutes of arrival on site. Concrete shall be transported in a truck-mixer unless the purchaser agrees to the use of non-agitating vehicles. When non-agitating vehicles are used, the mixed concrete shall be protected from gain or loss of water.

**Time in Transport:** The general requirement is that concrete shall be discharged from the truck-mixer within 2 h of the time of loading. However, a longer period may be permitted if retarding admixtures are used or in cool humid weather or when chilled concrete is produced. The time of loading shall start from adding the mixing water to the dry mix of cement and aggregate or of adding the cement to the wet aggregate whichever is applicable. Ready-mixed concrete plant shall have test facilities at its premises to carry out routine tests as per the requirement of the standard. Information to be made available by the purchaser to the RMC supplier: following information shall be necessarily made available by the purchaser to RMC supplier:

**TABLE 5.8  
CONCRETE MIX INFORMATION TO BE SUPPLIED BY THE PURCHASER**

RMC: .....  
 Contractor: .....  
 Site: .....

MIX CODE						
Grade (N/mm <sup>2</sup> ) (Characteristic strength)						
Minimum Cement Content (kg./m <sup>3</sup> )						
Mineral Additives (Pulverized fuel ash/Slag/Others) (kg/m <sup>3</sup> )						
Maximum Free water Cement Ratio						
Nominal Maximum Aggregate size						
Cement Type and Grade (if preferred)						
Target workability (slump) (mm)						
Target workability at site						
Maximum Temperature of Concrete at the time of placing						
Class of sulphate Resistance (if applicable )						
Exposure condition (if applicable)						

Class of finish (if applicable)						
Mix Application						
Method of Placing						
Any other requirements (early strength workability retention, permeability testing, chloride content restriction, maximum cement content, etc.)						
Concrete Testing (Frequency)						
Material's Testing (any non-routine requirements)						
Alternatives to be offered: Yes/No						
Method of Curing to be used by contractor						
Quantity (m <sup>3</sup> )						

- **Note:** Additional proforma for further information may be used, such as for specific test rates to be achieved for concrete or raw materials, exact method statements of the contractors proposed site practice.

#### **DELIVERY TICKET INFORMATION for RMC**

- 1) The following information shall be included in the delivery ticket to accompany the load to the purchaser:
  - (a) Name or number of the ready-mixed concrete depot
  - (b) Serial number of the ticket
  - (c) Date
  - (d) Truck number
  - (e) Name of the Purchaser
  - (f) Name and location of site
  - (g) Grade or mix description of the concrete
  - (h) Specified target workability
  - (i) Minimum cement content (if specified)
  - (j) Type of cement and grade (if specified)
  - (k) Maximum free water-cement ratio (if specified)
  - (l) Nominal maximum size of aggregate
  - (m) Generic Type or name of any chemical and mineral admixtures included.
  - (n) Quantity of concrete in m<sup>3</sup>
  - (o) Time of loading
  - (p) Signature of the plant operator
  - (q) A statement warning the purchaser of the precautions needed to be taken when working with cement and wet concrete.

- 2) On site the following information will be added. :
- (a) Time of arrival on site.
  - (b) Time when discharge was completed.
  - (c) Any water/admixture added by the supplier to meet the specified workability.
  - (d) Any extra water /admixture added at the request of the purchaser of the concrete, or his Representative, and his signature.
  - (e) Pouring location.
  - (f) Signature of the purchaser or his representative conforming discharge of the load.

#### 5.14 Sampling and Testing of Ready-Mixed Concrete

**Point and Time of Sampling :** For the assessment of compliance of ready-mixed concrete, the point and time of sampling shall be at discharge from the producer's delivery vehicle or from the mixer to the site or when delivered into the purchaser's vehicle. It is critical that the sampling procedure and equipment used enables as representative a sample as possible to be taken of the quantity of concrete delivered. The sampling may be carried out jointly by the purchaser and the supplier with its frequency mutually agreed upon. However, it will not absolve the supplier of his responsibility from supplying in concrete as per the requirement given in this standard or otherwise agreed to where so permitted in the standard.

#### 5.15 Workability

The workability shall be within the following limits on the specified value as appropriate:  
Slump  $\pm 25$  mm or  $1/3$  of the specified value, whichever is less.

Compacting factor:  $\pm 0.03$ , where the specified value is 0.90 or greater,  
 $\pm 0.04$ , where the specified value is less than 0.90 but more than 0.80,  
 $\pm 0.05$ , where the specified value is 0.80 or less.

Flow table test may be specified for concrete, for very high workability (see IS 9103)  
Acceptance criteria for spread (flow) are to be established between the supplier and the purchaser.

#### 5.16 Specified Strength

Compliance shall be assessed against the requirements of IS 456 or other agreed Indian Standard. The purchaser may perform his sampling and testing or may enter into an arrangement with the producer to provide his testing requirements.

Unless otherwise agreed between the parties involved, the minimum testing frequency to be applied by the producer in the absence of a recognized ready-mixed concrete industry method of production control should be one sample for every  $50 \text{ m}^3$  of production or every 50 batches, whichever is the greater frequency. Three test specimens shall be made up for each sample for testing at 28 days (see also IS 456). In order to get a relatively quicker idea of the quality of concrete, optional test on beams for modulus of rupture at  $72 \pm 2$  h or at 7 days or compressive strength test at 7 days may be carried out in addition to 28 days compressive strength test. For this purpose the value should be arrived at based on actual testing. In all cases 28 days compressive strength shall alone be the criteria for acceptance or rejection of the concrete.

The purchaser shall inform the producer if his requirements for sampling and testing are higher than one sample every  $50 \text{ m}^3$  or 50 batches, whichever is the greater frequency.

## 5.17 Sampling and Testing for Quality Control of Hardened Concrete

Test on cube crushing strength of concrete in accordance and compliance with IS 456 and IS 516 shall do as under:-

Sample of fresh concrete shall be taken from concrete at central batch plant mixer while loading delivery trucks or other transport and also from concrete transported to placement location.

Test on specimens made from samples collected at placement location shall be considered as field test specimens and results therefrom shall be the criterion of concrete strength. Test in specimens made from samples at the batch plant shall only be taken as guideline test. Only in the case of doubtful result, the Engineer-in-Charge may refer to such guideline results for deciding on the quality of concrete.

For truck mix concrete and shrink mix concrete guideline test specimens shall be made from samples collected at discharge location from mixing trucks. For this purpose first and last 15% of the load shall be omitted while collecting samples.

### SAMPLING OF CONCRETE (RMC)

After the truck mixer has re-mixed its delivery on site, allow at least the first one-third of a m<sup>3</sup> of concrete to be discharged prior to taking any samples. Take at least 4 incremental samples from the remainder of the load avoiding sampling the last cubic metre of concrete. Thoroughly re-mix this composite sample either on a mixing tray or in the sampling bucket and proceed with the required testing.

Frequency of sampling shall be as given below in Table 5.5 for each grade of concrete of different workability's and for each type of specimens (field test specimens and guideline test specimens) for conducting 28 days crushing strength tests.

**TABLE 5.9**  
**Sampling of Concrete**

Quantity of concrete Delivered (cum)	Number of samples
Less than 5	1
6 to 15	2
31 to 50	3
51 and above sample for each	4 plus one additional 50 cum or part thereof

Each sample shall be of adequate quantity so that a minimum of 3 specimen cubes can be made test of the sample in accordance with IS 516.

All test specimens shall be made compacted cured and tested in compliance with IS 516 and test result interpreted in accordance with IS 456 for acceptance of concrete strength, field specimens test results shall not be less than values as prescribed.

In addition to 28 day crushing strength test on specimens made at frequencies specified above, early strength tests at 7 days shall also be conducted on field specimens as well as guideline test specimens. Frequency of sampling for this set of test shall also be same as those specified above. 7 day strength shall conform to values given in Table as under. But these test results even if conforming to specified values shall only be taken a guideline



values for projecting concrete strength and shall not be construed as conforming to specifications.

**TABLE 5.10**  
**Compressive Strength of Concrete**

Concrete Mix (Nominal Mix on Volume basis)	Compressive Strength in (Kg/ sq cm)	
	7 days'	28 days'
1:1:2	210	315
1:1.5:3	175	265
1:2:4	140	210

For each grade of concrete and for all workability conditions with different water – cement ratios and compositions of admixtures, preliminary test shall be conducted for crushing strength on finalization to design mix for each type of concrete. Such test shall be conducted both at 7 days and 28 days under laboratory conditions. Six test specimens shall be made for 7 days test and six test specimens shall be made for 28 days test. Average of the six test results of different periods shall not be less than those specified.

Crushing strengths on cubes shall also be conducted during the process of finalization of concrete design mix. Frequency and number of such tests shall be as per Mix of requirements of concrete manufacturer.

All test specimens for conducting crushing strength shall be properly labeled for identification indicating:-

- (i) Date of making specimen
- (ii) Grade of concrete
- (iii) Placement location exact
- (iv) Purchasers order number

In addition to crushing strength test on concrete, the Engineer-in-Charge may call for other tests on hardend concrete. The placement contractor and the manufacturer of concrete shall comply with all such instructions.

### 5.18 Non-destructive Tests

When the 28 days crushing values on field specimens and/ or specimens and/or specimens made for guideline test fall short of specified values, or in case of doubtful placement of concrete, the Engineer-in-Charge shall call for non-destruction tests on the structure. Such tests may be any one or a combination of the following:-

- (i) Rebound hammer test
- (ii) Windsor Penetration Probe test
- (iii) Pulse velocity (sonic or Ultrasonic) test
- (iv) Core test
- (v) Load test

Interpretation of rebound hammer, Windsor Probe and Pulse velocity test results shall rest with the Engineer-in-Charge.

Core test, if ordered by the Engineer-in-Charge, shall be done in accordance with IS: 516. Samples for such test shall be taken from locations to be identified by the Engineer-in- Charge and such samples shall be collected in compliance with IS: 1199.



If felt necessary, the Engineer-in-Charge may instruct load testing for any part of the structure based on doubtful concrete strengths. Such test shall be carried out as per details to be provided by the Engineer-in-Charge in consultation with the structural consultants.

The concrete manufacturer/ concrete placement contractor shall arrange for all test to be conducted in accordance with these specifications, including all necessary tools, plants, equipment and material, and shall be responsible for conducting all test at his cost.

All test conducted at the field laboratory shall be carried out by qualified technicians employed by the concrete manufacturer/ concrete placement contractor, in presence of authorized representative of the Engineer-in-Charge. All test reports and observation reports shall be jointly signed by the Engineer-in-Charge authorized representative and the technician conducting such test.

Engineer-in-Charge shall alone decide where such tests are to be conducted. He may instruct tests to be conducted at laboratories other than the field laboratory and such instructions shall be followed without claiming extra charges on this account.

The Concrete Manufacturer/ Placement contractor shall set up a laboratory at this own expense which shall have facilities, for conducting all necessary field test on materials and field and laboratory test on concrete.

## **TEST FOR ORGANIC IMPURITIES**

- The aggregate must also be checked for organic impurities such as decayed vegetation humus, coal dust etc. What is called the colour test is reliable indicator of the presence of harmful organic matter in aggregate, except in the area where there are deposits of lignite.

### **Test Procedure:**

- Fill a 350 ml clear glass medicine bottle upto 70 ml mark with a 3% solution of caustic soda or sodium hydroxide.
- The sand is next added gradually until the volume measured by the sandy layer is 125 ml. The volume is then made upto 200 ml by addition of more of solution.
- The bottle is then stoppered and shaken vigorously and allowed to stand for 24 hours.
- At the end of this period, the colour of the liquid will indicate whether the sand contains a dangerous amount of matter. A colourless liquid indicates a clean sand free from organic matter. A straw coloured solution indicates some organic matter but not enough to be seriously objectionable. Darker colour means that the sand contains injurious amounts and should not be used unless it is washed, and a retest shows that it is satisfactory.
- Add 2.5 ml of two per cent solution of tannic acid in 10 per cent alcohol, to 97.5 ml of three per cent sodium hydroxide solution. Place in a 350 ml bottle, fix the stopper, shake vigorously and allow to stand for 24 hours before comparison with the solution above the sand.

- ✓ **Note:** A three per cent solution of caustic soda is made by dissolving 3 g of sodium hydroxide in 100 ml of water, preferably distilled. The solution should be kept in a glass of bottle tightly closed with a rubber stopper. Handling sodium hydroxide with moist hands may result in serious burns. Care should be taken not to spill the solution for it is highly injurious to clothing, leather, and other materials.

## TEST FOR PARTICLE SIZE (SIEVE ANALYSIS)

- **Apparatus:** Perforated plate sieves of designation 10 mm, 4.75 mm and fine mesh sieve of designation 2.36 mm, 1.18 mm, 600 micron, 300 micron and 150 micron should be used. The balance or scale shall be such that it is readable and accurate to 0.1 per cent of the weight of the test sample.
- **Sample:** The weight of sample available shall not be less than the weight given in the table below. The sample of sieving shall be prepared from the larger sample either by quartering or by means of a sample divider.

**TABLE 5.11**  
**Showing Minimum Weights for Sampling**

Maximum size present in substantial proportions (mm)	Minimum weight of sample for sieving (Kg)
<b>10</b>	<b>0.5</b>
<b>4.75</b>	<b>0.2</b>
<b>2.36</b>	<b>0.1</b>

### Test Procedure:

- The sample shall be brought to an air-dry condition before weighing and sieving. This may be achieved either by drying at room temperature or by heating at a temperature of 100 degree to 110 degree centigrade.
  - The air dry sample shall be weighed and sieved successively on the appropriate sieves starting with the largest. Care shall be taken to ensure that the sieves are clean before use. Each sieve shall be shaken separately over a clean tray until not more than a trace passes, but in any case for a period of not less than two minutes. The shaking shall be done with a varied motion, backwards and forwards, left to right, circular clockwise and anti-clockwise, and with frequent jarring, so that the material is kept moving over the sieve surface in frequently changing directions.
  - Materials shall not be forced through the sieve by hand pressure, but on sieves coarser than 20 mm, placing of particles is permitted, Lumps of fine material, if present may be broken by gentle pressure with fingers against the side of the sieve. Light brushing of under side of the sieve with a soft brush may be used to clear the sieve openings. Light brushing with a fine camel hair brush may be used on the 150 micron IS sieve to prevent segregation of powder and blinding of apertures. Stiff or worn out brushes shall not be used for this purpose and pressure shall not be applied to the surface of the sieve to force particles through the mesh.
  - On completion of sieving the material retained on each sieve, together with any material cleaned from the mesh, shall be weighed.
- ✓ **Reporting of Results:** The results shall be calculated and reported as:
- (i) The cumulative percentage by weight of the total sample passing each of the sieves, to the nearest whole number:  
Or
  - (ii) The percentage by weight of the total sample passing one sieve and retained on the next smaller sieve, to the nearest 0.1 percent.

## TEST FOR SILT CONTENT

- A sample of sand to be tested shall be placed without drying in a 200 ml measuring cylinder. The volume of the sample shall be such that it fills the cylinder upto 100 ml mark
  - Clean water shall be added upto 150 ml mark. Dissolve a little salt in the water in the proportion one tea spoon to half a litre. The mixture shall be shaken vigorously, the last few shakes being sidewise direction to level off the sand and the contents allowed to settle for three hours.
  - The height of the silt visible as settled layer above the sand shall be expressed as a percentage of the height of sand below. The sand containing more than the above allowable percentage of silt, shall be washed so as to bring the silt contents within allowable limits.
- ✓ The sand shall not contain more than 8% of silt.

## BULKING OF FINE AGGREGATES/SAND (FIELD METHODS)

- Two methods are suggested for determining the bulking of sand/fine aggregate. The procedure may be suitably varied, if necessary. Both depend on the fact that the volume of inundated sand/fine aggregate is the same if the sand/fine aggregate were dry.

### Method -1:

- Put sufficient quantity of sand loosely into a container until it is about two-third full. Level off the top of the sand and push a steel rule vertically down through the sand at the middle to bottom, measure the height. Suppose this is 'X' cm.
- Empty the sand out of the container into another container where none of it is lost. Half fill the first container with water. Put back about half the sand and rod it with a steel rod, about 6 mm in diameter, so that its volume is reduced to a minimum. Then add the remainder and level the top surface of the inundated sand. Measure its depth at the middle with the steel rule. Suppose this is 'Y' cm. The percentage of bulking of the sand due to moisture shall be calculated from the formula:
- Percentage bulking =  $(X/Y - 1) \times 100$

### Method-2:

- In a 250 ml measuring cylinder, pour the damp sand, consolidate it by staking until it reached the 200 ml mark. Then fill the cylinder with the water and stir the sand well (the water shall be sufficient to submerge the sand completely). It will be seen that the sand surface is now below its original level. Suppose the surface is at the mark of Yml, the percentage of bulking of sand due to moisture shall be calculated from the formula.
- Percentage bulking =  $(200/Y - 1) \times 100$

## DETERMINATION OF PARTICLE SIZE

The apparatus, sample size and test procedure shall be same as specified in sub-head 'MORTARS'. In order that the sieves shall not be overloaded, care must be taken to ensure that the maximum sieve loads shown in Table A-4.1 (below) are not exceeded at the completion of sieving.

**TABLE 5.12  
Particle Size Specification**

I.S. Sieve Designation	Maximum weight for	
	45 cm dia sieve Kg	30 cm dia sieve kg
45 mm	10	4.5
40 mm	8	3.5
31.5 mm or 22.1 mm	6	2.5
20 mm	4	2.0
16 mm or 12.5 mm	3	1.5
10 mm	2	1.0
5.6 mm	1.5	0.75
4.75 mm	1.0	0.50
3.35 mm	-	0.30

**Test Procedure:**

- The sample weight taken will thus normally require several operations on each sieve. Each sieve should be taken separately over a clean tray or receiver until no more than a trace passes, but in any case for not less than two minutes.
- Materials should not be forced through the apertures but hand placing is permitted. A light brush should be used with fine sieves.
- The cumulative weight passing each sieve should be calculated as percentage of the total sample weight to the nearest whole number.

**SLUMP TEST**

**Apparatus:**

Mould shall consist of a metal frustum of cone having the following internal dimensions:

Bottom diameter ..... 20 cm  
 Top diameter.....10 cm  
 Height ..... 30 cm

The mould shall be of a metal other than brass and aluminium of at least 1.6 mm (or 16 BG) thickness. The top and bottom shall be open and at right angles to the axis of the cone. The mould shall have a smooth internal surface. It shall be provided with suitable foot pieces and handles to facilitate lifting it from the moulded concrete test specimen in a vertical direction as required by the test. A mould provided with a suitable guide attachment may be

used. Tamping rod shall be of steel or other suitable material 16 mm in diameter 60 mm long and rounded at one end.

**Procedure:**

- The internal surface of the mould shall be thoroughly cleaned and free from superfluous moisture and any set concrete before commencing the test.
- The mould shall be placed on a smooth horizontal, rigid and non-absorbent surface viz. levelled metal plate. The operator shall hold the mould firmly in place while it is being filled with test specimen of concrete.
- The mould shall be filled in four layers, each approximately one quarter of height of mould. Each layer shall be tamped with twenty five strikes of the rounded end of the tamping rod. The strokes shall be distributed in a uniform manner over the cross section of the mould and for the second and subsequent layers shall penetrate into the underlying layer. The bottom layer shall be tamped through out its depth.
- After the top layer has been rodded, the concrete shall be struck off level with trowel or the tamping rod, so that the mould is exactly filled. Any mortar which shall leak out between the mould and the base plate shall be cleaned away.
- The mould shall be removed from the concrete immediately after filling by raising it slowly and carefully in a vertical direction.
- The moulded concrete shall then be allowed to subside and the slump shall be measured immediately by determining the difference between the height of the mould and that of the highest point of specimen.
- The above operations shall be carried out at a place free from vibration or shock, and within a period of two minutes after sampling.

**Result:**

The slump shall be recorded in terms of millimeters of subsidence of the specimen during the test. Any slump specimen which collapses or shears off laterally give incorrect result. If this occurs, the test shall be repeated with another sample.

✓ The slump test shall not be used for very dry mixes as the results obtained are not accurate.

**TABLE 5.13**  
**Physical Requirements of Fly Ash**

Sl. No	Characteristics	Requirement of Fly Ash	
		For use as Pozzolana	For use as Pozzolana
I	Fineness- Specific surface in m <sup>2</sup> /kg by Blaine’s permeability method, min	320	200
II	Lime reactivity – average compressive strength in N/mm <sup>2</sup> Min	4.5	-
III	Compressive strength at 28 days in N/ mm <sup>2</sup>	Not less than 80 per cent of the strength of corresponding Mortar cubes.	-

IV	Soundness of autoclave test expansion of specimens, per cent, max	0.8	0.8
V	Particles retained on 45 micron IS sieve (wet sieving) in percent maximum	34	50

### **CUBE TEST FOR COMPRESSIVE STRENGTH OF CONCRETE – MANDATORY LAB TEST**

One sample (consisting of six cubes 15x15x15 cm shall be taken for every 20 cum or part thereof concrete work ignoring any part less than 5cum or as often as considered necessary by the Engineer-in- Charge. The test of concrete cubes shall be carried out in accordance with the procedure as described below. A register of cubes shall be maintained at the site of work in Appendix C. The casting of cubes, concrete used for cubes and all other incidental charge, such as curing, carriage to the testing laboratory shall be borne by the contractors. The testing fee for the cubes, if any, shall be borne by the department.

#### **Test Procedure:**

##### **Mould**

- The mould shall be of size 15cm x15cmx15cm for the maximum nominal size of aggregate not exceeding 40 mm. For concrete with aggregate size more than 40 mm size of mould shall be specified by the Engineer-in-charge, keeping in view the fact that the length of size of mould should be about four times the size of aggregate. The moulds for test specimens shall be made of non-absorbent material and shall be substantially strong enough to hold their form during the moulding of test specimens. They shall not vary from the standard dimensions by more than one percent. The moulds shall be so constructed that there is no leakage of water from the test specimen during moulding. All the cube moulds for particular site should, prior to use, be checked for accuracy in dimensions and geometric form and such test should at least be made once a year. Each mould shall be provided with a base plate having a plane surface and made of non-absorbent material. This plate shall be large enough in diameter to support the moulds properly without leakage. Glass plates not less than 6.5mm thick or plain metal not less than 12mm thick shall be used for this purpose. A similar plate shall be provided for covering the top surface of the test specimen when moulded.
- **Note:** Satisfactory moulds can be made from machine or steel castings, rolled metal plates or galvanized.

##### **Sample of Concrete**

- Sample of concrete for test specimen shall be taken at the mixer or in the case of ready mixed concrete from the transportation vehicle discharge or as directed by Engineer-in- Charge. Such samples shall be obtained by repeatedly passing a scoop or pail through the discharge stream of concrete.
- The sampling operation should be spread over evenly to the entire discharging operation. The samples thus obtained shall be transported to the place of moulding of the specimen to counteract segregation. The concrete shall be mixed with a shovel until it is uniform in appearance. The location in the work of the batch of concrete this sampled shall be noted for further reference. In case of paving concrete, samples shall be taken from the batch immediately after deposition of the sub grade. At least five samples shall be taken from

different portion of the pile and these samples shall be thoroughly mixed before being used to form the test specimen. The sampling shall be spread as evenly as possible throughout the day. When wide changes occur during concreting, additional sample shall be taken if so desired by the Engineer-in-Charge.

### Preparation of Test Specimens

- The interior surfaces of the mould and base plate shall be lightly oiled before the concrete is placed in the mould. The samples of concrete obtained as described under the test specimen shall be immediately moulded by one of the following methods as indicated below:-
- When the job concrete is compacted by manual methods, the test specimen shall be moulded by placing the fresh concrete in the mould in three layers, each approximately one third of the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a uniform distribution of concrete within the mould. Each layer shall be rodded 35 times with 16 mm rod, 60 cm in length, bullet pointed at the lower end. The strokes shall be distributed in uniform manner over the cross section of the mould and shall penetrate into underlying layer. The bottom layer shall be rodded through its depth. After the top layer has been rodded, the surface of the concrete shall be struck off with a trowel and covered with a glass plate at least 6.5 mm thick or a machined plate. The whole process of moulding shall be carried out in such a manner as to preclude the change of the water cement ratio of the concrete, by loss of water either by leakage from the bottom or over flow from the top of the mould. When the job concrete is placed by vibration and the consistency of the concrete is such that the test specimens cannot be properly moulded by hand rolling as described above, the specimens shall be vibrated to give a compaction corresponding to that of the job concrete. The fresh concrete shall be placed in mould in two layers, each approximately half the volume of the mould. In placing each scoopful of concrete the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a symmetrical distribution of concrete within the mould. Either internal or external vibrators may be used. The vibration of each layer shall not be continued longer than is necessary to secure the required density. Internal vibrators shall only be used when the concrete is required to be compacted in layers. In compacting the first layer, the vibrators shall not be allowed to rest on the bottom of the mould. In placing the concrete for top extent that there will be no mortar loss during vibrations. After vibrating the second layer enough concrete shall be added to bring level above the top of the mould. The surface of the concrete shall then be struck off with a trowel and covered with a glass or steel plate as specified above. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of water-cement ratio of the concrete by loss of water, either by leakage from the bottom or over flow from the top of the mould.

### Curing and Storage of Test Specimen

- In order to ensure reasonably uniform temperature and moisture conditions during the first 24 hours for curing the specimen and to protect them from damage, moulds shall be covered with wet straw or gunny sacking and placed in a storage box so constructed and kept on the work site that its air temperature when containing concrete specimens shall remain 22°C to 33°C. Other suitable means which provide such a temperature and moisture conditions may be used.
- ✓ **Note:** -It is suggested that the storage box be made of 25 mm dressed tongued and grooved



timber, well braced with battens to avoid warping. The box should be well painted inside and outside and should be provided with a hinged cover and padlock. The test specimen shall be removed from the moulds at the end of 24 hours and stored in a moist condition at a temperature within 24°C to 30°C until the time of test. If storage in water is desired, a saturated lime solution shall be used.

### **Testing Procedure:**

- The specimens shall be tested in accordance with procedure as described below:
- The tests shall be made at an age of concrete corresponding to that for which the strengths are specified.
- Compression tests shall be made immediately upon removal of the concrete test specimen from the curing room i.e. the test specimen shall be loaded in damp condition. The dimensions of the test specimens shall be measured in mm accurate to 0.5 mm.
- The metal bearing plates of the testing machine shall be placed in contact with the ends of the test specimens. Cushioning materials shall not be used. In the case of cubes, the test specimen shall be placed in the machine in such a manner that the load is applied to sides of the specimens as cast. An adjustable bearing block shall be used to transmit the load to the test specimen. The size of the bearing block shall be the same or slightly larger than that of test specimen. The upper or lower section of the bearing block shall be kept in motion as the head of the testing machine is brought to a bearing on the test specimen.
- The load shall be applied axially without shock at the rate of approximately 140 kg. per sq.cm. per minute. The total load indicated by the testing machine at failure of test specimen shall be recorded and the unit compressive strength is calculated in kg per sq. cm. using the area computed from the measured dimension of the test specimen. The type of failure and Appearance of the concrete shall be noted.

### **ADDITIONAL TESTS FOR CONCRETE**

- In case the concrete fails when tested as per the method prescribed in Appendix A, one or more of the following check tests may be carried out at the discretion of Engineer-in-Charge to satisfy the strength of the concrete laid. All testing expenditure shall be borne by the contractor, the number of additional tests to be carried out shall be determined by the Engineer-in-Charge. He shall be the final authority for interpreting the results of additional test and shall decide upon the acceptance or otherwise. His decision in this regard shall be final and binding. For the purpose of payment, the Hammering test results only shall be the criteria. Some of the tests are outlined below:-

### **REBOUND HAMMER TEST**

- If a rebound hammer is regularly used by trained personnel in accordance with procedure described in IS 13311 (part II) and a continuously maintained individual charts are kept showing a large number of reading and the relation between the reading and strength of concrete cubes made from the same batch of concrete, such charts may be used in conjunction with hammer readings to obtain an approximate indication of the strength of concrete in a structure for element. If calibration charts are available from manufactures, it can be used. When making rebound hammer test each result should be the average of at least 12 readings. Reading should not be taken within 20mm of the edge of concrete members and it may be necessary to distinguish between readings taken on a troweled face and those on a moulded face. When making the tests on a precast unit, special care should be taken to bed them firmly against the impact of the hammer.



## CUTTING CORES

- 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.

## ULTRASONIC TEST

- If an ultrasonic apparatus is regularly used by trained personnel in accordance with IS 13311 (part I) and continuously maintained individual charts are kept showing a large number of readings & the relation between the reading and strength of cubes made from the same batch of concrete, such charts may be used to obtain approximate indications of the strength of concrete in the structures. In cases of suspected lack of compaction or low cube strength the results obtained from the ultrasonic test results on adjacent acceptable section of the structures may be used for the purpose of assessing the strength of concrete in the suspected portion.

## LOAD TESTS ON INDIVIDUAL PRECAST UNITS

- The load tests described in this clause are intended as check on the quality of the units and should not be used as substitute for normal design procedure. Where members require special testing. Such special testing procedures shall be in an accordance with the specification. Test loads shall be applied and removed incrementally.

### Non Destructive Tests

- The unit shall be supported at its designed point of support and loaded for five minutes with a load equal to the sum of the characteristic dead load plus one and a quarter time the characteristic imposed load. The deflection is then recorded. The maximum deflection after application of the load shall be in accordance with the requirements defined by the Engineer-in-Charge. The recovery is measured five minutes after the removal of the load and the load then reimposed. The percentage recovery after the second loading shall be not less than that after the first loading nor less than 90% of the deflection recorded during the second loading. At no time during the tests, shall the unit show any sign of weakness or faulty construction as defined by the Engineer-in-Charge in the light of reasonable interpretation of relevant data.

## CALIBRATION AND WEIGHING EQUIPMENT ACCURACY

- **The following limits shall apply to all ready-mixed concrete plants :**

(a) The accuracy, sensitivity and arrangement of the weighing devices shall be such as to enable the materials to be batched within the following tolerances:

(1) Cement, mineral Admixtures	Within + 2 percent of the quantity of the constituent being measured
(2) Aggregate, chemical admixtures and water	Within + 3 percent of the quantity of the constituent being measured.

(b) Analogue scales shall have scale increments not exceeding 5 kg. for cement and mineral admixtures, 25 kg. for aggregate and 2 kg. for water.

- (c) Preset controls shall be calibrated in increments not exceeding 5 kg. for cement and mineral admixtures, 10 kg. for aggregate and 2 kg. for water.
- (d) For continuous mixer plants calibration shall be in increments not exceeding 10 kg. /m<sup>3</sup> for cement and mineral admixtures, 25 kg. /m<sup>3</sup> for aggregates and 10 l/m<sup>3</sup> for water.
- (e) Digital readouts shall have scale increments not exceeding 2 kg. for cement and mineral admixtures, 10 kg. for aggregate and 10 for water.
- (f) At the time of installation, or reconditional the accuracy of the indicated mass at any point on the scale shall be within 0.25 percent of the full scale reading.
- (g) Any other time during the masonry operation the accuracy shall be within 0.50 percent of the full scale reading.
- (h) Chemical Admixture dispensers shall have scale increment for exceeding.

**TABLE 5.14**  
**Admixtures Quantity Specifications**

Ranger of scale in kg/l	Scale increment in Kg/l
0.1 – 0.5	0.01
0.5 - 1.0	0.02
1.0 – 10.0	0.2
more than 10.0	0.4

- (i) All weighing and measuring equipment shall be tested and calibrated over its full working Range at the following intervals:

(1) Mechanical /knife edge systems	At least once every two month
(2) Electrical /load cell systems	At least once every three months

Adequate and identified facilities shall be provided for the application of the test loads.

- (j) In the case of batch weighing systems testing and calibration shall be based on the application test loads to the weigh hoppers.

- (k) Checks on continuous weigh systems shall be based on comparison of preset quantities with those actually produced.

- (l) To achieve the required accuracy of calibration, a minimum of 500 kg. Of stamped weights are required, except that for low capacity scale an acceptable limit on the total mass of calibration weight would be 20 percent of the scale capacity.

- (m) When calibration of weighing equipment is carried out all personnel involved should be competent and fully trained, the procedures should be fully documented, and special attention should be paid to the health and safety aspects of the procedure.

**TABLE 5.15**  
**Register of Work Test of Concrete (by volume)**

(a) Name of work	Concrete mix, (by volume)	Compressive strength in kg/cm <sup>2</sup> on 7 days
(b) Name of Contractor	1:1:2	210
(c) Agreement No.	1:1.5:3	175
(d) Sample No.	1:2:4	140
(e) Identification mark		
(f) Portion of work any quantity represented by sample		
(g) Date and time of casting cube		
(h) Proportion of mix/ grade of concrete		

**6 Days' Test**

(1) Due date of test	Cube No.
(2) Actual date of test	
(3) (a) Minimum strength	
(b) Maximum strength	
(c) Average strength of three cubes	
(d) Difference between 3a and 3b	
(e) Difference in % age in terms of Average strength i.e. $\frac{3b - 3a}{3c} \times 100$	
(4) Specified compressive strength of concrete mix used	
(5) (a) If 3(e) is more than 30%	Sample is not acceptable, then 28 days Strength test shall be carried out.
(b) If 3(e) is equal to or less than 30% then proceed as below:-	
(i) Difference between column 4 specified compressive strength and column 3 (c) i.e., actual average is higher, it will be denoted (+) and (-) if it is less	
(ii) Difference in column 5(b) (i) terms of % age of specified strength	$\frac{3(c) - (4)}{4} \times 100\%$
(iii) If the difference in column 5(b) (i) Is +ve and the same in terms of % age of specified strength (4) i.e., value of col. 5(b) (ii) is within (+15% range)	Acceptable & strength is considered in order

**TABLE 5.15**  
**Register of Work Test for Concrete**

(a) Name of work	Concrete mix, (by volume)	Compressive strength in kg/cm <sup>2</sup> on 7 days
(b) Name of Contractor	1:1:2	315
(c) Agreement No.	1:1.5:3	265
(d) Sample No.	1:2:4	210
(e) Identification mark		
(f) Portion of work any quantity represented by sample		
(g) Date and time of casting cube		
(h) Proportion of mix/grade of concrete		

### 7 Days' Test

(1) Due date of test	Cube No.
(2) Actual date of test	
(3) Actual compressive strength of cubes (min. no. of cubes to be tested –three)	
(a) Minimum strength	
(b) Maximum strength	
(c) Average strength of three cubes	
(d) Specified compressive strength of concrete mix used	
(e) 70% specified strength	i.e. 70% of 3(d)
(f) 130% of specified strength	i.e. 130% of 3(d)
(4) If 3(b) = 3(f) and 3(a) > 3(e)	Value of 3(c) shall be compressive strength of sample
(5) If 3 (c) is more than 3(f)	EE may order further investigation
(6) If any test value exceeds 3(f)	It should be restricted to 3(f) for computation of strength
(7) If 3 (c) > 3(d) but < 3(f)	Strength is in order and concrete accepted at full rates.
(8) If 3 (c) < 3(d) and > 3(e)	Concrete may be accepted at reduced rates in accordance with para 5.4.13.2
(9) If 3(c) < 3(e)	Work represented by this sample shall be rejected and action taken as prescribed in clause 5.4.10.4

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.1		RCC upto plinth	Providing and laying in position specified grade of reinforced cement concrete (with 20mm nominal size graded stone aggregate) excluding the cost of centering, shuttering, finishing and reinforcement - All work up to plinth level :		
	5.1.1	M-20	M-20 Grade Concrete	cum	6153.00
	5.1.2	M-15	M-15 Grade Concrete	cum	5397.00
5.2		RCC in walls, columns, pillars etc	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in walls (any thickness), including attached pilasters, buttresses, plinth and string courses, fillets, columns, pillars, posts and struts etc. above plinth level and upto floor two level excluding cost of centering, shuttering, finishing and reinforcement:		
	5.2.1	M-20	M-20 Grade Concrete	cum	6231.00
5.3		RCC in beams, floors, staircases etc	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in beams, suspended floors, roofs having slope of any degree landings, balconies, shelves, chajjas, lintels, bands, plain window sills, staircases and spiral staircases above plinth level and upto floor two level excluding the cost of centering, shuttering, finishing and reinforcement in concrete grade.		
	5.3.1	M-20	M-20 Grade Concrete	cum	6541.00
5.4		RCC in kerbs, steps	Providing and laying upto floor two level reinforced cement concrete (with 20 mm nominal size graded stone aggregate) in kerbs, steps and the like excluding the cost of centering, shuttering, finishing and reinforcement with Concrete grade.		
	5.4.1	M-20	M-20 Grade Concrete	cum	5542.00
5.5		RCC in arches, domes, shells etc.	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in arches, arch ribs, domes, vaults, shells, folded plate above plinth level and upto floor two level excluding the cost of centering, shuttering, finishing and reinforcement in Concrete grade.		
	5.5.1	M-20	M-20 Grade Concrete		6906.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.6		RCC in chimneys and shafts etc.	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in chimneys, shafts, upto floor two level excluding the cost of centring, shuttering, finishing and reinforcement with		
	5.6.1	M-20	M-20 Grade Concrete	cum	6337.00
5.7		RCC in well steining	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in well-steining excluding the cost of centering, shuttering, finishing and reinforcement with		
	5.7.1	M-20	M-20 Grade Concrete	cum	5448.00
5.8		RCC in fins	Reinforced cement concrete work (with 20 mm nominal size graded stone aggregate) in vertical and horizontal fins individually or forming box louvers, facias and eaves boards up to floor two level excluding the cost of centering, shuttering, finishing and reinforcement in M 20 –Grade Concrete	cum	6518.00
5.9		Centering and Shuttering	Centering and shuttering in cluding strutting, propping etc. and removal of form for:		
	5.9.1	Upto plinth	Foundations, footings, bases of columns, etc. for concrete upto plinth level	sqm	190.60
	5.9.2	Walls	Walls (any thickness) in cluding attached pilasters butter esses, plinth beams and string courses etc.		
	5.9.2.1	Upto plinth level	Uptoplinthlevel.	sqm	219.00
	5.9.2.2	Above plinth	Above plinth upto 3.6 m height from plinth level	sqm	330.00
	5.9.2.3	Extra for additional height in centering, shuttering	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of de-shuttering and decentering at all levels, over a height of 3.6 m, for every additional height of 1 metre or part thereof.	sqm	40.00
	5.9.3	Suspended floors, roofs etc	Suspended floors, roofs, landings, balconies and access platform.	sqm	439.60

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	5.9.4	Shelves	Shelves(Cast in situ)	sqm	290.00
	5.9.5	Lintels, Beams and Centilevers	Lintels, beams, girders, bressumers and cantilevers	sqm	356.00
	5.9.6	Columns	Columns, Pillars, Piers, Abutments, Posts and Struts.	sqm	471.20
	5.9.7	Staircase	Stairs, (excluding landings) except spiral-Staircases.	sqm	435.70
	5.9.8	Spiral Staircase	Spiral staircases (including landing).	sqm	450.00
	5.9.9	Arches	Arches, domes,vaults upto 6m span	sqm	1141.60
	5.9.10	Extra for arches >6m	Extra for arches, domes, vaults exceeding 6 m span	sqm	451.30
	5.9.11	Chimneys and shafts	Chimneys and shafts	sqm	294.00
	5.9.12	Coffer slab	Coffer/waffle slab of any size or shape as shown in the drawing.	sqm	1481.00
	5.9.13	Well steining	Well steining	sqm	264.00
	5.9.14	Fins	Vertical and horizontal fins individually or forming Box louvers band, facias and eaves boards.	sqm	643.40
	5.9.15	Extra for circular or other geometrical shape	Extra for shuttering in circular work or any other geometrical shape (20% ofrespective centering and shuttering items).	sqm	20%
	5.9.16	Lintels	Small lintels not exceeding 1.5m clear span, mouldingas incornices, window, sills, courses, bands, copings, bed plates, anchor blocks and the like.	sqm	191.00
	5.9.17	Cornices and mouldings	Cornices and mouldings	sqm	565.00
	5.9.18	Small surfaces	Small surfaces such as cantilever ends, brackets and ends of steps, caps and bases to pilasters and columns and the like.	sqm	529.60
	5.9.19	Weather shade and chajjas	Weather shade, Chajjas, corbels etc., including Edges.	sqm	534.20

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	5.9.20	Suspended floors with ply	Suspended floors, roofs, landings, balconies and Access platform. With water proof ply 12 mm thick. (item to be executed with prior permission of S.E. in case of B & R works and from Additional Project Director in case of PIU works)	sqm	575.35
	5.9.21	Lintels, beams, columns etc with ply	Lintels, beams, columns, girders, bressumers and cantilevers with waterproof ply 12 mm thick (item to be executed with prior permission of S.E. in case of B&R works and from Additional Project Director in case of PIU works)	sqm	521.20
5.10		Extra for additional height in centering, shuttering	Extra for additional height in centering, shuttering where ever required with adequate bracing, propping etc. including cost of de-shuttering and decentering at all levels, over a height of 3.6 m, for every additional height of 1 metre or part thereof (Plan area to be measured)		
	5.10.1	Suspended floors	Suspended floors, roofs, landing, beams and balconies (Plan area to be measured).	sqm	212.00
5.11		Precast RCC M-15	Providing, hoisting and fixing up to floor two level precast reinforced cement concrete in lintels, manhole cover, shelves and like including setting in cement mortar 1:3 (1 cement : 3 sand), cost of required centering, shuttering and finishing with neat cement punning on exposed surfaces but excluding the cost of reinforcement with M 15 –Grade Concrete.	cum	7830.00
5.12		Precast RCC Jali 1:2:4	Providing precast cement concrete Jali 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 6mm nominal size) reinforced with 1.6 mm dia mild steel wire including centering and shuttering, roughening cleaning, fixing and finishing in cement mortar 1:3 (1 cement: 3 sand) etc. complete excluding plastering of the jambs, sills and soffits.		
	5.12.1	50mm thick	50 mm thick	sqm	790.00
	5.12.2	40mm thick	40 mm thick	sqm	689.00
	5.12.3	25mm thick	25 mm thick	sqm	598.00
5.13		Encasing RCC in rolled steel sections	Encasing rolled steel sections, in beams and columns, with cement concrete M 15 (1 cement: 2 sand: 4 graded stone aggregate 20mm nominal size) including centering and shuttering complete but excluding cost of reinforcement.	cum	6934.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.14		Encasing RCC in grillages	Encasing rolled steel section in grillages with cement concrete M 15 (1 cement: 2 sand: 4 graded stone aggregate 20 mm nominal size) including centering and shuttering but excluding cost of expanded metal and hangers.	cum	4835.00
5.15		Expanded metal for encasing rolled steel sections	Extra for providing and fixing expanded metal mesh of size 20x60mm and strands 3.25mm wide 1.6mm thick weighing 3.64 kg per sqm for encasing of rolled steel sections in beams, columns and grillages excluding cost of hangers.	sqm	408.00
5.16		Reinforcement	Reinforcement for R.C.C. work including straightening, cutting, bending, placing in position and binding including cost of binding wire all wastages and overlaps, couplers (overlaps shall be provided as per requirement of IS 13920 for ductile detailing IS 456 RCC Design & SP 34 Reinforcement detailing ) etc. complete . <b>(Note:-</b> 1. Spacer bars (chairs) shall be paid separately as shown in the drawing and as per direction of engineer in charge. 2. No extra payment shall be done for overlaps and/or couplers. 3. Couplers shall be conforming to IS code on “Reinforcement Couplers for Mechanical Splices of Bars for Concrete Reinforcement - Specification”)		
	5.16.1	Mild and medium	Mild steel and Medium Tensile steel bars.	kg	78 .00
	5.16.2	Hard	Hard drawn steel wire	kg	75.00
	5.16.3	Cold twisted	Cold twisted bars (CTD)	kg	81.00
	5.16.4	Hot rolled	Hot rolled deformed bars	kg	81.00
	5.16.5	Hard drawn	Hard drawn steel wire fabric	kg	76.00
	5.16.6	TMT (FE 500D or more)	Thermo-Mechanically Treated bars.FE 500 D or more conforming to IS 1786	kg	80.00
	5.16.6	TMT (FE 500 or more)	Thermo-Mechanically Treated bars.FE 500 or more conforming to IS 1786	kg	77.00
5.17		Reinforcement above floor two level	Add extra for providing reinforcement above Floor two level for every additional floor or part thereof.	kg	0.20

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.18		Copper plate for expansion joints	Providing and fixing in position copper plate as per design for expansion joints.	Kg	472.00
5.19		Blown bitumen	Providing and filling in position, blown bitumen in expansion joints.	per cum	45353.00
5.20		Bitumen mix filler	Providing and filling in position bitumen mix filler of Proportion 80 kg. Of hot bitumen, 1 kg. Of cement and 0.25 cubic metre of sand for expansion joints.	per cum	13863.00
5.21		Silicon sealant	Providing and filling gap in expansion joint between RCC/ Stone/Ceramic tiles/Granite/Marble by providing silicon sealant over backer rod of approved quality weather sealant as per drawing and direction of engineer in charge up to 25mm width & 12 mm depth.	Per cm depth per cm width one m long.	104.54
5.22		Bitumen impregnated fibre board	Providing and fixing in position bitumen impregnated fibre board conforming to IS: 1838 including cost of primer, sealing compound in expansion joints.		
	5. 22.1	12 mm thick	12 mm thick	sqm	402.00
	5. 22.2	25 mm thick	25 mm thick	sqm	574.00
	5. 22.3	50 mm thick	50 mm thick	sqm	674.00
5.23		Sheet cover over expansion joints	Providing and fixing sheet covering over expansion joints with iron screws as per design.		
	5. 23.1	Fibre cement	Non-asbestos fibre cement board 6 mm thick as per IS: 14862.		
	5. 23.1.1	150mm	150mm wide.	RM	102.00
	5. 23.1.2	200mm	200mm wide.	RM	137.00
	5. 23.1.3	250mm	250mm wide.	RM	153.00
	5. 23.2	Aluminium	Aluminium fluted strips 3.15mm thick.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	5. 23.2.1	150 mm	150 mm wide.	RM	483.00
	5. 23.2.2	200 mm	200 mm wide.	RM	646.00
	5. 23.2.3	250 mm	250 mm wide.	RM	725.00
	5. 23.3	SS -304	Stainless steel Grade 304 plate-1.0 mm thick		
	5. 23.3.1	150 mm	150 mm wide.	RM	367.00
	5. 23.3.2	200 mm	200 mm wide.	RM	443.00
	5. 23.3.3	250 mm	250 mm wide.	RM	555.00
5.24		Plaster drip course/ groove	Providing for plaster drip course/ groove in plastered surface or moulding to R.C.C. projections.	RM	18.5
5.25		Extra RCC for in or under water	Extra for laying reinforced cement concrete in or under water and/ or liquid mud including cost of pumping or bailing out water and removing slush etc., complete. <b>Note-</b> For Item No. 5.25:-The quantity will be calculated by multiplying the depth measured from the subsoil water level up to the centre of gravity of the R.C.C. under ubsoil water with the quantity of R.C.C. in cubic metre executed under subsoil water. The depth of centre of gravity shall be reckoned correct to 0.1 m. 0.05 m or more shall be taken as 0.1 m and less than 0.05 m ignored. No extra payment shall be made for placing reinforcement or centering & shuttering under sub – soil water condition	cum	297.00
5.26		Extra for RCC in or under foul position	Extra for laying reinforced cement concrete in or under foul positions.	cum	109.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.27		BMC	Providing and laying in position machine batched, machine mixed cement concrete (BMC) of M-25 grade for reinforced cement concrete work using cement content as per approved mix design including use of admixtures in recommended proportions as per IS 9103 to accelerate/retard setting, improve workability of concrete without impairing strength and durability as per direction of Engineer-in charge and pumping of concrete to site of laying and finishing but excluding the cost of centering, shuttering, and reinforcement. (Note: - Minimum cement content is 330 kg/cum) and no extra payment for extra cement used as per mix design.		
	5.27.1	Upto plinth	All works upto plinth level.	cum	6100.00
	5.27.2	Above plinth upto floor 5	All works above plinth level and upto floor five level.	cum	6581.00
	5.27.3	Above floor 5	Add extra for each floor for all works above floor five level.	cum	72.00
5.28		Extra for richer BMC mix	Extra for providing richer mixes of BMC design mix as per item no 5.27 upto plinth level and at all floor levels. (No extrapayment for using extra cement as per requirement of mix design.)		
	5. 28.1	M-30	Providing M-30 grade concrete instead of M-25 grade. (Note : minimum cement content is @ 340 kg/cum)	cum	140.00
	5. 28.2	M-35	Providing M-35 grade concrete instead of M-25 grade. (Note: : minimum cement content is @ 350 kg/cum)	cum	280.00
	5. 28.3	M-40	Providing M-40 grade concrete instead of M-25 grade. (Note: minimum cement content is @ 360 kg/cum)	cum	421.00
5.29		Precast RCC waffle unit	Providing and placing in position precast reinforced cement concrete waffle units square or rectangular as per design and shape for floors and roofs in M-20 –Grade Concrete (with graded stone aggregate 10mm nominal size) including flush or deep ruled pointing at	cum	13479.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			joints in Cement mortar 1:2 (1 Cement : 2 sand), making necessary holes of required sizes for carrying through service lines etc. including provision of steel hooks for lifting and form work, handling, hoisting, centering and erection complete for all floor levels but excluding the cost of reinforcement.		
5.30		RMC M-25	Providing and laying in position ready mixed concrete (RMC) of M-25 grade for reinforced cement concrete work, using cement content as per approved design mix and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, 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. <b>Note:</b> Minimum cement content is @ 330 kg/cum. (No extra payment for using extra cement as per requirement of mix design.)		
	5.30.1	Upto plinth	All works upto plinth level.	cum	6332.00
	5.30.2	Upto floor V level	All works above plinth level and upto floor V level.	cum	6814.00
	5.30.3	Extra for Additional floor	Extra for each additional floor for all works above floor five level	cum	72.00
5.31		Extra for R.C.C. above floor two level	Extra for R.C.C. work above floor two level for each floors or part thereof. (except items 5.27 and 5.30)	cum	1% of respective item
5.32		Water based concrete curing compound	Supplying and applying pre tested and approved water based concrete curing compound to concrete/ masonry surface, all as per manufacturer's specification and direction of Engineer-in-charge.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	5.32.1	Non pigmented	Non pigmented wet curing compound	sqm	93.00
	5.32.2	Pigmented	Pigmented wet curing compound.	sqm	100.00
5.33		Doors windows RCC frames	Providing and fixing in position factory made precast RCC M-40 doors, windows and ventilator frames having excellent smooth finish, as per IS: 6523 with 6mm dia main reinforcement (3 nos for single rebate and 4 nos for double rebate) tied with 3mm mild steel stirrups @ 200mm c/c, with high destiny virgin polymer blocks of size 25X25X125 mm, to receive hinges (3 to 4 for door and window and at least 2 for ventilator), each polymer block having at least four holes for passing one of the main reinforcement bar, providing specially designed M.S. galvanised sleeves for accommodating 6mm dia. fully threaded hold fast bolts, and providing hole cap for receiving 16mm dia sliding door bolts (L-drop), providing virgin high density polymer blocks for fixing socket of tower bolt window frame provided with holes between or adjacent rebates to hold fast grill or steel bar, ventilator frame provided with grooves for louvers at an angel of 45 degree at spacing to block direct vision etc. complete, as per the direction of Engineer-in-charge. The cost of hold fast and cement concrete block of 1:3: 6 (1 Cement: 3 sand: 6 Graded stone aggregate 20mm nominal size) mix is also included in the item.		
	5. 33.1.	Double rebate	Frame 125 mmx 60 mm (double rebate)	RM	366.00
	5. 33.2.	Single rebate	Frame 100mmx 60 mm (Single rebate)	RM	339.00
	5. 33.3	Single rebate	Frame 85mmx 60 mm (Single rebate)	RM	325.00
5.34		6 mm plaster (cm1.3) over RCC	Smooth finishing of the exposed surface of RCC work with 6mm thick cement mortar 1:3 (1 cement: 3 sand).	sqm	96.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.35		Compressible filler in expansion joints.	Providing and fixing in position pre moulded compressible filler board made from polymer base in black color approved make conforming to the specifications having minimum density of 95 kg / cum, non- staining, with less than 1 percent waterabsorption and compression recovery of 93 percent minimum including cost of double sided adhesive tape, sealant etc. in expansion joints.		
	5. 35.1	12 mm thick	12 mm thick	sqm	441.00
	5. 35.2	25 mm thick	25 mm thick.	sqm	894.00
	5. 35.3	50 mm thick	50 mm thick.	sqm	1194.00
5.36		Expansion joints with aluminum section	Providing and sealing the retaining wall expansion Joints with anodized aluminum extruded section of 135 mm × 3.1 mm confirm to alloy of 6063 T5/T6including fixing of an imported EPDM moisture Barrierconform to (American Society for Testing and Materials) 2240 & ASTM - G53 & 84 fixing with Epoxy adhesive confirm to ASTM C-881 complete in all respect as per manufacturer Drawing and specifications. With 5 year guarantee.	metre	3234.00
5.37		Expansion joints cover	Providing and fixing sheet covering over expansion joints with iron screws as per design. Non- asbestos cement bonded particle board 6 mm thick as IS: 14276		
	5.37.1	150mm	150mm wide	meter	96.00
	5.37.2	200mm	200mm wide	meter	130.00
	5.37.3	250mm	250mm wide	meter	160.00
5.38		High tensile steel wires	Providing & laying in position Prestressing steel strands (low relaxation) on hollow core bed by using mechanical pulling arrangement like Rabbit/ Bed master including all accessories for Stressing & destressing operations as per approved make conforming to IS1343 & grade FY-1860 etc, complete as per drawings and direction of Engineer -in-charge.	Kg	123.92

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.39		Expansion Joint for Floor	Providing and fixing of expansion joint system related with floor location as per drawings and direction of Engineer-In- Charge. The joints system will be of extruded aluminum base members, self aligning / self centering arrangement and support plates etc. as per ASTM B221-02. The system shall be such that it provides floor to floor /floor to wall expansion control system for various vertical location in load application areas that accommodates multi directional seismic movement without stress to it's components. System shall consist of metal profiles with a universal aluminum base member designed to accommodate various project conditions and finish floor treatments. The cover plate shall be designed of width and thickness requiredto satisfy projects movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates / moves in all directions. The Self - centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. Provision of Moisture Barrier Membrane in the Joint System to have watertight joint is mandatory requirement all as per the manufactures design and as approved by Engineer - inCharge. (Material shall confirm to ASTM 6063).		
	5. 39.1	100 mm	Floor Joint of 100 mm gap	metre	4857.00
	5. 39.2	150 mm	Floor Joint of 150 mm gap	metre	5946.00
	5. 39.3	200 mm	Floor Joint of 200 mm gap	metre	7616.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
5.40		Expansion Joint for walls	Providing and fixing of expansion joint system related with wall joint (internal/ external) location as per drawings and direction of Engineer-In- Charge. The joints shall be of extruded aluminum base members, self aligning / centering arrangement and support plates as per ASTM B221- 02. The material shall be such that it provides an Expansion Joints System suitable for vertical wall to wall/ wall to corner application, both new and existing construction in office Buildings & complexes with no slipping down tendency amongst the components of the Joint System. The Joint System shall utilize light weight aluminum profiles exhibiting minimal exposed aluminum surfaces mechanically snap locking the multicellular to facilitate movement.(Material shall confirm to ASTM 6063).		
	5. 40.1	100 mm	Wall Joint of 100 mm gap	metre	4044.00
	5. 40.2	150 mm	Wall Joint of 150 mm gap	metre	4552.00
	5. 40.3	200 mm	Wall Joint of 200 mm gap	metre	5293.00
5.41		Expansion joint for roofs	Providing and fixing of expansion joint system of approved make and manufactures for various roof locations as per approved drawings and direction of Engineer-In-Charge. The joints shall be of extruded aluminum base members with, self aligning and self centering arrangement support plates as per ASTM B221-02. The system shall be such that it provides watertight roof to roof/roof to corner joint cover expansion control system that is capable of accommodating multidirectional seismic movement without stress to its components. System shall consist of metal profile that incorporates a universal aluminum base member designed to accommodate various project conditions and roof treatments. The cover plate shall be designed of width and thickness required to satisfy movement and loading requirements and secured to base members by utilizing manufacturer's pre-engineered self-centering arrangement that freely rotates/moves in all directions. The Self		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			centering arrangement shall exhibit circular sphere ends that lock and slide inside the corresponding aluminum extrusion cavity to allow freedom of movement and flexure in all directions including vertical displacement. The Joint System shall resist damage or deterioration from the impact of falling ice, exposure to UV, airborne contaminants and occasional foot traffic from maintenance personnel. Provision of Moisture Barrier Membrane in the Joint System to have water tight joint is mandatory requirement. (Material shall confirm to ASTM 6063.)		
	5.41.1	100 mm	Roof Joint for 100 mm gap	metre	4509.00
	5.41.2	150 mm	Roof Joint for 150 mm gap	metre	5017.00
	5.41.3	200 mm	Roof Joint for 200 mm gap	metre	5950.00
5.42		Scaffolding net	Providing and fixing Scaffolding net of required width made of high density Polyethylene UV stabilized knitted on warp knitting machines having density 100gm/sqm and shading coefficient minimum 75% around the construction site/ for vertical extension as per requirement including fastening/tying with building/scaffolding pipes or with any other fixtures etc. complete as per direction of Engineer-in-Charge. (One time payment shall be made for providing Scaffolding net from start of work till completion of work including shifting if any. The Scaffolding net shall be the property of the contractor on completion of the work)	sqm	20.00
5.43		Glass Reinforced Concrete (G.R.C) Screens/ Jali	Providing and fixing Glass Reinforced Concrete (G.R.C) Screens/ Jali customized as per design, dimensions as per drawings in approved shade in overall thickness of 40mm, or inner design membrane between 30-35mm and borders 50mm, casted with layering technique Power Spray methodology have weight approximately between 3.75 -4.5 Kg per Sq. Ft. The screens casting shall take place with layering methodology using- Direct Power Spray machines. The screens shall be casted from 53 grade White Portland Cement manufactured by Fine graded, sieved Quartz & Silica Sand, reinforced with Alkali Resistant Glass Fiber manufactured between 4-5% by having Zirconia content at least 16%, Super	sqm	4721.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			Plasticizers and UV resistant Synthetic inorganic pigments should be used for pigmentation		
5.44		Cement concrete Block jali	Providing and laying Cement concrete Block jali made out by white cement , (Size 200X200X75mm thick), approximate weight of each block 2.5 kg and blocks jointed with approved block laying polymer modified adhesive mortar applied in uniform thickness of 2 to 3 mm in horizontal and verticals joints . Block should be gently pressed down using a rubber mallet to expel out entrapped air and the masonry shall be cured two days. 1st layer of CC block shall be placed on perfectly leveled surface, Rates include all materials including steel bars, wastages, scaffolding and all labour etc. complete. as per architectural drawing. The rates are inclusive of all lead & lifts and All necessaries to complete the item in good condition, nothing shall be paid extra separately unless specified.	sqm	3660.00
5.45		Teracotta jali	Providing and fixing Eco Friendly Teracotta jali size length 210 x width 210x thick 70 mm including m.s. frame , all joints, matching pigment etc. complete with compressive strength 12-15 mpa. Density of material 1200-1300 kg per m <sup>3</sup> and water absorption range 12-15 %. As per drawing and as directed by Engineer in charge	sqm	1961.00

**CHAPTER – 6.0**  
**MASONRY WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 712	Specification for building limes.
2	IS 1077	Common burnt clay building bricks.
3	IS 1200 (Part 3)	Method of measurements of brick works.
4	IS 2212	Code of practice for brick work. (1st Revision)
5	IS 2222	Specification for burnt clay perforated building bricks.
6	IS 2849	Specification for non-load bearing gypsum partition blocks, (Solid and hollow types)
7	IS 3495	Method of test for burnt clay building bricks.
8	IS 3812	Specification for fly ash for use as pozzolana and admixture.
9	IS 4139	Specification of calcium silicate bricks.
10	IS4885	Specification for sewer brick.
11	IS 5454	Methods of sampling of clay building bricks.
12	IS 12894	Pulverized fuel ash lime bricks specification.
13	IS 13757	Specification of burnt clay fly ash bricks.
14	IS 2185 (part-3)	Autoclaved cellular aerated concrete
15	IS 6073	Autoclaved Reinforced cellular concrete floor and roof slabs saticifications
16	IS 6072	Autoclaved Reinforced cellular concrete wall slabs
17	IS 1893	Criteria for earth quake

## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Frequency of testing
1	2	3	4	5	6
1	Bricks/ brick/ Tiles	6.1.3, 6.1.4, 6.1.5,	Testing of Bricks/Brick Tiles for dimensions, Compressive strength, Water absorption and efflorescence	Laboratory	As per Table 6.3 and 6.4
2	Sewer Bricks	6.1.4	Dimensions, Compressive strength, Water absorption and Efflorescence	Laboratory	
3	Burnt clay Perforated building bricks	6.1.5	Dimensions, Compressive strength, Water absorption and Efflorescence	Laboratory	As per Table 6.3 and 6.4
4	AAC blocks		Dimensions, Laboratory, Compressive, strength, Block density Thermal conductivity Drying shrinkage		

**PREAMBLE**  
**BRICK WORK**  
**(CHAPTER: 6.0)**

**6.1 Bricks used in the masonry may be of the following type.**

**The Common Burnt Clay Bricks** shall conform to IS: 1077 and shall be hand moulded or machine moulded. They shall be free from nodules of free lime, visible cracks, flaws warpage and organic matter, have a frog 100 mm in length 40 mm in width and 10 mm to 20 mm deep on one of its flat sides. Each brick shall be marked (in the frog where provided) with the manufacturer's identification mark or initials. The common burnt bricks classified as under:

- (a) Class 40 TM chimney brick/grog or ghol brick: - For this item either selected chimney burnt bricks or ghol bricks are used and superior workmanship than the following varieties is required. The crushing strength when thoroughly soaked in water shall not be less than 40 kg/sq.cm.
- (b) Class 25 TM chimney brick masonry: - The crushing strength when thoroughly soaked in water shall not be less than 25 kg/sq.cm.
- (c) Class 25 TM open bhatta or pajawa burnt brick: - As is clear the only difference between (b) and (c) varies in the method of burning bricks. The crushing strength when thoroughly soaked in water shall not be less than 25 kg/sq.cm.

**Fly Ash Lime Bricks (FALG Bricks):**The Fly Ash Lime Bricks (FALG Bricks) shall conform to IS 12894. Visually the bricks shall be sound, compact and uniform in shape free from visible cracks, warpage, flaws and organic matter. The bricks shall be solid and with or without frog on one of its flat side.

**Fly Ash:** Fly ash shall conform to IS 3812.

**Note:** FLAG Bricks will be used only for load bearing structure upto 2 storeys and for non- load bearing walls 20 cms thick for multi-storeyed buildings. Bottom ash used as replacement of sand shall not have more than 12% loss on ignition when tested.

**Sand:** Deleterious materials, such as clay and silt in the sand shall preferably be less than 5%.

**Lime:** Lime shall conform to class 'C' hydrated lime of IS 712.

**Additives:** Any suitable additive considered not detrimental to the durability of bricks may be used.

**Clay Fly Ash Bricks:** The clay fly ash bricks shall conform to IS 13757. The bricks shall be sound, compact and uniform in shape and colour. Bricks shall have smooth rectangular faces with sharp and square corners. The bricks shall be free from visible cracks, flaws, warpage, nodules of free lime and organic matter, the bricks shall be hand or machine moulded. The bricks shall have frog of 100 mm in length 40 mm width and 10 to 20 mm deep on one of its flat sides. If made by extrusion process may not be provided with frogs. Fly Ash shall conform to grade I or grade II of IS 3812.

**Calcium Silicate Bricks:** The bricks shall conform to IS 4139. The Calcium silicate bricks shall be sound, compact and uniform in shape. Bricks shall be free from visible cracks, warpage, organic matter, large pebbles and nodules of free lime. Bricks shall be solid and with or without frog. The bricks shall be made of finely grounded sand siliceous rock and lime. In addition limited quantity of fly ash conforming to IS 3812 may be used in the mix. These bricks are also known as Fly Ash Sand Lime bricks in the construction industry.

**Mechanized Autoclave Fly Ash Lime Brick:** These bricks shall be machine moulded and prepared in plant by appropriate proportion of fly ash and lime. The autoclave fly ash bricks shall conform to IS 12894. Visually, the bricks shall be sound, compact and uniform shape, free from visible cracks, warpage and organic matters. The brick shall be solid with or without frog, and of 100/80 mm in length, 40 mm width and 10 to 20 mm deep one of its flat side as per IS 12894. The brick shall have smooth rectangular faces with sharp corners and shall be uniform in shape and colour. Fly ash shall conform to IS 3812 and lime shall conform to class 'C' hydrated lime of IS 712.

## 6.2 Dimensions

The brick may be modular bricks/tiles shall be as per Table 6.1. While use of modular bricks/tiles is recommended, sizes shall be as mentioned in Table 6.1 specified.

**Table 6.1**  
**Dimensions of Bricks**

Type of Bricks/ Tiles	Nominal Size mm	Actual Size mm
Modular Bricks	200 × 100 × 100 mm	190 × 90 × 90 mm
Modular tile bricks	200 × 100 × 40 mm	190 × 90 × 40 mm

## 6.3 Classification

Bricks/Brick tiles shall be classified on the basis of their minimum compressive strength as given below:

**Table 6.2**  
**Classification of Bricks**

Class Designation	Average compressive strength			
	N/mm <sup>2</sup>	(kgf/cm <sup>2</sup> )	N/mm <sup>2</sup>	(kgf/cm <sup>2</sup> )
Designation 40	4.0	40	5.0	50
Designation 25	2.5	25	3.0	30

The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour and emit clear ringing sound when struck.

**Note:** Upper limits specified in Table 6.2 are for calculating the average compressive strength.

## 6.4 Sampling and Tests

Samples of bricks shall be subjected to the following tests:

- (a) Dimensional tolerance.
- (b) Water absorption.
- (c) Efflorescence.
- (d) Compressive strength.

**Sampling:** For carrying out compressive strength, water absorption, efflorescence and dimensional tests, the samples of bricks shall be taken at random from the lot given in Table 6.3. The sample thus taken shall be stored in a dry place until tests are made. For the purpose of sampling, the following definition shall apply.



**Lot:**A collection of bricks of same class and size, manufactured under relatively similar conditions of production. For the purpose of sampling a lot shall contain a maximum, of 50,000 bricks. In case a consignment has bricks more than 50,000 of the same classification and size and manufactured under relatively similar conditions of production, it shall be divided into lots of 50,000 bricks or part thereof.

**Sample:** A collection of bricks selected for inspection and/or testing from a lot to reach the Decision regarding the acceptance or rejection of the lot.

**Defective:**A brick failing to meet one or more of the specified requirements.

The samples shall be taken as below:

**Sampling from a Stack:** When it is necessary to take a sample from a stack, the stack shall be divided into a number of real or imaginary sections and the required number of bricks drawn from each section. For this purpose bricks in the upper layers of the stack shall be removed to enable units to be sampled from places within the stack.

**Scale of sampling and criteria for conformity for visual and dimensional characteristics:**

**Visual characteristics:** The bricks shall be selected and inspected for ascertaining their conformity to the requirements of the relevant specification.

The number of bricks to be selected from a lot shall depend on the size of lot and shall be in accordance of Col. 1 and 2 of Table 6.3 for visual characteristics in all cases and dimensional characteristics if specified for individual bricks.

**Visual Characteristics:** All the bricks selected above in accordance with Col. 1 and 2 of Table 6.3 shall be examined for visual characteristics. If the number of defective bricks found in the sample is less than or equal to the corresponding number as specified in Col. 3 of Table 6.3 the lot shall be considered as satisfying the requirements of visual characteristics, otherwise the lot shall be deemed as not having met the visual requirements.

**Dimensional Characteristics:** The number of bricks to be selected for inspecting the dimensions and tolerance shall be in accordance with Col. 1 and 4 of Table 6.3. These bricks will be divided into groups of 20 bricks at random and each of the group of 20 bricks thus formed will be tested for all the dimensions and tolerances. A lot shall be considered having found meeting the requirements of dimensions and tolerance if none of the groups of bricks inspected fails to meet the specified requirements.

**TABLE 6.3****Scale of Sampling and Permissible Number of Defectives for Visual and Dimensional Characteristics.**

No. of bricks in the lot	For characteristics specified for individual bricks		For dimensional characteristics for group of 20 bricks
	No. of bricks to be selected	Permissible no. of defective in the sample	No. of bricks to be selected
1	2	3	4
2001—10000	20	1	40
10001—35000	32	2	60
35001—50000	50	3	80

**Note:** In case the lot contains 2000 or less bricks the sampling shall be as per decision of the Engineer-in-Charge.

**Scale of Sampling and Criteria for Physical Characteristics:** The lot which has been found satisfactory in respect of visual and dimensional requirements shall be next tested for physical characteristics like compressive strength, water absorption, efflorescence as specified in relevant material specification. The bricks for this purpose shall be taken at random from those already selected above. The number of bricks to be selected for each of these characteristics shall be in accordance with relevant columns of Table 6.4.

**Table 6.4****Scale of Sampling for Physical Characteristics**

Lot size	Sample size for compressive strength, water absorption and efflorescence	Permissible No. of defectives for efflorescence	Warpage	
			Sample size	Permissible No of defects
1	2	3	4	5
2001—10000	5	0	10	0
10001—35000	10	0	20	1
35001—50000	15	1	30	2

**Note:** In case the lot contains 2000 or less bricks, the sampling shall be as per decision of Engineer-in-Charge.

A lot shall be considered having satisfied the requirements of physical characteristics if the condition stipulated here in are all satisfied.

From the test results for compressive strength, the average shall be calculated and shall satisfy the requirements specified in relevant material specification.

**Note:** In case any of the test results for compressive strength exceeds the upper limit for the class of bricks, the same shall be limited to the upper limit of the class for the purpose of ave

Wherever specified in the material specification, the compressive strength of any individual bricks tested in the sample shall not fall below the minimum average compressive strength specified for the corresponding class of brick by more than 20 per cent.

From the test results for water absorption, the average for the bricks in the sample shall be calculated and shall satisfy the relevant requirements specification in material specification.

The number of bricks failing to satisfy the requirements of the efflorescence specified in the relevant specification should not be more than the permissible no. of defectives given in Col. of Table 6.4.

**Dimensional Tolerances:** The dimensions of, specifications modular bricks when tested as described above as per procedure described in Appendix A of Chapter 6 shall be within the following limits per 20 bricks or locally available size as approved by Engineer-in-charge.

### **For modular size**

Length 7320 to 3880 mm ( $3800 \pm 80$  mm)

Width 1760 to 1840 mm ( $1800 \pm 40$  mm)

Height 1760 to 1840 mm ( $1800 \pm 40$  mm) for 90 mm high bricks

60 to 840 mm ( $800 \pm 40$  mm) for 40 mm high bricks

## **6.5 BRICK WORK**

### **Classification**

The brick work shall be classified according to the class designation of bricks used.

### **6.6 Mortar**

The mortar for the brick work shall be as specified, and conform to accepted standards. Lime shall not be used where reinforcement is provided in brick work.

### **6.7 Soaking of Bricks**

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

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

**Note II:** If the bricks are soaked for the required time in water that is frequently changed the soluble salt in the bricks will be leached out, and subsequently efflorescence will be reduced.

### **6.8 Laying**

Bricks shall be laid in English Bond, unless otherwise specified. For brick work in half brick wall, bricks shall be laid in stretcher bond. Half or cut bricks shall not be used except as closer where necessary to complete the bond. Closers in such cases, shall be cut to the required size and used near the ends of the wall. Header bond shall be used preferably in all courses in curved plan for ensuring better alignment.

**Note:** Header bond shall also be used in foundation footings unless thickness of walls (width of footing) makes the use of headers impracticable. Where thickness of footing is uniform for a

number of courses, the top course of footing shall be headers.

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 lying, 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 it. Joints shall be fully filled and packed with mortar such that no hollow space is left inside the joints.

The walls shall be taken up truly in plumb or true to the required batter where specified. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in the alternate course shall come directly one over the other. Quoin, Jambs and other angles shall be properly plumbed as the work proceeds. Care shall be taken to keep the perpend properly aligned within following maximum permissible tolerances:

- (i) Deviation from vertical within a storey shall not exceed 6 mm per 3 m height.
- (ii) Deviation in verticality in total height of any wall of building more than one storey in height shall not exceed 12.5 mm.
- (iii) Deviation from position shown on plan of any brick work shall not exceed 12.5 mm.
- (iv) Relative displacement between load bearing wall in adjacent storeys intended to be vertical alignments shall not exceed 6 mm.
- (v) A set of tools comprising of wooden straight edge, masonic spirit levels, square, 1 metre rule line and plumb shall be kept on the site of work for every 3 masons for proper check during the progress of work.

All quoins shall be accurately constructed and the height of brick courses shall be kept uniform. This will be checked using graduated wooden straight edge or storey rod indicating height of each course including thickness of joints. The position of damp proof course, window sills, bottom of lintels, top of the wall etc. along the height of the wall shall be marked on the graduated straight edge or storey rod. Acute and obtuse quoins shall be bonded, where practicable in the same way as square quoins. Obtuse quoins shall be formed with squint showing three quarters brick on one face and quarter brick on the other.

The brick work shall be built in uniform layers. No part of the wall during its construction shall rise more than one metre 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.

Top courses of all plinths, parapets, steps and top of walls below floor and roof slabs shall be laid with brick on edge, unless specified otherwise. Brick on edge laid in the top courses at corner of walls shall be properly radiated and keyed into position to form cut corners. Where bricks cannot be cut to the required shape to form cut corners, cement concrete 1:2:4 (1 cement:2 sand: 4 graded stone aggregate 20 mm nominal size) equal to thickness of course shall be provided in lieu of cut bricks.

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.

To facilitate taking service lines later without excessive cutting of completed work, sleeves (to be paid separately) shall be provided, where specified, while raising the brick work. Such sleeves in external walls shall be sloped down outward so as to avoid passage of water inside.

Top of the brickwork in coping and sills in external walls shall be slightly tilted. Where brick coping and sills are projecting beyond the face of the wall, drip course/throating (to be paid separately) shall be provided where indicated.

Care shall be taken during construction that edges of jambs, sills and projections are not damaged in case of rain. New built work shall be covered with gunny bags or tarpaulin so as to prevent the mortar from being washed away. Damage, if any, shall be made good to the satisfaction of the Engineer-in-Charge.

Vertical reinforcement in the form of bars (MS or high strength deformed bars or thermo mechanically treated bars as per direction of Engineer-in-Charge)), considered necessary at the corners and junction of walls and jamb opening doors, windows etc. shall be encased with cement mortar not leaner than 1:4 (1 cement : 4 sand), or cement concrete mix as specified. The reinforcement shall be suitably tied, properly embedded in the foundation and at roof level. The dia. of bars shall not be less than 8 mm and concrete grade shall be minimum 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size).

In retaining walls and the like, where water is likely to accumulate, weep holes, 50 to 75 mm square shall be provided at 2 m vertically and horizontally unless otherwise specified. The lowest weep hole shall be at about 30 cm above the ground level. All weep holes shall be surrounded by loose stones and shall have sufficient fall to drain out the water quickly.

**Note:** Work of providing loose stone will be payable extra.

Work of cutting chases, wherever required to be made in the walls for housing G.I. pipe, CI pipe or any other fixtures shall be carried out in various locations as per guidelines given below:

Cutting of chases in one brick thick and above load bearing walls.

- (i) As far as possible services should be planned with the help of vertical chases. Horizontal chases should be avoided.
- (i) The depths of vertical chases and horizontal chases shall not exceed one-third and one-sixth of the thickness of the masonry respectively.
- (i) When narrow stretches of masonry (or short length of walls) such as between doors and windows, cannot be avoided they should not be pierced with openings for soil pipes or waste pipes or timber joints, etc. Where there is a possibility of load concentration such narrow lengths of walls shall be checked for stresses and high strength bricks in mortar or concrete walls provided, if required.
- (iv) Horizontal chases when unavoidable should be located in the upper or lower one-third of height of storey and not more than three chases should be permitted in any stretch of a wall. No continuous horizontal chase shall exceed one metre in length. Where unavoidable, stresses in the affected area should be checked and kept within the permissible limits.
- (v) Vertical chases should not be closer than 2 m in any stretch of a wall. These shall be kept away from bearings of beams and lintels. If unavoidable, stresses in the affected area should be checked and kept within permissible limits.

- (vi) Masonry directly above a recess, if wider than 30 cm horizontal dimension) should be supported on lintel. Holes in masonry may be provided upto 30 cm width and 30 cm height without any lintel. In the case of circular holes in the masonry, no lintel need be provided for holes upto 40 cm in diameter.

Cutting of chases in half brick load bearing walls. No chase shall be permitted in half brick load bearing walls and as such no recessed conduits and concealed pipes shall be provided with half brick thick load bearing walls.

Cutting of chases in half brick non-load bearing wall: Services should be planned with the help of vertical chases. Horizontal chase should be provided only when unavoidable.

## 6.9 Joints

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.

**Note:** Specified thickness of joints shall be of 1 cm. Deviation from the specified thickness of all joints shall not exceed one-fifth of specified thickness.

**Finishing of Joints:** The face of brick work may be finished flush or by pointing. In flush finishing either the face joints of the mortar shall be worked out while still green to give a finished surface flush with the face of the brick work or the joints shall be squarely raked out to a depth of 1 cm while the mortar is still green for subsequently plastering. The faces of brick work shall be cleaned with wire brush so as to remove any splashes of mortar during the course of raising the brick work. In pointing, the joints shall be squarely raked out to a depth of 1.5 cm while the mortar is still green and raked joints shall be brushed to remove dust and loose particles and well wetted, and shall be later refilled with mortar to give ruled finish. Some such finishes are 'flush', 'weathered', ruled, etc.

## 6.10 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.

## 6.11 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.

**Single Scaffolding:** Where plastering, pointing or any other finishing has been indicated for brick work, single scaffolding may be provided, unless otherwise specified. In single scaffolding, one end of the put-logs/pole shall rest in the hole provided in the header course of brick masonry. Not more than one header for each put-log/pole shall be left out. Such holes shall not be allowed in the case of pillars, brick work less than one metre in length between the openings or near the skew backs of arches or immediately under or near the structural member supported by the walls. The holes for putlogs/poles shall be made good with brick work and wall finishing as specified.

**Double Scaffolding:** Where the brick work or tile work is to be exposed and not to be finished with plastering etc. double scaffolding having two independent supports, clear of the work, shall be provided.

## 6.12 HALF BRICK WORK



Brick work in half brick walls shall be done in the same manner as described earlier 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 8 mm dia., shall be embedded in every third course as given in the item. 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 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.

## TEST FOR COMPRESSIVE STRENGTH OF BRICKS

### Specimen

- Five whole bricks shall be taken from the samples as specimens for this test. Length and width of each specimen shall be measured correct to 1 mm.

### Apparatus

- The apparatus consists of compression testing machine, the compression plate of which shall have a ball seating in the form of portion of a sphere the centre of which shall coincide with the centre of the plate.

### Procedure:

- Pre-conditioning: The specimen shall be immersed in the water for 24 hours at 25° to 29°C. Any surplus moisture shall be allowed to drain at room temperature. The frog of the bricks should be filled flush with mortar 1:3 (1 cement: 3 sand of grade 3 mm and down) and shall be kept under damp jute bags for 24 hours, after that these shall be immersed in clean water for three days. After removal from water, the bricks shall be wiped out of any traces of moisture.
- Actual Testing: Specimen shall be placed with flat faces horizontal and mortar filled face upward between three 3 ply plywood sheets each of thickness 3 mm and carefully centred between plates of the testing machine. Plaster of Paris can also be used in place of plywood sheets to ensure a uniform surface. Load shall be applied carefully axially at uniform rate of 14 N/mm<sup>2</sup> per minute till the failure of the specimen occurs.

### Reporting the Test Results

- The compressive strength of each specimen shall be calculated in N/mm<sup>2</sup> as under :

$$\text{Compressive Strength} = \frac{\text{Maximum load at failure (in N)}}{\text{Area of Specimen (in sq mm)}}$$

In case the compressive strength of any individual brick tested exceeds the upper limit of the average compressive strength specified for the corresponding class of brick, the same shall be limited to the upper limit of the class for the purpose of calculating the average compressive strength. Compressive strength of all the individual bricks comprising the sample shall be averaged and reported.

### Criteria for Conformity

- A lot shall be considered having satisfied the requirements of average compressive strength if the average compressive strength specified for the corresponding class of brick tested is not below the minimum average compressive strength specified for the corresponding class of bricks by more than 20 per cent.

## TEST FOR WATER ABSORPTION (BRICKS)

### No. of Specimen

- Five whole bricks shall be taken from samples as specimen for this test.

### Apparatus

- A balance required for this test shall be sensitive to weigh 0.1 percent of the weight of the specimen.

### Procedure

- Pre-conditioning: The specimen shall be allowed to dry in a ventilated oven at a 110°C to 115°C till it attains a substantially constant weight. If the specimen is known to be relatively dry, this would be accomplished in 48 hours, if the specimen is wet, several additional hours may be required to attain a constant weight. It shall be allowed to cool at room temperature. In a ventilated room, properly separated bricks will require four hours for cooling, unless electric fan passes air over them continuously in which case two hours may suffice. The cooled specimen shall be weigh (W<sub>1</sub>) a warm specimen shall not be used for this purpose.
- Actual Testing: Specimen shall be completely dried before immersion in the water. It shall be kept in clean water at a temperature of 27°C ± 2°C for 24 hours. Specimen shall be wiped out of the traces of water with a damp cloth after removing from the water and then shall be weighed within three minutes after removing from water (W<sub>2</sub>).

### Reporting the Test Results

- The water absorption of each specimen shall be calculated as follows and the average of five tests shall be reported.

$$\text{Water Absorption} = \frac{W_2 - W_1}{W_1} \times 100$$

### Criteria for Conformity

- A lot shall be considered having satisfied the requirements of water absorption if the average water absorption is not more than 20% by weight.

## TEST FOR EFFLORESCENCE (BRICKS)

### No. of Specimen

- Five whole bricks shall be taken as specimen for this test.

### Apparatus

- Apparatus required for this test shall be a shallow flat bottom dish containing distilled water.

### Procedure (actual testing)

- The brick shall be placed vertically in the dish with 2.5 cm immersed in the water. The room shall be warm (18°C to 30°C) and well ventilated. The bricks should not be removed until it absorbs whole water. When the whole water is absorbed and the brick appears to be dry, place a similar quantity of water in that dish and allow it to evaporate as before. The brick shall be examined after the second evaporation.



## Reporting the Test Results

- The rating to efflorescence in ascending order shall be reported as ‘NIL’, ‘SLIGHT’, ‘MODERATE’, ‘HEAVY’ or ‘SERIOUS’ in accordance with the following :
  - (i) NIL: When there is no perceptible deposit of efflorescence.
  - (ii) SLIGHT: When not more than 10 per cent of the area of the brick is covered with a thin deposit of salts.
  - (iii) MODERATE: When there is heavier deposit and covering upto 50% of the area of the brick surface but unaccompanied by powdering or flaking of the surface.
  - (iv) HEAVY: When there is a heavy deposit of salts covering 50% or more of the brick surface but unaccompanied by powdering or flaking of the surface.
  - (v) SERIOUS: When there is heavy deposit of salts, accompanied powdering and/or flaking of the surface and tending to increase in the repeated wetting of the specimen.

## Criteria for Conformity

- A lot be considered having satisfied the requirements of efflorescence if for 4 out of the specimen of 5 bricks, the rating of efflorescence is not beyond “Moderate”

### 6.14 AUTOCLAVED AERATED CONCRETE BLOCK MASONRY WORK

#### 6.14.1 Terminology

For the purpose of, Autoclave Aerated Concrete Block masonry work, the following definitions shall apply

- 1. Autoclaved** - Steam curing of concrete Products, sand lime bricks, asbestos cement products, hydrous calcium silicate insulation Products, or cement in an autoclave at maximum ambient temperatures generally between 1700C to 2150C.
- 2. Block** - A concrete masonry unit, any one of the external dimensions of which is greater than the corresponding dimension of a brick as specified in IS : 3952-1978 and of such size and mass as to permit it to be handled by one man. Furthermore, to avoid confusion with slabs and Panels, the height of the block shall not exceed either its length or six times its width.
- 3. Block Density** - The density calculated by dividing the mass of a block by the overall volume, including holes or cavities and end recesses..
- 4. Drying Shrinkage** - The difference between the length of specimen which has been immersed in water and then subsequently dried to constant length, all under specified conditions; expressed as a percentage of the dry length of the specimen.
- 5. Gross Area**-The total area occupied by a block on its loading face, including areas of the cavities and end recesses.
- 6. Height** -The vertical dimension of the exposed face of a block, excluding any tongue or other device designed to provide mechanical keying

**7. Length** - The horizontal dimension of the exposed face of a block excluding any tongue or other device designed to provide mechanical keying.

**8. Width** -The external dimension of a block at the bedding plane, measured at right angles to the length and height of the block.

#### **6.14.2 Dimensions & Tolerances:**

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

Autoclave Aerated Concrete Block shall be referred to by its normal dimension the term 'normal' means that the dimension includes the thickness of the mortar joints. The actual dimension shall be 10mm short of the normal dimension (or 6mm short in special areas finer joints as specified).

**6.14.2.1** The normal dimension of the concrete block shall be as follows:-

Length : 400, 500 or 600 mm

Height : 200, 250 or 300 mm

Width : 100, 150, 200 or 250 mm

In addition, Autoclave Aerated Concrete Block shall be manufactured in half length of 200, 250 or 300 mm

correspond to the full lengths.

**6.14.2.2** The nominal dimensions of the units are so designed that taking account of the thickness of mortar joints, they will produce wall length and heights which will conform to the principles of modular co-ordination.

**6.14.2.3** Block of sizes other than those specified above, may also be used if so specified in the case of special Autoclave Aerated Concrete Block such as jallie or screen wall and ornamental block ,the specified size may not necessarily apply.

**6.14.2.4** The maximum variation in the length of the Autoclave Aerated Concrete Block shall not be more than plus/minus 5mm and maximum variation in the height and width of Autoclave Aerated Concrete Block, not more than plus/minus 3mm.

**6.14.2.5** The faces of Autoclave Aerated Concrete Block shall be flat & Rectangular, opposite faces shall be parallel and all arises shall be square. The bedding surfaces shall be at right angle to the face of the Blocks.

**6.14.2.6** The Autoclave Aerated Concrete Block with special faces shall be manufactured and supplied if so specified.

#### **6.14.3 Materials**

**6.14.3.1 Cement** complying with any of the Indian Standard may be used as per the direction of the manufacturer.

**6.14.3.2 Use of Fly ash** conforming to IS 3812-1981 may be permitted to a limit of 20% in cement conforming to IS 269-1976.

**6.14.3.3 The lime** shall satisfy the requirement for class C lime specified as IS 712-1973.

**6.14.3.4 The aggregate** used for the manufacture of Autoclave Aerated Concrete Block shall conform to the following requirements

(a) **Sand**-Conforming to IS 383-1970 except for the grading which may be made to suit the product and silica content shall not be less than 80%.

(b) **Fly ash** – Conforming to IS 3812-1981 with loss on ignition not more than 6%.

**6.14.3.5 The water** used in the manufacture of Autoclave Aerated Concrete Block shall be free from matter harmful to concrete or reinforcement or matter likely to cause efflorescence in the block and shall meet the requirements of IS 456-2000.

**6.14.3.6 Additives and Admixtures** may be added either as additives to the cement during manufacturing or as additive or admixtures to the concrete mix. Additive or admixtures used in the manufacture of concrete block may be

(a) Accelerating , water reducing and air –entraining admixtures conforming to IS 9103-1979

(b) Water proofing agent conforming to IS 2645-1975

(c) Colouring pigments

#### **6.14.4 Physical requirements**

**6.14.4.1** All Autoclave Aerated Concrete Block shall be sound, free of cracks or other defects which interfere with the proper placing of block units, impair the strength or performance of the construction.

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

**6.14.4.3 Dimensions**- The overall dimension of the block units when measured shall be in accordance with para 6.14.2.1 subjected to the tolerances mentioned in para 6.14.2.4

**6.14.4.4 Block Density** - The Block density shall conform to the requirements specified in table of para 6.14.3, when tested accordance with para 6.14.6 (1)

**6.14.4.5 Compressive Strength** - The min. compressive strength being the average of twelve block units shall be as prescribed in table of para 6.14.3, when tested accordance with para 6.14.6(2)

**6.14.4.6 Thermal Conductivity** - The thermal conductivity shall be not exceed the values specified in table of para 6.14.3 when tested accordance with para 6.14.6(3)

**6.14.4.7 Drying Shrinkage** – the drying shrinkage shall be not more than 0 .05% for grade –1 block and 0.10% for grade-2 block when tested accordance with para 6.14.6(4)

#### **6.14.5 Tests**

1. Block Density- The block density shall be determined in the manner described in IS 6441 ( part-1) -1972

2. Compressive Strength- The compressive strength of block shall be determined in accordance with IS 6441 ( part-5) -1972

3. Thermal Conductivity- The thermal conductivity of block shall be determined in accordance with IS 3346 -1980

4. Drying Shrinkages-The drying shrinkage of block shall be determined in the manner described in IS 6441 ( part-2) -1972

### 6.14.6 Sampling

6.14.61 **Lot** - In any consignment, all the blocks of the same size and from the same batch of manufacture shall be grouped together into a minimum number of groups of 10000 blocks or less. Each such group shall constitute a lot.

6.14.62 From each lot, a sample of 24 blocks shall be selected at random. The required numbers of Blocks shall be taken at regular intervals during the loading of the vehicle or unloading the vehicles depending on whether sample is taken before delivery or after delivery. When this is not practicable, sample shall be taken from the stack in which case the required number of blocks shall be taken at random from across the top of the stacks, the sides accessible and from the interior of the stacks by opening trenches from the top.

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

### 6.14.7 Number of tests

6.14.7.1 All the 24 Blocks shall be checked for dimensions and inspected for visual defects.

6.14.7.2 Out of the 24 blocks, 12 blocks shall be subjected to the test for compressive strength, 3 blocks to the test for density, 3 blocks to the test for thermal conductivity and 3 blocks to the test for drying shrinkage. The remaining 3 blocks shall be reserved for re-test for drying shrinkage if a need arises.

6.14.7.3 The samples of AAC blocks (each sample consisting of 6 specimen) shall be chosen randomly from the lot procured and tested for various parameters specified in para 6 above. One samples shall be tested for every **100 cum** or part thereof. However, minimum one sample shall be tested from each lot received at site if the quantity procured in the lot is less than 100 cum. If required, Engineer-in-Charge or his authorized representative shall inspect the factory during production of the material for this work and also collect samples (of materials used for making AAC blocks and precast AAC blocks) from the factory itself. The contractor shall consider this contingency also while placing the order with one of the approved firms. Nothing extra shall be payable on this account.

### 6.14.8 – Criteria for conformity

6.14.8.1 The number of blocks with dimensions outside the tolerance limit and or with visual defects, among those inspected, shall not be more than two.

6.14.8.2 For density, the mean value shall be within the range specified in Table of para3

6.14.8.3 For compressive strength, the mean value, say X shall be determined. The test results shall be grouped into groups of 4, individual values of ranges shall be determined, the average range a calculated from these values and shall satisfy the following condition:  $X - 0.6 R >$  minimum value specified in Table of para3.

6.14.8.4 For thermal conductivity, the mean value shall be equal to or less than the value specified in Table of para3.

6.14.8.5 For drying shrinkage, all the test specimens shall satisfy the requirements of the test. If one or more specimens fail to satisfy the requirements, the remaining 3 blocks shall be subjected to these tests. All these blocks shall satisfy the requirements.

### **6.14.9 Manufacturer's Certificate**

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

### **6.14.10 Independent Tests**

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

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

### **6.14.11 Storage**

6.14.11.1 General requirements of storage of autoclaved cellular (aerated) concrete blocks shall be as described in IS : 4082-1977\*.

### **6.14.12 Marking**

6.14.12.1 Each lot of concrete masonry units manufactured in accordance with this specification shall be suitably marked with information-

- (i) The identification of the manufacture
- (ii) The grade and block density of the unit
- (iii) The month and year of manufacturing

Each block may also be marked with the ISI Certification mark.

**6.14.13** The R.C C bend shall be provided on **150mm /230mm/300mm** thick masonry to increase the strength and compatibility . The RCC bend shall be provided at sill level and at lintel level over throughout the wall. This thickness of the bend shall be approved by the Engineer in charge or as specified in drawing. The payment of RCC bend and reinforcement shall be paid separately.

Autoclave Aerated Concrete Block masonry shall be provided with polymer modified adhesive mortar.

The polymer modified adhesive mortar shall be provided @ 30 kg per cum or with cement mortar 1:4 (1 cement : 4 coarse sand).

**6.14.14.** Autoclave Aerated Concrete Block with **100 mm thick** masonry shall be provided with two number 6mm dia reinforcement steel bar at every third course. The payment of reinforcement shall be paid separately.

**6.14.15.** Autoclaved Aerated Concrete Block confirming the IS Code – 2185 (Part-3) 1984 (Reaffirmed 2005)

### **6.14.16 Measurements**

6.14.16.1 Autoclave Aerated Concrete Block Masonry shall be measured in cubic metres unless otherwise specified. Any extra work over the specified dimensions shall be ignored. Dimensions shall be measured correct to the nearest 0.01 metre, ie. 1 cm. Areas shall be calculated to the nearest 0.01 sqm and the cubic contents shall be worked out to the nearest 0.01 cubic metres.

**Note :** (i) Autoclave Aerated Concrete Block work in parapet walls, mummy, lift machine room and water tanks constructed on the roof upto 1.2 m height above roof shall be measured together with the corresponding work of the floor next below.

6.14.162 No deductions or additions shall be done and no extra payment made for the following:

Note: Where minimum area is defined for deduction of an opening, void or both, such areas shall refer only to

opening or void within the space measured.

(a) Ends of dissimilar materials (that is, joists, beams, lintels, posts, girders, rafters, purlins, trusses, corbels, steps etc.); up to 0.1 m<sup>2</sup> in section;

(b) Opening up to 0.1 m<sup>2</sup> in area (see Note);

(c) Wall plates, bed plates, and bearing of slabs, chajjas and the like, where thickness does not exceed 10 cm and bearing does not extend over the full thickness of wall;

(d) Cement concrete blocks as for hold fasts and holding down bolts;

(e) Iron fixtures, such as wall ties, pipes upto 300 mm diameter and hold fasts for doors and windows;

(f) Chases of section not exceeding 50 cm in girth; and

(g) Bearing portion of drip course, bearing of moulding and cornice.

Note: In calculating area of an opening, any separate lintel or sills shall be included with the size of the opening but end portions of lintel shall be excluded. Extra width of rebated reveals, if any, shall also be excluded.

6.14.163 String courses, projecting pilasters, aprons, sills and other projections shall be fully described and measured separately in running metres stating dimensions of each projection.

6.14.164 Square or rectangular pillars shall be measured separately in cubic metres

6.14.165 Circular pillars shall be measured separately in cubic metres as per actual dimensions.

6.14.166 Autoclave Aerated Concrete Block work curved on plan shall be measured like the block work in straight walls and shall include all cutting and wastage of blocks, tapered vertical joints and use of extra mortar, if any. Block work curved on plan to a mean radius not exceeding six metres shall be measured separately and extra shall be payable over the rates for block work in straight walls. Nothing extra shall be payable if the mean radius of the block work curved in plan exceeds six metres.

6.14.167 Tapered walls shall be measured net as walls and extra payment shall be allowed for making tapered surface for block work in walls.

#### **6.14.17 Rate**

The rate shall include the cost of materials and labour required for all the operations described. The rate shall also include the following:

(a) Raking out joints or finishing joints flush as the work proceeds;

(b) Preparing tops of existing walls and the like for raising further new block work.

(c) Rough cutting and waste for forming gables, splays at eaves and the like.

- (d) Leaving holes for pipes upto 150 mm dia. and encasing hold fasts etc.
- (e) Rough cutting and waste for block work curved in plan and for backing to stone or other types off acing.
- (f) Embedding in ends of beams, joists, slabs, lintels, sills, trusses etc.
- (g) Bedding wall plates, lintels, sills, roof tiles, corrugated sheets, etc. in or on walls if not covered in respective items
- (h) Leaving chases of section not exceeding 50 cm in girth or 350 sq cm in cross-section; and
- (i) Block on edge courses, cut brick corners, splays reveals, cavity walls, brick works curved on plan to a mean radius exceeding six metres.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
6.1		Brick work with 40kg/cm <sup>2</sup> chimney bricks up to plinth	Brick work with well burnt chimney bricks in bulls pattern trench kiln manufactured by ghol process, crushing strength not less than 40kg /cm <sup>2</sup> and water absorption not more than 15% in foundation and plinth i/c curing etc. complete.		
	6.1.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5818.00
	6.1.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	5626.00
6.2		Brick work with 40kg /cm <sup>2</sup> chimney bricks in superstructure	Brick work with well burnt chimney bricks in bulls patent trench kiln manufactured by ghol process ,crushing strength not less than 40kg /cm <sup>2</sup> and water absorption not more than 15% in superstructure above plinth level and up to floor two level i/c curing etc. complete.		
	6.2.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	6012.00
	6.2.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	5821.00
6.3		Brick work with 25kg /cm <sup>2</sup> chimney bricks in foundation and plinth	Brick work with well burnt chimney bricks in bulls pattern trench kiln, crushing strength not less than 25kg /cm <sup>2</sup> and water absorption not more than 20% in foundation and plinth i/c curing etc complete.		
	6.3.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5252.00
	6.3.2	CM 1:6	Cement Mortar 1:6 (1 cement:6 sand).	cum	5061.00
6.4		Brick work 25kg /cm <sup>2</sup> chimney bricks in superstructure	Brick work with well burnt chimney bricks in bulls pattern trench kiln, crushing strength not less than 25kg /cm <sup>2</sup> and water absorption not more than 20% in superstructure above plinth level and up to floor two level i/c curing etc complete.		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	6.4.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5446.00
	6.4.2	CM 1:6	Cement Mortar 1:6 (1 cement:6 sand).	cum	5255.00
6.5		Brick work with bhatta, bricks in foundation	Brick work with well brunt open bhatta, bricks, crushing strength not less than 25kg /cm <sup>2</sup> and water absorption not more than 20% in foundation and plinth i/c curing etc complete.		
	6.5.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	4347.00
	6.5.2	CM 1:6	Cement Mortar 1:6 (1 cement: 6 sand).	cum	4155.00
6.6		Brick work with bhatta, bricks in superstructure	Brick work with well brunt open bhatta, bricks, crushing strength not less than 25kg / cm <sup>2</sup> and water absorption not more than 20% in superstructure above plinth level and up to floor two level i/c curing etc complete.		
	6.6.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	4541.00
	6.6.2	CM 1:6	Cement Mortar 1:6 (1 cement : 6 sand)	cum	4350.00
6.7		Brick work fly ash bricks insuper structure	Brick work with fly ash lime bricks (FALG Bricks) conforming to IS:12894-2002, in super structure above plinth level up to floor two level in :		
	6.7.1	100 kg / cm <sup>2</sup>	Having 100 kg / cm <sup>2</sup> average compressive strength.		
	6.7.1.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5384.00
	6.7.1.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	5162.00
	6.7.2	75 kg / cm <sup>2</sup>	Having 75 kg / cm <sup>2</sup> average compressive strength.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	6.7.2.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5271.00
	6.7.2.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	5049.00
	6.7.3	50 kg / cm <sup>2</sup>	Having 50 kg / cm <sup>2</sup> average compressive strength.		
	6.7.3.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5158.00
	6.7.3.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	4936.00
6.8		Brick work with calcium silicate bricks	Brick work with calcium silicate bricks machine moulded conforming to IS:4139, having 100 kg/cm <sup>2</sup> average compressive strength in super structure above plinth level upto floor II level in :		
	6.8.1	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	cum	5287.00
	6.8.2	CM 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	5095.00
6.9		Brick work sewer bricks in foundation	Brick work with extruded burnt fly ash clay sewer bricks (Conforming to IS: 4885 ) in foundation and plinth :	cum	5082.00
			Cement Mortar 1:4 ( 1 cement : 4 sand)		
6.10		Brick work sewer bricks in arches	Brick work with extruded burnt fly ash clay sewer bricks (conforming to IS: 4885) in arches in foundation and plinth including centering and shuttering complete in cement mortar 1:3 (1 cement: 3 sand).	cum	7655.00
6.11		Extra for brick work above floor two level	Extra for brick work in superstructure above floor two levels for each additional floor or part thereof respective item.	cum	2%

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
6.12		Half brick masonry ghol brick 40 kg/cm <sup>2</sup>	Providing half brick masonry with well burnt chimney bricks in bull patent trench kiln manufactured by ghol process crushing strength not less than 40 kg /cm <sup>2</sup> and water absorption not more than 15% in superstructure above plinth level and up to floor two level.		
	6.12.1	CM 1:3	Cement mortar 1:3 (1 cement : 3 sand)	sqm	697.00
	6.12.2	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	sqm	673.00
6.13		Half brick masonry chimney 25 kg/cm <sup>2</sup>	Providing half brick masonry with well burnt chimney bricks in bull pattern trench kiln crushing strength not less than 25 kg /cm <sup>2</sup> and water absorption not more than 20% in superstructure above plinth level and up to floor two level.		
	6.13.1	CM 1:3	Cement mortar 1:3 (1 cement : 3 sand)	sqm	639.00
	6.13.2	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	sqm	615.00
6.14		Half brick masonry open bhatta bricks	Providing half brick masonry with well burnt open bhatta bricks crushing strength not less than 25 kg /cm <sup>2</sup> and water absorption not more than 20% in superstructure above plinth level and up to floor two level		
	6.14.1	CM 1:3	Cement mortar 1:3 (1 cement : 3 sand)	sqm	546.00
	6.14.2	CM 1:4	Cement mortar 1:4 (1 cement : 4 sand)	sqm	522.00
6.15		Half brick masonry fly ash lime bricks	Half brick masonry with fly ash lime Gypsum bricks (FALG bricks) conforming to IS: 12894, in super structure above plinth and upto floor two level.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	6.15.1	100 kg/cm <sup>2</sup>	Having 100 kg/cm <sup>2</sup> average compressive strength.		
	6.15.1.1	CM 1:3	Cement mortar 1 : 3 (1 cement : 3 sand)	sqm	570.00
	6.15.1.2	CM 1:4	Cement mortar 1 : 4 (1 cement : 4 sand)	sqm	551.00
	6.15.2	75 kg/cm <sup>2</sup>	Having 75 kg/cm <sup>2</sup> average compressive strength.		
	6.15.2.1	CM 1:3	Cement mortar 1 : 3 (1 cement : 3 sand)	sqm	524.00
	6.15.2.2	CM 1:4	Cement mortar 1 : 4 (1 cement : 4 sand)	sqm	505.00
	6.15.3	50 kg/cm <sup>2</sup>	Having 50 kg/cm <sup>2</sup> average compressive strength.		
	6.15.3.1	CM 1:3	Cement mortar 1 : 3 (1 cement : 3 sand)	sqm	479.00
	6.15.3.2	CM 1:4	Cement mortar 1 : 4 (1 cement : 4 sand)	sqm	459.00
6.16		Extra for half brick masonry above floor two level	Extra for half brick masonry in superstructure, above floor two level for every floor or part thereof respective item.	sqm	11.00
6.17		Extra for M.S. bars in half brick masonry	Extra for providing and placing in position 2 Nos. 8mm dia. M.S. bars at every third course of in half brick masonry.	sqm	127.00
6.18		Honey-comb brick work	Honey-comb brick work 10 cm thick with well burnt chimney bricks manufactured by ghol process crushing strength not less than 40kg /sqm and water absorption not more than 15% in cement mortar 1:4 (1 cement : 4 sand).	sqm	456.00
6.19		Extra for forming cavity in wall	Extra for forming cavity 5cm to 7.5cm wide in cavity walls with necessary weep and vent holes including use of cores and cost of providing and fixing bitumastic coated M .S. Ties 300mm long of	sqm	75.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			25x3mm section at not less than 3 ties per sqm as per approved design.		
6.20		Brick work in plain arches	Brick work in plain arches in superstructure including centering and shuttering complete with chimney bricks having crushing strength not less than 40kg /cm <sup>2</sup> and water absorption not more than 15% in cement mortar 1:3 (1 cement : 3 sand).	cum	8507.00
6.21		Brick work in gauged arches	Brick work in gauged arches in superstructure in cement mortar 1:3 (1 cement : 3 sand) including centering and shuttering complete, with chimney bricks having crushing strength not less than 40kg /cm <sup>2</sup> and water absorption not more than 15%	cum	9691.00
6.22		Half brick masonry for closing cavity	Providing half brick masonry with kiln burnt clay bricks of 40kg /cm <sup>2</sup> and water absorption not more than 15% in cement mortar 1:3 (1Cement : 3 sand) in superstructure for closing cavity 5 to 7.5 cm wide in cavity wall complete with 10 cm wide bitumen felt type 3 grade 1.	metre	210.00
6.23		Extra for brick work under water	Extra for laying brick work in or under water and/or liquid mud including cost of pumping or bailing out water and removing slush etc. complete. <b>NOTE:</b> - The quantity will be calculated by multiplying the depth measured from sub - soil water level up to the centre of gravity of brick work under sub - water with the quantity of brick work in cum executed under the sub - soil water. The depth of centre of gravity shall be reckoned correct to 0.1 m. 0.05 mor more shall be taken as 0.1 m and less than 0.05 m ignored.	cum per metre depth	297.00
6.24		Extra for brick work in foul position	Extra for laying brick work in or under foul position.	cum	109.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
6.25		Cellular concrete block masonry	Providing and laying cellular concrete blocks masonry having density ranging from 800kg/m <sup>3</sup> in super structure above plinth level up to floor two level in cement mortar 1:4 (1 cement: 4 sand) The nominal dimensions of the concrete blocks shall be as follows in additional block shall be of half lengths of 200, 250 or 300 mm to correspond to the full lengths. The size of the blocks specified other than those specified may also be used.	cum	5052.00
6.26		Autoclaved Aerated Concrete (AAC) blocks masonry	Providing and laying Autoclaved Aerated Concrete (AAC) blocks masonry, using AAC blocks (Size length 300, 400, 500, 600 mm Height 200, 250, 300 mm Width 100, 150, 200, 250 mm) conforming to IS 2185 PART 3, having compressive strength not less than 4 MPa (Grade II) in super structure, blocks jointed with approved block laying polymer modified adhesive mortar as per ASTM 1660-09, applied in uniform thickness of 2 to 3 mm in horizontal and verticals joints using special trowel, polymer modified mortar having minimum compressive strength and minimum splitting tensile strength of not less than 5MPa and 0.34 MPa respectively as per ASTM international standard including raking out joints. The surface of masonry units (AAC-Block) should be slightly moist prior to application of jointing mortar. Block should be gently pressed down using a rubber mallet to expel out entrapped air and the masonry shall be cured two days. 1st layer of masonry block shall be placed on perfectly leveled surface, which if required, shall be leveled with M-15 cement concrete at plinth		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			or floor level. Masonry shall have 75mm thick RCC band with M-15 cement concrete having 2 bars horizontal of 8 mm dia with 8mm dia U- shaped single stirrup @ 300mm C/C. Such horizontal bands shall be placed at sill level and lintel level where there is a provision of windows in walls otherwise placed at vertical interval of 1.8 meter in vertical direction shall be spaced at 4.5 meter in horizontal direction. Vertical bands shall be placed along jams (vertical member of chowkhats) and extend upto lintel levels to arrest cracking at corner openings. RCC bands shall be measured with AAC block masonry. Rates include all materials including steel bars, wastages, scaffolding and all labour etc. complete.		
	6.26.1	Polymer modified mortar	AAC Masonry in polymer modified mortar	cum	5500.00
6.27		Extra for AAC work above floor two level	Extra for AAC masonry work in superstructure above floor two level for each additional floor or part thereof	cum	1%
6.28		Precast Reinforced AAC roof slabs, lintels and chhajjas	Providing hoisting & fixing precast Autoclaved Aerated Concrete (AAC) reinforced roof slabs, lintels and chhajjas as per IS: 6073 -2006 grade D specifications (dry density, without steel, 550 kg/m <sup>3</sup> to 650 kg/m <sup>3</sup> and minimum compressive strength 3.5 N/mm <sup>2</sup> ) Reinforcement shall be designed & spot welded as per ACI 523.4R-09 and shall have anti corrosive protective coating as per IS: 6441 (Part -4). The roof slabs shall have tongue and groove arrangement, jointed with polymer modified mortar, as per ASTM C 1660-09, groove provided with one bar of 10mm dia and filled with M20 grade cement concrete. Both ends of bar in groove shall be tied with bond beam of minimum 80 mm	cum	5700.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>width and depth equal to slab/panel thickness running at center of load bearing wall/ beam/ supports and on other support as well to achieve diaphragm action as per IS 1893:2000. The Peripheral bond beam shall have minimum 2 bars of 12 mm dia as longitudinal bars which shall be held down by hook made in 12 mm dia vertical bars coming out from structural beam. However Concrete in groove and bond beam shall not be paid separately but shall be measured with AAC reinforced slab. Precast orintel and chhajja shall be jointed with cm 1:6 or 2 to 3 mm thick polymer modified cement mortar as per ASTM C 1660-09 to AAC Block masonry. Structural steel if used for providing support to the lintels (such as cleat of angle iron, C-section anchored/hold fasted to column) at column end towards (where door / window opening is adjacent to the column) shall not be paid separately. Rate includes all handling, transportation, hire charges of machineries scaffolding and anti-corrosive protective coating on reinforcement inside AAC slab / lintel/chhajja etc. complete up to floor two levels. All reinforcement of peripheral bond beam, grooves and inside AAC slab, lintel, and chhajja shall be paid @ SOR rate (including tender percentage) separately.</p> <p>Quantity of reinforcement steel provided inside AAC slab, lintel and chhajja shall be ascertained on the basis of manufacturer's certificate and also by random destructive testing done by engineer-in-charge or his representative for which cost of samples and testing charges shall be borne by the contractor. Deflection &amp; ultimate load test for AAC reinforced roof slab and lintel shall</p>		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			be as per annex. B of IS: 6073 -2006 and criteria for conformity and sampling shall be as per clause-13 of IS: 6073 -2006.		
6.29		Precast Reinforced AAC wallpanels	<p>Precast autoclaved aerated concrete (AAC) reinforced wall panels:- Providing hoisting &amp; fixing precast Autoclaved Aerated Concrete (AAC) reinforced wall panels as per IS:6072 -1972 grade D (dry density, without steel, 550 kg/m<sup>3</sup> to 650 kg/m<sup>3</sup> and minimum compressive strength (3.5 N/mm<sup>2</sup>). Wall panels shall have tongue and groove arrangement, jointed with polymer modified mortar as per ASTM C 1660-09. Galvanized iron connector/cleats, nails &amp; screw and all accessories as per manufactures designed shall not be paid separately. All reinforcement inside panels, as per manufacturer's design &amp; spot welded as per ACI 523.4R-09, shall have anti corrosive protective coating as per IS: 6441 (Part -4), shall be paid separately. Rate includes all handling, transportation, hire charges of machineries scaffolding and anti-corrosive protective coating on reinforcement inside AAC wall panels etc. complete up to floor two level but does not include cost of reinforcement inside AAC panels. Quantity of reinforcement steel in AAC panels shall be ascertained on the basis of certificate of the manufacturer and also by random destructive testing by engineer-in-charge or his representative for which cost of samples and testing charges shall be borne by the contractor. Cost of reinforcement inside AAC panels shall be paid separately.</p>	cum	5800.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
6.30		Extra for reinforced AAC work above floor two level	Add extra for AAC wall panels, roof slabs, lintels and chhajjas above floor two level for each additional floor as per item no 6.29 and 6.30.	cum	1%
6.31		AAC blocks masonry Jali	Providing and laying Autoclaved Aerated Concrete (AAC) blocks masonry Jali work, using AAC blocks (Size length 300, 400, 500, 600 mm Height 200, 250, 300 mm Width 100, 150, 200, 250 mm) conforming to IS 2185 PART 3, having compressive strength not less than 4 MPa (Grade II) in super structure, blocks jointed with approved block laying polymer modified adhesive mortar as per ASTM 1660-09, applied in uniform thickness of 2 to 3 mm in horizontal and verticals joints using special trowel, polymer modified mortar having minimum compressive strength and minimum splitting tensile strength of not less than 5MPa and 0.34 MPa respectively as per ASTM international standard including raking out joints. The surface of masonry units (AAC-Block) should be slightly moist prior to application of jointing mortar. Block should be gently pressed down using a rubber mallet to expel out entrapped air and the masonry shall be cured two days. 1st layer of masonry block shall be placed on perfectly leveled surface, which if required, shall be leveled with M-15 cement concrete at plinth or floor level. . Rates include all materials including steel bars, wastages, scaffolding and all labour etc. complete.as per architectural drawing. The rates are inclusive of all lead & lifts and All necessaries to complete the item in good condition, nothing shall be paid extra separately unless specified.	cum	4237.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
6.32		Exposed non modular brick work of class designation 7.5	Brick work with common burnt clay selected F.P.S. (non modular) bricks of class designation 7.5 in exposed brick work including making horizontal and vertical grooves 10 mm wide 12 mm deep complete in cement mortar 1:6 (1 cement : 6 coarse sand)		
	6.32.1	Upto plinth	From ground level upto plinth level	cum	4689.00
	6.32.2	Above plinth upto floor two level	Above plinth level upto floor II level	cum	5236.00
6.33		Exposed modular brick work of class designation 7.5	Brick work with modular bricks of class designation 7.5 in exposed brick work including making horizontal and vertical grooves 10mm wide 12mm deep complete from ground level up to plinth level in cement mortar 1:6 (1 cement : 6 coarse sand)		
	6.33.1	Upto plinth	From ground level upto plinth level	cum	4038.00
	6.33.2	Above plinth upto floor two level	Above plinth level upto floor II level	cum	4563.00
6.34		Gypsum panel partitions	Providing and laying Gypsum panel partitions 100 mm thick with water proof Gypsum panels of size 666x500x100 mm, made of calcite phosphor Gypsum fixed with tongue and groove, jointed with bonding plaster as per manufacturer's specifications in superstructure above plinth level up to floor two level. Gypsum blocks will have a minimum compressive strength of 9.3 kg/cm <sup>2</sup>	sqm	653.00
6.35		Extra for above floor two level	Extra for Gypsum panel Partitions in superstructure above floor two level for every four floors or part thereof.	sqm	70.00
6.36		Brick work on exposed wall	Providing and laying Red Brick work of size 200X100x50 mm on exposed wall in cement mortar 1:3 including racking and jointing rubbing and filler polishing 2 coat as per direction by Engineer in Charge.	sqm	1838.00

**CHAPTER – 7.0**  
**STONE WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 737	Specifications for wrought aluminium and aluminium alloy, steel and strip for general engineering purpose.
2	IS 1121 - (Part-I)	Methods of determination of properties and strengths of natural building stones (Part-I compressive strength).
3	IS 1122	Methods for determination of specific gravity of natural building stone
4	IS 1123	Methods of identification of natural building stones.
5	IS 1124	Methods of test of determination of water absorption, apparent, specific gravity and porosity of natural building stones.
6	IS 1125	Methods of test of determination of weathering of natural building stone
7	IS 1126	Methods of test for determination of durability of natural building stone
8	IS 1128	Specification for Lime stone (Slab and Tiles).
9	IS 1129	Recommendations for dressing of natural building stones.
10	IS 1200 (Part-IV)	Methods of measurements of building and Civil engineering works stone Masonry.
11	IS 1197 (Part-I)	Code of practice for construction of rubble stone masonry
12	IS 1597 (Part-II)	Code of practice for construction of ashlar stone masonry
13	IS 1805	Glossary of terms relating to stones, quarrying and dressing
14	IS 3620	Specification for laterite stone block for masonry
15	IS 3622	Sand stone (Slab and Tiles)
16	IS 4104 (Part-I)	Code of practice for external facings and veneers (Part I-Stone facing)
17	IS 4101 (Part-II)	Code of practice for external facing and veneers: (Part II-Cement Concrete facing).

## LIST OF MANDATORY TESTS

Material	Clause	Test		Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
Stone	7.1.1 7.4 7.8 7.9	(i) Water Absorption	Not more than 2.5% by mass for sand stone and as specified in IS 1123 for Other stones.	Laboratory	IS 1124	50 sqm. for slabs and 10 cum in stone masonry	100 sqm/20 cum or part thereof or change of source as per direction of Engineer in- Charge
		(ii) Transverse Strength	Not less than 7 N/mm <sup>2</sup> (70 Kgf/cm <sup>2</sup> ) for sand stone and as specified in IS 1123 for Other stones.	Laboratory	IS 1121 Part II	-do-	-do-
		(iii) Resistance to wear	Not greater than 2 mm on the average and 2.5 mm for any individual specimen for sand stone and as specified in IS 1123 for other stones.	Laboratory	IS 1706	-do-	-do-
		(iv) Durability	Shall not develop signs of spalling, disintegration or cracks for sand stone and as specified in IS 1123 for Other stones.	Laboratory	IS 1126	-do-	-do-

**PREAMBLE  
STONE WORK  
(CHAPTER: 7.0)**

**7.1 RANDOM RUBBLE STONE MASONRY**

- **Material**
- **Stone**

The stone shall be of the type specified such as granite, trap, limestone, sand stone, quartzite, etc. and shall be obtained from the quarries, approved by the Engineer-in-Charge. Stone shall be hard, sound, durable and free from weathering decay and defects like cavities, cracks, flaws, sand holes, injurious veins, patches of loose or soft materials and other similar defects that may adversely affect its strength and appearance. As far as possible stones shall be of uniform colour, quality or texture. Generally stone shall not contain crypts crystalline silica, mica and other deleterious materials like iron-oxide organic impurities etc. Stones with round surface shall not be used. The compressive strength of common types of stones shall be as per Table 7.1 and the percentage of water absorption shall generally not exceed 5% for stones other than specified in Table 7.1. For laterite this percentage is 12%.

**Table 7.1  
Types of Stones**

<b>Type of stone</b>	<b>Maximum Water Absorption Percentage by weight</b>	<b>Minimum Compressive Strength kg./sq.cm.</b>
Granite	0.5	1000
Basalt	0.5	400
Lime stone (Slab and Tiles)	0.15	200
Sand stone (Slab and Tiles)	2.5	300
Marble	0.40	500
Quartzite	0.40	800
Late rite (Block)	12	35

**Note 1:** Test for compressive strength shall be carried out as laid down in IS 1121 (Part I).

**Note 2:** Test for water absorption shall be carried out as laid down in IS 1124.

**7.2 Size of Stones**

Normally stones used should be small enough to be lifted and placed by hand. Unless otherwise indicated, the length of stones for stone masonry shall not exceed three times the height and the breadth on base shall not be greater than three-fourth of the thickness of wall, or not less than 150 mm. The height of stone for rubble masonry may be upto 300 mm. The selection and grading of stones for rubble masonry is largely done at site and the smaller stones are used in the hearting of wall.

Random Rubble Masonry shall be uncoursed or brought to courses as specified. Uncoursed random rubble masonry shall be constructed with stones of sizes as specified and shapes picked up random from the stones brought from the approved quarry. Stones having sharp corners or round surfaces shall, however, not be used.

Random rubble masonry brought to the course is similar to uncoursed random rubble masonry except that the courses are roughly levelled at intervals varying from 300 mm to 900 mm in height according to the size of stones used.

### 7.3 Dressing

#### Hammer Dressed Surface

A hammer dressed stone shall have no sharp and irregular corners and shall have a comparatively even surface so as to fit well in masonry. Hammer dressed stone is also known as hammer faced, quarry faced and rustic faced. The bushing from the general wall face shall not be more than 40 mm on exposed face and 10 mm on faces to be plastered.

Each stone shall be hammer dressed on the face, the sides and the beds. Hammer dressing shall enable the stones to be laid close to neighboring stones such that the bushing in the faceshall not project more than 40 mm on the exposed face.

- (i) **Face stone:** At least 25% stones shall be headers tailing into the work at least 2/3rd the thickness of wall in super structure masonry. Such stones shall not be less than 200 sq. cm in cross sections.
- (ii) **Hearting Stones:** The hearting or interior filling of a wall face shall consist of rubble stones not less than 150 mm in any direction, carefully laid, hammered down with a wooden mallet into position and solidly bedded in mortar. The hearting should be laid nearly level with facing and backing.
- (iii) **Quoin Stone:** Quoin stone shall be less than 0.03 cum in volume.
- (iv) **Jamb stones:** The jambs shall not be made with stones specified for quoins except that the stones which were required to be provided at 1 metre centre to centre on both the exposed faces shall here be provided only on the jamb and the length shall be equal to the thickness of the wall for wall upto 60 cm and a line of headers shall be provided for walls thicker than 60 cm as specified for bond.

### 7.4 Courses

The masonry shall be carried out in regular courses of height not exceeding 50 cm and masonry on any day will not be raised more than 60 cm in height when using mortars having compressive strength less than 20 kg. /sq. cm at 28 days and 100 cm when using mortars exceeding this strength.

### 7.5 Thickness of Joints

The joint thickness shall not exceed 30 mm at any point on the face. Chips of the stone and spalls shall be wedged into seating bed of face stones to avoid excessive bed thickness. No pinning shall be allowed to avoid excessive joint thickness.

### 7.6 Mortar

The mortar used for joining shall be as specified.

### 7.7 Laying

Stone shall be laid on their natural bed and shall be solidly bedded full in mortar with close joints, chips of stone spalls be wedged into the work wherever necessary. No dry work or hollow spaces shall be allowed and every stone whether large or small shall be carefully



selected to fit snugly the interstices between the large stones. Masonry shall be built breaking joints in all the three directions. Bond stone and headers shall be properly laid into the work and shall be marked by the contractor with white lead paint. The bond stones shall be provided as specified. The masonry work in wall shall be carried up true to plumb or to specified batter. Random rubble masonry shall be brought to the level courses at plinth, window sills, and lintel and roof levels. Leveling shall be done with concrete comprising of one part of the mortar as used for masonry and two parts of graded stone aggregate of 20 mm nominal size. The masonry in structure shall be carried uniformly. Where the masonry of one part is to be delayed, the work shall be raked back at an angle not steeper than 45°.

### **7.8 Raking out joints**

All the joints on the faces to be pointed or plastered shall be raked out with racking tool to a depth of 20mm while the mortar is still green.

### **7.9 Bond Stones**

Though bond stones shall be provided in walls upto 600 mm thickness, a set of two or more bond stones overlapping each other by at least 150 mm shall be provided in a line from face to back. In case of highly absorbent types of stones (porous lime stone and sand stone etc.) the bond stone shall extend about two-third into the wall, as through stones in such walls a set of two or more bond stones overlapping each other by at least 150 mm shall be provided. Each bond stone or a set of bond stones shall be provided for every 0.5 m<sup>2</sup> of the wall surface and shall be provided at 1.5 m to 1.8 m apart clear in every course. In case of highly absorbent types of stones (porous lime stone and sand stone etc.) single piece bond stones may give rise to dampness. For all thicknesses of such walls a set of two or more bond stones overlapping each other by at least 15 cm shall be provided. Length of each such bond stone shall not be less than two-third of the thickness of the wall. Where bond stones of suitable lengths are not available pre-cast cement concrete block of 1:3:6 mix (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) of cross section not less than 225 square centimeters and length equal to the thickness. At least one bond stone or a set of bond stones shall be provided at 1.5 m to 1.8 m apart clear in every course. (Bond stones shall be marked suitably with paint as directed by the Engineer-in-Charge).

### **7.10 Quoin and Jamb Stones**

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

### **7.11 Joints**

Stones shall be so laid that all joints are fully packed with mortar and chips. Face joints shall not be more than 20 mm thick. The joints shall be struck flush and finished at the time of laying when plastering or pointing is not to be done. For the surfaces to be plastered or pointed, the joints shall be raked to a minimum depth of 20 mm when the mortar is still green.

### **7.12 Scaffolding**

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

## **COURSED RUBBLE MASONRY - FIRST SORT**

### **7.13 Dressing**

Face stones shall be hammer dressed on all beds, and joints so as to give them approximately rectangular block shape. These shall be squared on all joints and beds. The bed joint shall be rough chisel dressed for at least 80 mm back from the face, and side joints for at least 40 mm such that no portion of the dressed surface is more than 6 mm from a straight edge placed on it. The remaining unexposed portion of the stone shall not project beyond the surface of bed and side joint. The bushing on the face shall not project more than 40 mm as an exposed face and 10 mm on a face to be plastered. The hammer dressed stone shall also have a rough tooling for minimum width of 25 mm along the four edges of the face of the stone, when stone work is exposed.

### **7.14 Mortar**

The mortar for jointing shall be as specified.

### **7.15 Laying**

All stones shall be wetted before use. The walls shall be carried up truly plumb or to specified batter. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The height of each course shall not be less than 15 cm nor shall more than 30 cm. Face stones be laid alternate headers and stretchers. No pinning shall be allowed on the face. No face stone shall be less in breadth than its height and at least one third of the stones shall tail into the work for length not less than twice their height. The hearting or the interior filling of the wall shall consist of stones carefully laid on their proper beds in mortar; chips and spalls of stone being used where necessary to avoid thick beds of joints of mortar and at the same time ensuring that no hollow spaces are left anywhere in the masonry. The chips shall not be used below the hearting stone to bring these upto the level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearting and these shall not exceed 10% of the quantity of stone masonry. The masonry in a structure shall be carried up uniformly but where breaks are unavoidable, the joints shall be raked back at angle not steeper than 45°. Tothing shall not be allowed.

### **7.16 Bond Stones**

Shall be as specified except that a bond stone or a set of bond stones shall be inserted 1.5 to 1.8 metres apart, in every course.

### **7.17 Quoins**

The quoins shall be of the same height as the course in which these occur. These shall be at least 450 mm long and shall be laid stretchers and headers alternatively. These shall be laid square on the beds, which shall be rough-chisel dressed to a depth of at least 100 mm. In case of exposed work, these stones shall have a minimum of 25 mm wide chisel drafts at four edges, all the edges being in the same plane.

### **7.18 Joints**

All bed joints shall be horizontal and all side joints vertical. All joints shall be fully packed with mortar, face joints shall not be more than one cm thick. When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, joints shall be raked to a minimum depth of 20 mm by raking tool during the progress of work, when the mortar is still green.

## **COURSED RUBBLE MASONRY - SECOND SORT**

### **7.19 Dressing:**

Shall be as specified except that no portion of dressed surface of joints shall show a depth of gap more than 10 mm from a straight edge placed on it and use of chips shall not exceed 15 percent of the quantity of stone masonry.

### **7.20 Mortar**

The mortar for jointing shall be as specified.

### **7.21 Laying**

Shall be as specified as above except that the use of chips shall not exceed 15% of the quantity of stone masonry and stone, in each course need not be of the same height but not more than two stones shall be used in the height of a course.

### **7.22 Joints**

All bed joints shall be horizontal and all side vertical. All joints shall be fully packed with mortar, face joints shall not be more than 20 mm thick. When plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying. Otherwise, the joints shall be raked to a minimum depth of 20 mm by raking tool during progress of work, where the mortar is still green.

### **7.23 Plain Ashlar Masonry**

Stone shall be of the type specified. It shall be hard, sound, durable and tough, free from cracks, decay and weathering and defects like cavities, cracks, flaws, sand holes, veins, patches of soft or loose materials etc. before starting the work, the contractor shall get the stones approved by Engineer-in-Charge.

### **7.24 Kota Stone for Veneering**

Kota stone shall be of selected quality, hard, sound, dense and homogeneous in texture free from cracks, decay, weathering and flaws. They shall be machine cut to requisite size and thickness. They shall be of colour indicated in the drawings or as instructed by the Engineer-in-Charge. The stone shall have the top (exposed) face polished before being brought to site unless otherwise specified. Before starting the work, the contractor shall get the samples of Kota stone approved from the Engineer-in-Charge.

### **7.25 Dressing**

Every stone shall be cut to the required size and shape and fine machine dressed to the full depth so that a straight edge laid along the side of stone shall be in full contact with it. The thickness of the slab after it is dressed shall be 20, 25, 30 or 40 mm as specified in the item. Tolerance of  $\pm 2$  mm shall be allowed for the thickness.

### **7.26 Red Sand Stone and White Sand Stone Ashlar Masonry**

The stone shall be red or white as specified in the description of item. The stone shall be hard, sound, tough, and free from cracks, decay and weathering. In case of red sand stone, white patches or streaks shall not be allowed. However scattered spots upto 10 mm diameter will be permitted. Before starting the work the contractor shall get samples of stone approved by the Engineer-in-Charge.

### **7.27 Size of Stone**

Normally stones used should be small enough to be lifted and placed by hand. The length of the stone shall not exceed three times the height and the breadth on base shall not be greater than three fourth of the thickness of wall nor less than 15 cm. The height of stone may be upto 30 cm.

### **7.28 Dressing**

Every stone shall be cut to the required size and shape chisel dressed on all beds and joints so as to be free from waviness and to give truly vertical and horizontal joints. In exposed masonry, the faces that are to remain exposed in the final position and the adjoining faces to a depth of 6 mm shall be the fine chisel dressed so that when checked with 60 cm straight edge, no point varies from it by more than 1 mm. The top and bottom faces that are to form the bed joints shall be chisel dressed so that variation from 60 cm straight edge at no point exceeds 3 mm. Faces which are to form the vertical joints should be chisel dressed so that variation at any point with 60 cm straight edge does not exceed 6 mm. Any vertical face that is to come against backing of masonry shall be dressed such that variation from straight edge does not exceed 10 mm. All angles and edges that are to remain exposed in the final position shall be true, square and free from chippings. A sample of dressed stone shall be prepared for approval of Engineer-in-Charge. It shall be kept at the worksite as a sample after being approved.

### **7.29 Mortar**

The mortar for jointing shall be as specified.

### **7.30 Laying**

All stones shall be wetted before placing in position. These shall be floated on mortar and bedded properly in position with wooden mallets without the use of chips or under pinning of any sort. The walls and pillars shall be carried up truly plumb or battered as shown in drawings. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. In case of ashlar work without backing of brick work or coursed rubble masonry, face stone shall be laid headers and stretchers alternately unless otherwise directed. The headers shall be arranged to come as nearly as possible in the middle of stretchers above and below. Stone shall be laid in regular courses of not less than 30 cm in height and all the courses shall be of same height, unless otherwise specified. For ashlar facing with backing of brick work or coursed rubble masonry face stone shall be laid in alternate courses of headers and stretchers unless otherwise directed. Face stone and bond stone course shall be maintained throughout. All connected masonry in a structure shall be carried up nearly at one uniform level throughout, but where breaks are avoidable, the joint shall be made in good long steps so as to prevent cracks developing between new and old work. Bond stone provided in the masonry shall be payable in the item of Ashlar masonry. Neither any deduction will be made from the brick masonry for embedding the bond stone in the backing nor any extra payment shall be made for any extra labour involved in making holes in brick masonry backing. When necessary, jib crane or other mechanical appliances shall be used to hoist the heavy pieces of stones and place these into correct positions, care being taken that the corners of the stone are not damaged. Stone shall be covered with gunnybags, before tying chain or rope is passed over it, and it shall be handled carefully. No piece which has been damaged shall be used in work.

### **7.31 Joints**

All joints shall be full of mortar. These shall be not more than 6 mm thick. Face joints shall be uniform throughout and a uniform recess of 20 mm depth from face shall be left with the help of the steel plate during the progress of work.

### **7.32 Pointing**

All exposed joints shall be pointed with mortar as specified. The pointing when finished shall be sunk from stone face by 5 mm or as specified. The depth of mortar in pointing work shall not be less than 15 mm.

### 7.33 Curing

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

### 7.34 Protections

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

### 7.35 Punched Ashlar (Ordinary) Masonry

**Stone:** Shall be as specified above. In case of red or white sand stone, stone shall be red or white as specified in the item. In red sand stone, white patches or streaks shall not be allowed. However, scattered spots upto 10 mm diameter will be permitted.

**Dressing:** Shall be as previously described for ashlar masonry except that the faces exposed in view shall have a fine dressed chisel draft 2.5 cm wide all-round the edges and shall be rough tooled between the drafts, such that the dressed surface shall not be more than 3 mm from a straight edge placed over it.

### 7.36 Other Details

The specifications for mortars, laying and fixing, bond stone, joints, pointing, curing, protections, scaffolding, measurements and rates shall be same as specified.

### 7.37 Stone Veneering Work

Stone lining upto 8 cm shall be treated as veneering work and lining of greater thickness as plain Ashlar Masonry.

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

### 7.38 Dressing

Shall be as specified in earlier paras except that dressing at the back shall not be done, so as to ensure better grip with the hearting or backing. The dressed slabs shall be of the thickness as specified, with permissible tolerance of  $\pm 2$  mm.

### 7.39 Mortar

Mortar for fixing shall be as specified.

### 7.40 Laying

- The stone shall be wetted before laying. They shall then be fixed with mortar in position without the use of chips or underpinning of any sort.
- Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75 mm long and 6 mm diameter or as specified.
- Further the stones shall be secured to the backing by means of cramps. The material for cramps shall have high resistance to corrosion under conditions of dampness and against the chemical action of mortar or concrete in which cramps are usually embedded. Cramps shall be of 25 mm x 6 mm and 30 cm long in case of backing of stone masonry walls and brick masonry walls thicker than 200 mm. In case of backing with brick masonry walls 200 mm or less thick or RCC members, cramps shall be of 25 x 6 mm and length as per requirement made out of stainless steel or any other metal specified. Generally the outer length of cramp

in half brick work backing shall be 115 mm and in one brick work backing it shall be 150 mm. Cramps shall be spaced not more than 60 cm apart horizontally. Alternatively the stone may be secured to the backing by means of stone dowels 10 x 5 x 2.5 cm and the adjoining stone secured to each other by means of stainless steel cramps or copper pins of the specified size. Minimum one cramp/stone dowel shall be used to secure one slab to the backing.

- Cramps may be attached to its sides or top and bottom or sides, top and bottom. The actual number of cramps and their sections, however, shall be as per requirements of design to carry the loads.
- Where cramps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or a metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than 3.5 m apart and also over the heads of all openings. Such supports shall also be provided where there is transition from thin facings below to thick facings above.
- Alternatively cramps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such cramp should be properly designed as per IS 4101 (Part 1).
- The cramps shall be of copper alloyed with zinc or nickel or of stainless steel of grade 304.
- The pins, cramps and dowels shall be laid in cement mortar 1:2 (1 cement: 2 sand) and their samples got approved by the Engineer-in-Charge and kept at site.
- The walls shall be carried up truly plumb. All courses shall be laid truly horizontal and all vertical joints truly vertical. The stone shall break joints on the face for at least half the height of the course, unless otherwise shown in the drawings. The stone shall be laid in regular courses not less than 20 cm height and all the stones shall be of the same height unless otherwise specified. No stone shall be less in length than one and a half times its height unless otherwise specified.
- As far as possible the backing shall be carried up simultaneously with the face work. In case of reinforced cement concrete backing, the lining shall be secured to the backing after it has set and got cured. The cramps shall be fixed in concrete at the required positions, while laying.

#### **7.41 Joints**

The joints shall be done with cement mortar 1: 3 (1 cement: 3 sand). All joints shall be full of mortar. Special care shall be taken to see that the groundings for veneer work are full of mortar. If any hollow grounding is detected by tapping the face stones, these shall be taken out and relaid. The thickness of joints shall be as small as possible, not exceeding 5 mm. For a close butt jointed facing the thickness shall not exceed 1.5 mm. The face joints shall be uniform throughout. Where joint filler or compound is to be used, the joints shall be raked out to a depth of at least 25 mm after the mortar in the joints has set sufficiently and the filler or compound applied. The joints may be subsequently finished with a mortar suited to the appearance of the work. It is preferable to use joint sealing compounds where the facings are exposed to heavy rainfall and winds and their selections would depend upon local experience and availability of joint sealing compounds. In their absence only masonry mortars 1:3 (1 cement: 3 sand) which are proved to be successful from local exposure conditions shall be used.



#### **7.42 Curing**

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

#### **7.43 Protection**

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

#### **7.44 Rate**

The rate shall include the cost of materials and labour required for all the operations described above and shall include the following:

- (i) Raking out joints for plastering or pointing done as a separate item, or finishing flush as the work proceeds.
- (ii) Preparing tops and sides of existing walls for raising and extending.
- (iii) Rough cutting and waste for forming gables cores, skew backs or spandrels of arches, splays at eaves and all rough cutting in the body of walling unless otherwise specified.
- (iv) Bond stones or cement concrete bond blocks.
- (v) Leading and making holes for pipes etc.
- (vi) Bedding and pointing wall plates, lintels, sills etc. in or on walls, bedding roof tiles and corrugated sheets in or on walls.
- (vii) Building in ends of joists, beams, lintels etc.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.1		RR masonry in foundation and plinth	Random rubble masonry with hard stone in foundation and plinth including leveling up with cement concrete 1:6:12 (1 cement :6 sand : 12 graded stone aggregate 20mm nominal size) at plinth level with :		
	7.1.1	Cement mortar 1:6	Cement mortar 1:6 (1 cement : 6 sand)	cum	4147.00
7.2		RR masonry in superstructure upto floor two	Random rubble masonry with hard stone in superstructure above plinth level and upto floor two level, including leveling up with cement concrete 1:6:12 (1 cement : 6 sand : 12 graded stone aggregate 20mm nominal size) at window sills, ceiling level and the like.		
	7.2.1	Cement mortar 1:6	Cement mortar 1:6 (1 cement: 6 sand).	cum	4351.00
7.3		Extra for RR masonry above floor two	Extra for random rubble masonry with hard stone in superstructure above floor two level for every floors or part thereof	cum	2.5%
7.4		Extra for RR masonry pillar	Extra for random rubble masonry with hard stone in :		
	7.4.1	Square	Square or rectangular pillars	cum	213.00
	7.4.2	Circular	Circular pillars.	cum	894.00
7.5		Extra for RR masonry curve	Extra for random rubble masonry with hard stone curved on plan for a mean radius not exceeding 6 m.	cum	354.00
7.6		CR masonry upto plinth	Coursed rubble masonry (1 <sup>st</sup> or 2 <sup>nd</sup> sort) with hard stone in foundation and plinth.		
	7.6.1	1 <sup>st</sup> sort	Cement mortar 1:6 (1 cement : 6 sand)	cum	4603.00
	7.6.2	2 <sup>nd</sup> sort	Cement mortar 1:6 (1 cement : 6 sand)	cum	4342.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.7		CR masonry above plinth & upto floor two	Coursed rubble masonry with hard stone (first or second sort) in superstructure above plinth level and upto floor two level.		
	7.7.1	1 <sup>st</sup> sort	Masonry work (first sort) in cement mortar 1:6 (1 cement : 6 sand)	cum	4803.00
	7.7.2	2 <sup>nd</sup> sort	Masonry work (second sort) , in cement mortar 1:6 (1 cement : 6 sand)	cum	4541.00
7.8		Extra for CR masonry above floor two level	Extra for coursed rubble masonry with hard stone (first or second sort) in superstructure above floor two level for every floors or part thereof	cum	2.5%
7.9		Extra for CR masonry	Extra for coursed rubble masonry with hard stone (first or second sort) in :		
	7.9.1	Square or Rectangular	Square or rectangular pillars	cum	235.00
	7.9.2	Circular	Circular pillars.	cum	1003.00
	7.9.3	Curved in plan	Extra for coursed rubble masonry with hard stone (first or second sort) curved on plan for a mean radius not exceeding 6 m.	cum	384.00
7.10		Ashlar masonry	Stone work in plain ashlar masonry in super structure upto floor two level in cement mortar 1:6 (1 cement : 6 sand) including pointing with cement mortar 1:2(1 white cement : 2 marble dust) with an admixture of pigment matching the sand stone shade :		
	7.10.1	One face dressed	One face dressed.		
	7.10.1.1	Red sand stone	Red sand stone	cum	12905.00
	7.10.1.2	White sand stone	White sand stone	cum	12998.00
	7.10.2	Both face dressed	Both face dressed.		
	7.10.2.1	Red sand stone.	Red sand stone.	cum	18003.00
	7.10.2.2	White sand stone	White sand stone	cum	18080.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.11		Ashlar masonry in arches	Stone work plain ashlar masonry in arches in super structure upto floor two level in cement mortar 1:3 (1 cement: 3 sand) including centering, shuttering and pointing with white cement mortar 1:2 (1 white cement: 2 marble dust) with an admixture of pigment matching the sand stone shade.		
	7.11.1	One face dressed	One face dressed.		
	7.11.1.1	Red sand stone	Red sand stone	cum	17182.00
	7.11.1.2	White sand stone	White sand stone	cum	17207.00
	7.11.2	Both face dressed	Both face dressed.		
	7.11.2.1	Red sand stone.	Red sand stone.	cum	22264.00
	7.11.2.2	White sand stone	White sand stone	cum	22341.00
7.12		Ashlar masonry in domes	Stone work plain ashlar masonry in domes, in super structure upto floor two level in cement mortar 1:3 (1 cement: 3 sand) including centering, shuttering and pointing with white cement mortar 1:2 (1 white cement: 2 marble dust) with an admixture of pigment matching the sand stone shade.		
	7.12.1	One face dressed	One face dressed		
	7.12.1.1	Red sand stone	Red sand stone	cum	27834.00
	7.12.1.2	White sand stone	White sand stone	cum	27912.00
	7.12.2	Both face dressed.	Both face dressed.		
	7.12.2.1	Red sand stone	Red sand stone.	cum	39693.00
	7.12.2.2	White sand stone.	White sand stone.	cum	39770.00
7.13		Ashlar masonry punched	Stone work ashlar masonry punched (ordinary) in superstructure above plinth level and upto floor two level in cement mortar 1:6 (1 white cement: 6 sand) including pointing with		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			cement mortar 1:2 (1 whitecement: 2 marble dust) with an admixture of pigment matching the sand stone shade.		
	7.13.1	Red sand stone one face	Red sand stone one face punched.	cum	12190.00
	7.13.2	Red stone double face	Red sand stone both face punched	cum	12267.00
	7.13.3	White sand stone single face	White sand stone one face punched.	cum	1654100
	7.13.4	White stone double face	White sand stone double face punched	cum	16618.00
7.14		Extra for Ashlar or ashlar punched above floor-II	Extra for stone work, plain ashlar or ashlar punched above floor two level for every floor or part thereof.	cum	123.00
7.15		Extra for plain ashlar in pillar	Extra for plain ashlar or ashlar punched in :		
	7.15.1	Square or rectangular pillars	Square or rectangular pillars	cum	1771.00
7.16		Extra for ashlar or ashlar punched in curved	Extra for stone work; plain ashlar or ashlar punched in curved on plan with a mean radius not exceeding 6 m.	cum	1232.00
7.17		Extra for centering for arches	Extra for additional cost of centering for arches exceeding 6m span including all strutting, bolting, wedging etc. And removal (area of soffit to be measured).	sqm	503.00
7.18		Sunk or mouldedor sunk and moulded	Stone work sunk or moulded or sunk and moulded upto floor Two level in cement mortar 1:6 (1cement : 6 sand) including pointing with white cement mortar 1:2 (1 white : 2 marble dust) with an admixture of pigment matching the stone shade :		
	7.18.1	Red stone	Red sand stone	cum	20629.00
	7.18.2	White stone	White sand stone	cum	19706.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.19		Extra for sunk or moulded or sunk and moulded	Extra for stone work sunk or moulded or sunk and moulded or carved in :		
	7.19.1	Triangular /square rectangular	Triangular or Square or rectangular pillars	cum	2310.00
	7.19.2	Circular /polygon	Circular or polygonal pillars	cum	6545.00
7.20		Extra for stone work sunk or moulded in cornices	Extra for stone work sunk or moulded in cornices.	per metre per cm girth	14.00
7.21		Stone work for wall lining	Stone work (machine cut edges)for wall lining etc. (veneer work) up to 10 meter height backing filled with a grout of 12mm thick cement mortar 1:3 (1 cement : 3 sand) including pointing in white cement mortar 1:2 (1 white cement : 2 marble dust) with an admixture of pigment matching the stone shade : (To be secured tothe backing by means of clamps which shall be paid for separately):		
	7.21.1	Red stone face dressed face	Red sand stone - exposed face fine dressed with rough backing.		
	7.21.1.1	70 mm	70 mm thick.	sqm	1321.00
	7.21.1.2	60 mm	60 mm thick.	sqm	1299.00
	7.21.1.3	50 mm	50 mm thick	sqm	1276.00
	7.21.1.4	40 mm	40 mm thick.	sqm	1257.00
	7.21.1.5	30 mm	30 mm thick.	sqm	1230.00
	7.21.2	Red stone machine cut face	Red sand stone - Exposed face machine cut and table rubbed with rough backing.		
	7.21.2.1	70 mm	70 mm thick.	sqm	1808.00
	7.21.2.2	60 mm	60 mm thick.	sqm	1785.00
	7.21.2.3	50 mm	50 mm thick	sqm	1762.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	7.21.2.4	40 mm	40 mm thick.	sqm	1739.00
	7.21.2.5	30 mm	30 mm thick.	sqm	1717.00
	7.21.3	White stone fine dress face	White sand stone - exposed face fine dressed with rough backing.		
	7.21.3.1	70 mm	70 mm thick.	sqm	1327.00
	7.21.3.2	60 mm	60 mm thick.	sqm	1303.00
	7.21.3.3	50 mm	50 mm thick	sqm	1280.00
	7.21.3.4	40 mm	40 mm thick.	sqm	1256.00
	7.21.3.5	30 mm	30 mm thick.	sqm	1233.00
	7.21.4	White stone machine cut stone	White sand stone - Exposed face machine cut and table rubbed with rough backing.		
	7.21.4.1	70 mm	70 mm thick.	sqm	1813.00
	7.21.4.2	60 mm	60 mm thick.	sqm	1790.00
	7.21.4.3	50 mm	50 mm thick	sqm	1766.00
	7.21.4.4	40 mm	40 mm thick.	sqm	1743.00
	7.21.4.5	30 mm	30 mm thick.	sqm	1719.00
7.22		Extra for stone work curved on plan	Extra for stone work (vener work) curved on plan with a mean radius not exceeding 6 m.	cum	1771.00
7.23		Cramps for wall lining stone	Providing and fixing stainless steel cramps of required size and shape for anchoring stone wall lining to the backing or securing adjacent stones in stone wall lining in cement mortar 1:2 (1 cement :2 sand) including making the necessary chases in stone and holes in walls wherever required.	kg	631.00
7.24		Stone dowels	Providing and fixing stone dowels of size 10x5x2.5cm cut to double wedge shape as per design in cement mortar 1:2 (1 cement : 2 sand) including making the necessary chases	each	35.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.25		Copper pins for securing adjacent stones	Providing and fixing copper pins 7.5 cm long 6 mm diameter for securing adjacent stones in stone wall lining in cement mortar 1:2 (1 cement : 2 sand) including making the necessary chases.	each	35.00
7.26		Sloping chajja of stone	Providing and fixing sloping chajja of stone 40 mm thick and upto 80 cm wide beyond the wall as measured along the slope in cement mortar 1:4 (1 cement : 4 sand) with 12mm diameter anchoring steel bar 45 cm long fixed in each stone and supported on and including bricks cove in cement mortar 1:4 (1 cement :4 sand) including pointing in cement mortar 1:2 (1 whitecement: 2 marble dust) with an admixture of pigment matching the stone shade:		
	7.26.1	Red stone	Red sand stone:		
			With common burnt clay bricks of 25 kg/cm <sup>2</sup> compressive strength.	sqm	1196.00
	7.26.2	White stone	White sand stone		
			With common burnt clay bricks of 25 kg/cm <sup>2</sup> compressive strength.	sqm	1196.00
7.27		Horizontal chajja of stone	Providing and fixing horizontal chajja of stone 40 mm thick and upto 80 cm projection in cement mortar 1:4 (1 cement : 4 sand) including pointing in whitecement mortar 1:2 (1 white cement : 2 marble dust) with an admixture of pigment matching the stone shade:		
	7.27.1	Red stone	Red sand stone	sqm	744.00
	7.27.2	White stone	White sand stone	sqm	744.00
7.28		Sand stone sun-shade	30mm red sand stone sun-shade (chisel-dressed) supported on red sand stone brackets, fixed in walls with cement mortar 1:4 (1 cement: 4 sand) including finishing complete.	sqm	891.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.29		Red sand stone brackets	Providing and fixing red sandstone brackets 55x22.5x45cm sunk and moulded including providing and fixing with 4 Nos. gun metal cramp 25x6mm 30 cm long and dowel bars 7.5 cm long 6mm dia as per design.	each	1672.00
7.30		Stone work in copings, cornices, string courses and plinth courses	Stone work, plain in copings, cornices, string courses and plinth courses, upto 75 mm thick in Cement mortar 1:6 (1 cement : 6 sand) including pointing with white cement mortar 1:2 (1 white cement : 2 stone dust) with an admixture of pigment matching the stone shade.		
	7.30.1	Red stone	Red sand stone	cum	13187.00
	7.30.2	White stone	White sand stone	cum	13249.00
7.31		Stone jali	Providing and fixing stone jali 40mm thick throughout in cement mortar 1:3 (1cement :3 sand) including pointing in whitecement mortar 1:2 (1white cement: 2stone dust) with an admixture of pigment , matching the stone shade, jali slab without any chamfers etc.		
	7.31.1	Red stone	Red sand stone	sqm	5797.00
	7.31.2	White stone	White sand stone	sqm	5797.00
7.32		Extra for stone work under water	Extra for laying stone work in or under water and/or liquid mud including cost of pumping or bailing out water and removing slush etc. complete. <b>NOTE:</b> - The quantity will be calculated by multiplying the depth measured from sub - soil water level up to the centre of gravity of stone work under sub - water with the quantity of stone work in cum executed under the sub - soil water. The depth of centre of gravity shall be reckoned	cum/mtr depth	296.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			correct to 0.1 m. 0.05 m or more shall be taken as 0.1 m and less than 0.05 m ignored.		
7.33		Extra for stone work in foul position	Extra for laying stone work in or under foul position.	cum	109.00
7.34		Stone wall lining butch work	Wall lining butch work upto 10m height with red/ white sand stone 40 mm thick rough facing on the exposed surface with stone strips of minimum length 300 mm and required width including embedding every tenth layer and bottom most layer in masonry or concrete after making necessary chases of size 75x75mm and by providing layer of 75mm thick strips i/c 12mm thick bed of cement mortar 1:3 (1 Cement : 3 sand) i/c ruled pointing in cement mortar 1:2 (1 white cement: 2 marble dust) with an admixture of pigment to match the shade of stone complete as per direction of Engineer-in-charge.	sqm	1543.00
7.35		Stone wall lining	Stone work ( machine cut edges) for wall lining upto 10 m height etc. (Veneer work) backing filled with a grout of 12mm thick cement mortar 1:3 (1 Cement : 3 sand) and jointed with Cement mortar 1:2 (1 cement : 2 marble dust) including rubbing and polishing complete. (To besecured to the backing by means of cramps which shall be paid for separately)		
	7.35.1	Kota stone dressed rubbed	25mm thick Kota stone slabs exposed face dressed and rubbed.	sqm	1222.00
	7.35.2	Dholpur shivpuri dressed and rubbed stone	25mm thick Dholpur stone slabs exposed face dressed and rubbed.	sqm	1469.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	7.35.3	Kota stone not dressed	20 to 25mm thick kota stone slabs exposed slab not dressed and rubbed.	sqm	900.00
	7.35.4	Dholpur shivpuri stone note dressed	20 to 25mm thick Dholpur stone/shivpuri stone not dressed and rubbed.	sqm	1122.00
7.36		Stone wall lining tile machine cut & polished upto 10 m	Stone tile work with 8mm thick mirror polished and machine cut edge for wall lining upto 10 m height with special adhesive over 12 mm thick bed of cement mortar 1:3 (1 cement : 3 sand), including pointing in white cement with an admixture of pigment to match the stone shade.		
	7.36.1	Granite	Granite stone of any colour and shade	sqm	1524.00
	7.36.2	Marble	Raj Nagar plain white marble/ Udaipur green marble/ Zebra black marble	sqm	1119.00
7.37		Extra for extra height for stone wall lining	Extra for stone work for wall lining on exterior walls of height more than 10 m from ground level for every additional height of 3 m or part thereof.	sqm	67.00
7.38		Dry stone cladding upto 10m height	Providing and fixing dry stone cladding upto 10 metre height with 30mm thick gang saw cut stone with (machine cut edges) of uniform colour and size upto 1mx1m, fixed to structural steel frame work and/ or with the help of cramps, pins etc. And sealing the joints with approved weather sealant as per Architectural drawing and direction of Engineer-in-charge. (The steel frame work, stainless steel cramps and pins. shall be paid for separately.)		
	7.38.1	Red sand stone	Red sand stone.	sqm	1639.00
	7.38.2	White sand stone	White sand stone	sqm	1706.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
7.39		Structural steel for dry stone cladding	Providing and fixing structural steel frame (for dry stone cladding with 30 mm thick gang saw cut with machine cut edges sand stone) on walls at all heights using M.S. square/rectangular tube in the required pattern as per architectural drawing including cost of cutting, bending, welding etc. The frame work shall be supported in wall with the help of MS brackets/lugs of angle iron/flats etc. which shall be welded to the frame and embedded in brick wall with cement concrete block 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 20mm nominal size) of size 300x200x300mm including cost of necessary centering and shuttering and with approved expansion hold fasteners on CC/RCC surface includingdrilling necessary holes. Approved cramps/ pins etc. shall be welded to the frame work to support stone cladding the steel work will be given a priming coat of Zinc primer as approved by Engineer-in-charge and painted with two or more coats of epoxy paint (Shop drawings shall besubmitted by the contractor to the Engineer-in-charge for approval before execution).The frame work shall be fixed in true horizontal and vertical lines/ planes. (Onlystructural steel frame work shall be measured for the purpose of payment, stainless steel clamps shall be paid for separately and nothing extra shall be paid.)	kg	138.00
7.40		S.S. clamps for dry stone cladding	Providing and fixing adjustable stainless steel clamps of approved quality and of required shape and size adjustable with stainless steel nuts bolts and washer (total weight not less than 260 gms) for dry stone cladding fixed on frame	each	208.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			work at suitable location including making necessary recesses in stone slab, drilling required holes etc. complete as per direction of the Engineer-in-Charge.		

**CHAPTER – 8.0**

**ALUMINIUM STRUCTURAL GLAZING  
COMPOSITE PANEL AND SPIDER  
GLAZING**

**PREAMBLE**  
**STRUCTURAL GLAZING AND ALUMINIUM COMPOSITE PANEL**  
**(CHAPTER 8.0)**

**8.1 Materials (General)**

Materials and components used shall be of the first / superior quality and suitable for the purpose. All materials shall be free from any defects that may impair the strength, functioning/ performance or appearance of the curtain wall or adjacent construction.

**Fasteners** The type, size, alloy, quantity and spacing of all anchor fasteners and/or anchorage devices shall be as required for the specified performance standards.

**Bolts** anchors and other fastening devices like screws, nuts, washers etc. shall be of approved types as required for the strength of the connections, shall be self-locking, unless otherwise specified. These shall be of austenitic stainless steel of specified grade and shall be torque tightened, wherever required, to achieve the maximum torque tension relationship in the fasteners. Washers, nuts and all accessory items shall be of the same material as fasteners. The rivets/ nuts, bolts and washers for fixing insulation layer to the shadow box or with fire-stops (barriers)cum-smoke seal shall be stainless steel of approved grade. The anchor fasteners shall not be provided using PVC sleeves. Only expandable type self locking fasteners shall be provided.

**Aluminium extrusions**

In general aluminium alloy for extrusions shall be 6063 T5 or T6 grade as per B.S.1474. However, the grade and tempering specifications shall be as recommended by the supplier for each application.

All extruded aluminium sections shall be anodized in approved colour to a minimum thickness of 20 microns or shall be PVDF coil / spray coated in approved colour and shade with metallic coloursto a minimum thickness of 35 microns. The colour and the finish shall be uniform and free of streaks. The aluminium sections, before coating, shall be suitably cleaned, rinsed, buffed properly and sealed and protected after anodizing / PVDF coating, till the completion of the work.

All surfaces of the aluminium sections designed to receive the sealants shall be finished properlyto match the finish of the parent section as used for initial testing of sealant and aluminium surface adhesion. Further, it shall be ensured that the entire aluminium surface has adequate sealant contactand adhesion.

Sill sheets, plates and extrusions shall be visually flat under all lighting conditions.

The members of aluminium extruded sections for mullions, transoms, members of sub frames & sash frames shall be in single piece and not be splice jointed in the panel length and height.

### **Aluminium flashing**

All flashings shall be made from 1.0 mm thick solid aluminium sheet transparent anodized to a minimum thickness of 10 microns. It shall be fixed using stainless steel screws dipped in weather silicone sealant.

### **Aluminium composite panels**

The soffits of the canopies / walkways / entrance canopies etc., required as per the architectural drawings, shall be covered with aluminium composite panel material. The top of the canopies / walkways / entrance canopies shall be covered with zincalume sheets. The aluminium composite panel and zincalume sheets shall be bent to the required profile and fixed as per the approved shop drawings prepared on the basis of architectural drawings.

### **Brackets**

The brackets shall be fixed with high degree of accuracy to achieve the elevation as per the architectural drawing. The brackets shall have suitable lengths and sections to align curtain glazing in one face, as required as per the architectural drawings. Nothing extra shall be payable on this account. The brackets shall be fabricated from M.S rolled sections / plates to have the design strength. The quality of the weld shall also be ensured as per the standards. These shall be provided corrosion protection treatment by Hot Dipped Galvanizing. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized. Slots of elliptical or circular shape in the brackets shall be pre-drilled / machine punched and not flame cut and it shall be done before galvanizing. The surface of the brackets shall be serrated for additional grip before galvanizing. Washers made of serrated plates of the corresponding material shall also be provided for additional grip. The directions of the serration and the slot shall be such that they allow movements as per the design requirement and at the same time prevent any movement in the other direction. Each bracket shall be fixed to the R.C.C using anchor fasteners of suitable capacities and in numbers as required as per the design requirements. The brackets shall be fixed to the structural steel members of the building using stainless steel bolts & nuts / fasteners of required capacity and in numbers as per the design requirement. The holes of the required sizes shall be pre- drilled in RCC/ structural steel for fixing anchor fasteners/ bolts etc. Nothing extra shall be payable on this account.

## **Fittings**

All hardware and fittings such as patch fittings, handles, locks, stay-arms, floor springs, friction stays etc. for doors, windows and open able panels shall be heavy duty and of approved make as specified. Hinges for open able panels shall be heavy duty top hung stainless steel friction hinges selected for specified wind load and dead loads. All fittings and locks shall be as specified. Each open able panel of the Curtain glazing shall be provided with the fittings as specified in item nomenclature.

## **8.2 Sealants & Gaskets**

### **Selection of sealants**

- The compatibility and sequence of installation for all sealants must be carefully considered in all proposals in order to ensure the required curing and performance.
- Sealants must not degrade and / or fail under any or all design conditions including wind, thermal and seismic movements, exposure to water and humidity, ultraviolet exposure and / or other adverse environmental conditions.
- The designations of sealant types specified herein are intended for general design guidance only.
- Final selection for the sealant types shall be based on their conformity with the Performance Requirements specified herein and as per the recommendations of the sealant manufacturer. It may use sealant of equivalent grade and characteristics, manufactured by the manufacturer other than those specified herein, based on recommendations of those sealant manufacturers for specified use but with the prior approval of the Engineer-in-Charge. The contractor shall submit the documentary evidence in this regard.
- All precautions shall be taken during design of structural silicone bite and also during fabrication of the curtain glazing system to prevent failure of sealant during the guarantee period of 10 years after the date of completion of work and even beyond, upto the expected service life of the curtain wall.
- Sealants and gaskets shall not leach, discolour, stain or dry.

### **Structural silicone sealant**

The sealant manufacturer shall design the silicone bite for the design loads as specified and likely to come during the life of the curtain glazing system for arriving at bite size of the structural silicone sealant.

The structural silicone sealant bite as designed by the sealant manufacturer and as per the approved shop drawings shall be provided.

The Structural sealant shall be two part pump-filled Silicone sealant DC 983 of Dow Corning or equivalent recommended by manufacturer. The weather silicone sealant shall be one-part Silicone sealant DC 795 of Dow Corning or equivalent of other approved brand as per the list of approved materials.

The structural sealant to be used as specified for all exposed and concealed metal to metal(including tight or butt type metal to metal assembly prior to assembly) or glass to glass shall be 2- part silicone sealant, conforming to the manufacturer's recommendations for the specific uses and performance criteria. The sealant shall be applied using two-part pump for the same. All the sealings shall be done in a clean and controlled environment as specified by the silicone sealant manufacturer.

### **Weather silicone sealant**

The grade of weather silicone sealants wherever required like for concealed metal to metal, metal to glass and metal to concrete/ masonry such as embedment and lapping of flashings etc. where elements are to be installed or embedded, the weather sealant shall be of grade 795 of Dow Corning or equivalent for the other approved brand, as per the recommendations of the sealant manufacturers. Also, the gap between the aluminum sections and the glass, if so required, shall be filled with weather sealant as specified above including providing and fixing backer rod wherever required as per the approved shop drawings. The weather silicone sealant shall be of approved colour and shade. The weather silicone sealant for fixing the butt jointed glass for the fixed partitions shall be transparent in colour DC 791 of Dow Corning or equivalent of other approved brands.

### **Compatibility**

All sealants must be non-staining and compatible with adjoining sealants, backup materials, substrate materials and their respective finishes and/or applied colour coatings. Care shall be taken to ensure that two different types of sealant should not come in contact with each other unless compatibility is satisfied as per manufacturer's specifications.



### **Caulking compound**

Dow Corning weather silicone sealant – 795 or equivalent as approved by the Engineer-in-Charge, ( of approved colour and shade to match adjacent material wherever exposed and visible) for use around frame/ flashings or between frame/flashing and RCC/ masonry surface.

### **Gaskets**

Gaskets and seals shall be of approved quality compatible with substrates, finishes and other components they are in contact with. All gaskets exposed directly on the exterior face shall be silicon gaskets, which are UV resistant. They shall not degenerate, discolour or leach on exposure to solar radiations/ rains/ pollutants etc.

Manufacturers' test Certificate shall be submitted as specified.

## **8.3 Glass**

### **General**

All glass and glazing materials shall be as specified. Vision and spandrel glass shall have characteristics as specified.

The performance characteristics of glass panels, have to be ensured within the constraints of aesthetic requirements like colour, shade, reflectivity etc. And performance requirements like light transmission, U value, shading coefficient, relative heat gain etc. as specified. Minor variations in the characteristics of glass on superior side may be allowed, but without any extra cost to the Department on this account.

### **Installation**

Install glass panels and carry out glazing work as indicated on the drawings and as specified herein.

All glass panels shall be of accurate sizes as required.

All glass panels shall have clear undamaged edges and surfaces, which are not disfigured.

Any glass panel that does not fit in the curtain glazing system shall be rejected. Therefore, all care and precautions shall be taken while procuring the glass panels from the manufacturer / processors of the glass. No claims of any kind or any hindrance shall be entertained from the contractor on this account. Glass panels shall not be in direct contact with the aluminum framework.

### **Identification**

Permanent identification marking on glass shall be accomplished by a technique selected by the manufacturer. The location of the marking shall be proposed by the Manufacturer and approved by the Engineer – in - Charge. All glass shall be delivered to site with the manufacturer's / processor's label of identification attached.

## **Selection of Glass**

Each type of glass shall be obtained from only one manufacturer and preferably in one lot.

### **Insulated Glazed Units (IGUs) in the vision panels**

Insulated glazed units shall be obtained only from approved manufacturers/ processors as per the approved list.

Insulated units shall be factory assembled, with multiple panes, hermetically sealed, separated by and sealed to spacer tubes perforated on inner exposed face forming airtight dehydrated airspace inside the insulated units. The IGUs shall be assembled (prepared) by the manufacturer/ processor of the glass as per the approved list, in their dedicated workshops/ factory.

### **Laminating units**

The glasses shall be laminated with interlayer of Polyvinyl butyral (PVB) sheet of specified thickness

The interlayer material (PVB) shall be clear or as specified with no tendency to bubble, discolour or lose physical and mechanical properties after laminating glasses.

The laminated panels shall be free of foreign substances, air or glass pockets and shall not delaminate at edges.

### **Precaution in storing and handling glasses**

The glass manufacturer/ processor shall take necessary precautions as stated below besides any other precautions not specifically mentioned herein:

The reflective/ low E coating on the glass shall be protected against scratches, surface corrosion, staining and/ or any other abrasion. The glasses shall not be stored without a clean inter-leaving material. Also they should not slide against each other. The glass shall be protected from weld or grinding splatter. The reflective/ low E coating shall be protected against contact with acids or strong alkalies. The cleaners to be used for cleaning the surface shall be as per the manufacturer's recommendations. The glass shall be protected against moisture from humidity, which can stain glass as well as coating. Reflective/ low E coating shall also be protected against splashes from paints etc.

## **8.4 Metal Coatings**

### **Anodizing / PVDF coating**

Aluminium extruded sections shall be satin finish colour anodized to minimum 20 microns thickness, as per the approved colour and shade or PVDF coil / spray coated to approved metallic colour and shade to minimum 35 microns thickness.

## **Galvanizing**

The brackets for the curtain glazing system shall be hot dipped galvanized. The mass of the zinc coating to be not less than 610 gm. per sqm of steel area to be galvanized.

## **Samples**

Three samples shall be prepared, which shall define the colour and gloss of anodizing and submit them for approval.

## **Matching of finish**

Wherever the same colour finish is specified for extruded aluminium sections and composite aluminium sheets. It shall be ensured that the colour of both is matched as closely as possible.

## **Standards**

In general, it shall be followed either of the latest Indian/ International Standards as applicable for this sub head.

## **Design**

- Architectural drawings and specifications only indicate the required basic dimensions, and performance criteria. It shall be ensured that proper structural analysis and design for various load cases and their combination. This shall include designing and proper sizing of all sections meeting structural and architectural requirements. The anchor assemblies shall meet the performance and design requirements including installation of all inserts, fasteners, clips, bracing and framework as required for the proper anchorage to the structure, unless otherwise specified.
- Design of the curtain glazing system shall comply with all Government codes and regulations. The Contractor shall design the entire curtain glazing system for dead loads, wind loads, seismic loads, storm, air pollution, thermal stresses, building movements and consequent deflections without compromising the performance characteristic. Further, the individual members of the structural framing shall not deflect beyond permissible limits as specified. The design shall comply with the requirements of the relevant National Building Code and Indian Standard Code/ International Standards, unless specified otherwise.
- The curtain glazing system and its elements shall not sustain permanent deformation or failure under loading equivalent to 1.5 times the design wind pressure.
- The specified deflections must be reduced if they are in any way detrimental to curtain glazing system and building.

- It shall be ensured that the elevations are strictly as per the architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work.

## **8.5 Shop Drawings**

### **Submittals**

The contractor shall prepare shop drawings based on approved design and submit the same to the Engineer –in-charge for approval. The review of the shop drawings shall be limited to their conformity to the architectural and structural design concept & specifications. No fabrication shall be taken up until the shop drawings and all other related submittals, documentation, certification, samples and the mock-up for that work have been reviewed and approved by the Engineer-in- charge.

### **Scope of shop drawings**

Shop drawings shall incorporate scaled and dimensioned plans, elevations, sections and complete size details for all the works. The shop drawings shall indicate the required dimensional profiles and modules, function, design and performance standards and in general cover all dimensions and details required to fabricate and install the curtain glazing system. The contractor shall verify and co-ordinate the shop drawings with all applicable and inter-related trades, drawings and specifications. All dimensions / modules, etc., shall be field checked and the drawings shall be modified, if required, based on actual measurements at site. Details shall show and specify all metal sections, types of finishes, areas to be sealed and sealant materials, gaskets, applicable construction materials including fasteners and welds, all anchorage assemblies and components, fabrication and erection tolerances for the work. All details shall be subject to the approval of the Engineer-in-Charge, after incorporating all the modifications suggested by the Engineer-in-Charge.

### **Section profiles**

Profile adjustments, if required as per the site conditions may be allowed by the Engineer-in- Charge subject to meeting the architectural / performance requirements. However, this shall be carried out only with the written approval of the Engineer-in-charge provided that the general design and intent of the drawings and specifications are also maintained. Also, if any new / non- standard aluminium extruded section is required as per the site requirement and / or the architectural drawings for functional and / or aesthetic reasons, the contractor shall procure the same from the approved manufacturers for the aluminium sections, even if it entails preparing new die, etc. Nothing extra shall be payable on this account.

## 8.6 Documentation and Certification

The manufacturer's certificate for compliance of the various components/ materials for the works (under this sub head) as per the manufacturer's specifications for the various characteristics. A copy of the manufacturer's test report for each lot of material procured and supplied for the work shall also be obtained from the respective manufacturers and submitted to the Engineer-in-Charge for the record.

### Glass and glazing documentation

Before taking up the work, the glass manufacturer / processor shall submit written certification for the review of the Engineer-in-Charge and record, stating that all glass (properties as specified such as U value, shading coefficient, light transmission, solar factor, relative heat gain etc.) and glazing requirements (including heat strengthening/ toughening, reflective soft coating, low E coating, lamination, fabrication of IGUs including sealants) as per the shop drawings are recommended by them for use related to their specific applications and design parameters and that they are in conformity with the specifications. Tests shall be carried out for glass, including properties after processing, for each lot supplied, by the glass manufacturer / processor in his factory /laboratory or any other accredited laboratory and the copies of the test results shall be obtained by the contractor and submitted to the Engineer-in-Charge for the record.

Sealant Documentation : All sealant applications must be clearly designated on shop drawings.

Quality control documentation : The methodology and quality assurance statement shall be submitted for quality control procedures for the review and approval of the Engineer-in-Charge before taking up the work to ensure the design integrity and performance of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated). The Engineer-in-Charge or his authorized representatives may visit the plant / workshop / factory to inspect material, fabrication and quality assurance procedures.

## 8.7 Samples and Mock-Up at Site

Submittals The samples of the following materials together with detailed technical data / catalogues shall be submitted for review and approval of the Engineer-in-Charge along with the shop drawings..

**Aluminium Composite Panel** : Each type and thickness 600mmx600mm

**Aluminium extrusions** : Each section: 500mm long.

**Glass** : Each type 600 mm x 600 mm.

**Gaskets, separators, glass setting blocks / spacer tape, etc** : Each section or unit, backer rods, 300mm long or unit Bracket, fasteners and Connecting devices : Each type and size.

**Finish samples** : After approval of the final finish coating, the Engineer-in-Charge shall be provided with three approved samples. Ironmongery and accessories, as applicable.

**Finished flashing samples** : Finished samples of shadow boxes, fire stop (barrier)-cum smoke seals Structural and weather silicone sealant

Mock-up at site Before the fabrication and site installation is taken up and after the approval of shop drawings by the Engineer-in-Charge, a mock-up shall be prepared of his proposed curtain glazing system for a size of panel not exceeding 6 sqm. The mock-up shall be essentially put up at site for final approval of all materials and installation details by the Engineer-in-Charge. The mock up shall not form part of the work and shall not be paid for. It shall be dismantled and taken away by the contractor at his own cost, with the prior permission of the Engineer-in-Charge. Nothing extra shall be payable on this account.

### **8.8 Storage, Protection and Programme**

A schedule of procedure shall be submitted for inspection during installation so as to control and assure quality on the job site.

A detailed method statement shall be submitted for the protection of the surface of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc during delivery and erection, with description as to when the protection can be removed. The protection paper shall be kept for a period as recommended by Engineer-in-Charge and shall be replaced with the fresh protection paper, if so required. Further, it shall not have acid content, which in any manner may affect the substrate.

### **Delivery and Storage of Materials:**

All materials delivered to site shall be stored in allocated spaces where the stored materials shall not get exposed to rainwater, moisture or damage, and shall permit easy access to and handling of the materials. Materials shall be stored neatly and properly stacked.

Factory made glazing units and/or their components shall be transported, handled and stored in a manner to preclude damage of any nature. Necessary materials, required for erection at the site shall be delivered in labeled containers by the manufacturer / supplier.

All units or components, which are cracked, bent, chipped, scratched or otherwise defective and unsuitable for installation shall be removed and replaced by the contractor. Nothing extra shall be payable on this account.

### **8.9 Performance Requirements**

All components, assemblies and completed work shall conform to the various performance standards as applicable in respect of thermal movement of the curtain glazing, allowance for vertical and horizontal expansion and building movement and related building tolerance etc. The design and installation of the curtain glazing system shall accommodate all inherent building movements and deflections and the fabrication and installation tolerances of all related work not involved in this section without the loss of, or any detrimental effect to, the performance requirements herein specified. The contractor shall verify and coordinate all such movements and tolerances with the Engineer-in-Charge before designing the components of the curtain glazing system so that movements and deflections in the structure do not at any time affect the integrity and safety of curtain glazing system and vice versa.

### **Thermal property**

All insulation materials, fire-stops (barriers)-cum-smoke seal shall comply with the current requirements of the Fire Officer, MIDC and other authorities.

### **Structural properties**

The curtain glazing system shall be anchored to the R.C.C floor through serrated Hot Dipped Galvanized M.S brackets. As far as possible, the contractor shall take all precautions to avoid cutting through any reinforcement bars while fixing the brackets. The cost includes provision of sleeves/ leave slots at appropriate locations during casting of the concrete itself for making provision for fixing brackets for the curtain glazing system and to avoid chipping/ dismantling of concrete. The slot shall be filled up with concrete of the same grade in a workman like manner, after fixing the brackets. Any defect in alignment/ plumb in the building face shall be rectified by chipping/ dismantling of the concrete/ masonry and repairing the same as specified to achieve the required alignment of the curtain wall as specified. Any change in lengths of bracket/s required on this account and the consequent requirement of their sections and sizes shall be carried out. Nothing extra shall be payable on this account.

No holes shall be burned, filed or drilled in any structural steel/ RCC members unless expressly approved by the Engineer – in – Charge.

Member shapes and/or profiles if schematically shown on the Architectural drawings are not necessarily the exact shapes required or best suited for the particular conditions. Final shapes and locations shall be as designed by the contractor and are subject to the review and approval of the Engineer – in – Charge.

All framing members shall be shop fabricated and finished as specified.

### **Concrete tolerances**

While fixing the brackets for curtain glazing system, the contractor shall take into account the variation in the concrete and the masonry faces to which the structural framework of the curtain glazing system is to be fixed and such variations shall be adjusted in the lengths of brackets to align them in perfect plumb. The bracket shall be designed accordingly. Nothing extra shall be payable on this account.

### **Fire stops (barriers)-cum-smoke seal and interface with building**

Gaps between the building face and the curtain glazing system at soffit level between the successive floors shall be closed as specified with fire-stops (barriers)-cum-smoke seal. It shall have the required fire resistance to be approved by Fire Officer. Suitable gap for accommodating deflections of the aluminium framing of curtain glazing system as per the approved shop drawings shall be maintained between the fire-stops (barriers)-cum-smoke seal and the curtain glazing system. This smoke seal shall however be provided using backer rod and weather silicone sealant as specified and as approved by the Engineer-in-Charge.

The fire-stops (barriers)-cum-smoke seal shall consist of 1 mm thick plain G.I. sheet tray with 100 mm thick layer of non inflammable heat insulating material, rock wool, having density of minimum 64 Kg. per Cum. of the make as approved by the Engineer-in-Charge. The rock wool layer shall be attached to G.I sheet using stainless steel rivets/ nuts, bolts and washers. The tray shall be fixed to the RCC / Masonry surface by using stainless steel screws dipped in weather silicone sealant as per the approved shop drawings. Screws with plastic sleeves shall not be allowed to be used for the above fixing.

An aluminium flashing of 1.0 mm thick shall be permitted transparent anodized (10 micron thickness) solid aluminium sheet of the approved design and profile at the window sill level and also fill the gap between the aluminum flashing and the curtain glazing using weather silicone sealant as specified and as approved by the Engineer-in-Charge. Also, the fasteners/ screws to be used for fixing flashing shall be dipped in weather silicone sealant before using.

### **Acoustics**

Gaps between the mullions and the partitions of the cabins shall be suitably closed by double skin partition as directed by the Engineer-in-Charge including allowing for permissible deflections of mullions as per design requirements but without affecting the partitions and the curtain glazing system. The payment for this partition work shall be made under relevant item. Provisions shall also be made to prevent metal to metal rubbing, any rattling, noise due to thermal changes and wind pressure by using Teflon separators and shims.



## **Visual appearance**

It shall be ensured that the elevations are strictly as per the Architectural drawings and that the intent of the architectural design is retained. Visual appearance shall be a key consideration for acceptance of work.

## **8.10 Curtain Glazing and Aluminium Composite Panel Cladding Systems**

### **General**

Movement of building components to which the curtain glazing system is attached including long term and short term movements due to thermal effect, structural effect, wind pressure, seismic forces, erection or dead loads, creep, column shortening, deflection, torsion and vibrations etc shall be free and noiseless. This shall be achieved without any strain or stress being transferred to the glass, without buckling of any components, without excessive stress to any members or assemblies and without compromising on any of the performance requirement of the curtain wall.

### **Waterproofing**

Following precautions shall be taken by the contractor to ensure that the curtain glazing system is completely water tight during its guarantee period as well as expected service life besides any other precautions not specifically mentioned herein:

A drainage system must be incorporated into the curtain glazing system. The curtain glazing system shall have provision for air pressure equalization (all the internal spaces shall be vented by acceptable means to ensure air pressure equalization ) so that water leakage and condensation, if any shall be drained or discharged to exterior face of the curtain glazing.

Care should be taken that the sections of the aluminum extrusions used for structural framing of curtain glazing provide for proper drainage of water that infiltrates into the system by gravity and for this the section should have proper slope and weep holes as required. These shall be clearly indicated on the shop drawings.

Movement of water on exposed faces must be controlled to ensure that water is not retained and that elements will not be damaged or corroded by water and to minimize the potential for algae and fungal growth as a result of standing or trapped water.

EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also.

EPDM gaskets of the quality as specified and of required size and thickness shall be provided at all

required locations to prevent ingress of water or moisture. The same shall be indicated on the shop drawings also.

Aluminium sheet flashing using 1.0mm thick transparent anodized (10 microns) aluminium sheet wherever required shall be provided including sealing the gap between the flashing and the other material like RCC, masonry, aluminium etc. by using weather silicone sealant as specified.

### **Mullions and transoms**

The sections of mullions and transoms shall be designed to restrict deflection under dead loads, wind load, seismic loads etc. as specified and shall be rigid and stable enough to support and retain the in-fill panels in position under all conditions. The mullions and transoms shall also be designed for additional horizontal loads from the cleaning equipment and process besides horizontal live loads as specified.

### **Spandrel units**

Spandrel shall be of glass having same colour matching with vision areas after using a shadow box as specified.

Structural spandrel wall, fins, slab or beam, aluminium frame work, anchor fasteners, brackets , shadow boxes, fire stop(barrier)-cum-smoke seals and other construction shall not be visible through the glass in the spandrel portion of the curtain glazing from the exterior and shall be fully concealed behind the shadow box.

A shadow box shall be provided at a distance of minimum 50 mm behind the spandrel glass panel to ensure that the insulation panel material does not come in contact with the soft coating of the spandrel glass to prevent any damage to the coating on account of any chemical reaction or otherwise. It shall consist of an approved black fibre glass non-woven tissue stuck on surface #1 of 50 mm thick semi-rigid fibre glass wool insulation panel of minimum density of 48 kg per cum., and 1.5 mm thick transparent anodized (10 microns) solid aluminium sheet tray, on surface #2 by using suitable stainless steel rivets/ nuts, bolts and washers to hold the insulation panel in position. The periphery shall be properly sealed. Surface #1 shall be adequately protected against damage until spandrel glazing is done. Further, care shall be taken that the aluminium sheet backing of the shadow box does not heave or warp due to thermal stresses and/or its self-weight. Proper gaps at the edges of the tray shall be provided to accommodate movements on account of thermal stresses besides making elliptical slots if required to facilitate movements. The shadow box shall be fixed to the structural framing of the curtain glazing by using stainless steel screws. The fixing arrangement shall be as per the approved shop drawings.

### **Ventilators, open able windows and doors**

Ventilators, openable windows and doors shall be provided at positions as shown on the architectural drawings. The openable panels when in closed position shall remain watertight under all weather conditions and pass the water tightness tests as specified. Besides, the openable panels shall appear similar to the fixed ones from outside.

All hardware and accessories shall be provided and fixed by the contractor and shall be as specified.

### **Coping and soffit trimmer**

All coping and soffit panels shall have aluminium structural frame fixed rigidly to the structure. Effective drainage system shall be provided to drain out the water that may penetrate through the joints, on to the exterior face of the curtain glazing. Coping and soffits shall be visibly flat in all lighting conditions.

### **8.11 Measurements**

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

The height and width of double glazed/single glazed unit (the area of glass unit outside the snap beading shall only be measured) as fixed in place shall be measured correct to one centimeter and area calculated in sqm. correct to second place of decimal shall be taken for payment.

### **8.12 Rate**

Rate shall include cost of all inputs of labour, materials including wastages, T &P, equipments, other enabling temporary structures and services and all other incidental charges, if any, not specifically mentioned here, but as required for complete design, proof checking, engineering, fabrication, assembling, delivery, anchorage, installation, protection of curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. and making the system water tight (wherever specified), all complete, all in accordance with the true intent and meaning of the specifications and the drawings taken together, regardless of whether the same may or may not be

particularly shown on the drawings and / or described in the specifications , provided that the same can be reasonably inferred there from. The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) shall have framing which shall be structurally and mechanically designed to achieve the architectural elevations as well as performance parameters specified herein. Anchorage shall include all supporting brackets & anchor fasteners, as required to rigidly secure the structural framing to the RCC / Masonry / structural steel members of the building.

The curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated), etc. work shall include but will not necessarily be limited to the following:

- Frames, fixed glazed / vision panels, spandrels, hard wares, open able panels, as in the drawings inclusive of all accessories and fittings. Glass wool Insulation panel (shadow box), fire stop( barrier) - cum - smoke seals, splice plates, connectors, sleeves, anti-buckling clips etc.
- Anodized aluminium work for framing of curtain glazing as well as other aluminium work (PVDF coated) for trellis, louvers, fins, box sections, capping, strip etc wherever indicated in the schedule of quantities and drawings. Glazes doors.
- Structural, weather and other silicone sealants within and all round the perimeter of all the work under this sub head for fabricating IGUs, holding the glass to the aluminium & glass to glass and to provide water tightness to the curtain glazing.
- EPDM / silicone gaskets, trims, shims, setting blocks, double sided spacer tape, spacer blocks, weathering strips etc. All sealing and flashings including sealing at junctions with the building members.
- All brackets, anchor fasteners, screws, inserts, nuts, bolts & washers, and attachments required for complete installation and fixing to the RCC, masonry and/or the structural steel members of the building.
- All accessories, fasteners, screws, nuts and bolts, toggles, rivets etc. and other items implied in the drawings and the specifications though are not specifically indicated. Isolation of all dissimilar metal surfaces as well as moving surfaces by use of TEFLON (PTFE) separators.
- Engineering proposals, design, drawings and Architectural data. Shop drawings, engineering data and structural calculations (analysis & design) of all systems including aluminium structural framing, fasteners, sealants etc. Scheduling and monitoring of the work.
- Cost of all samples of the individual components, mock-ups at site and field tests.

Coordination with work of other agencies. Protection during storage and construction until handing over the building for occupation etc.

- All final exterior and interior cleaning of the curtain glazing, aluminium composite panel cladding and aluminium work (PVDF coated) etc. Before handing over the building for occupation. Hoisting, staging, scaffolding and temporary enabling structural work/services, cranes and cradles etc. Specified tests, inclusive of necessary records, reports, logbook etc. Design and performance guarantee in the enclosed format.
- Construction monitoring for regular quality control and technical inspection to ensure the work conforms to the approved shop drawings and details (including any modifications made after field testing) and acceptable standards of quality including monitoring the progress of the work.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
8.1		Aluminium sections frame work powder coated	Providing and supplying aluminium extruded tubular and other aluminium sections frame work as per the architectural drawings and approved shop drawings, the aluminium quality as per grade 6063 T5 or T6 as per BS 1474, including super durable powder coated of 60-80 microns conforming to AAMA 2604 of required colour and shade as approved by the Engineer-in-Charge. (The item includes cost of material such as cleats, sleeves, screws etc. necessary for fabrication of extruded aluminium frame work. Nothing extra shall be paid on this account).	kg	359.00
8.2		Aluminium Structural glazing	Designing, fabricating, testing, protection, installing and fixing in position semi (grid) unitized system of aluminium structural glazing (with open joints) for linear as well as curvilinear portions of the building for all heights and all levels. (A) Structural analysis and design and preparation of shop drawings for the specified design loads conforming to IS 875 part III (the system must passed the proof test at 1.5 times design wind pressure without any failure), including functional design of the aluminum sections for fixing glazing panels of various thicknesses, aluminium cleats, sleeves and splice plates etc. gaskets, screws, toggles, nuts, bolts, clamps etc., structural and weather silicone sealants, flashings, fire stop (barrier)-cum-smoke seals, microwave cured EPDM gaskets for water tightness, pressure equalisation and drainage and protection against fire hazard including:	sqm	2674.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>(B) Fabricating and supplying serrated M.S. hot dip galvanised / Aluminium alloy of 6005 T5 brackets of required sizes, sections and profiles etc. to accommodate 3 Dimensional movement for achieving perfect verticality and fixing structural glazing system rigidly to the RCC/ masonry/structural steel framework of building structure using stainless steel anchor fasteners/ bolts, nylon seperator to prevent bimetallic contacts with nuts and washers etc. of stainless steel grade 316, of the required capacity and in required numbers.</p> <p>(C) Providing and filling, two part pump filled, structural silicone sealant and one part weather silicone sealant compatible with the structural silicone sealant of required bite size in a clean and controlled factory / work shop environment, including double sided spacer tape, setting blocks and backer rod, all of approved grade, brand and manufacture, as per the approved sealant design, within and all around the perimeter for holding glass.</p> <p>(D) Providing and fixing in position flashings of solid aluminium sheet 1 mm thick and of sizes, shapes and profiles, as required as per the site conditions, to seal the gap between the building structure and all its interfaces with curtain glazing to make it watertight.</p> <p>(E) Making provision for drainage of moisture/ water that enters the curtain glazing system to make it watertight, by incorporating principles of pressure equalization, providing suitable gutter profiles at bottom (if required), making necessary</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>holes of required sizes and of required numbers etc. complete. This item includes cost of all inputs of designing, labour for fabricating and installation of aluminium grid, installation of glazed units, TandP, scaffolding and other incidental charges including wastages etc., enabling temporary structures and services, cranes or cradles etc. as described above and as specified. The item includes the cost of getting all the structural and functional design including shop drawings checked by a structural designer, dully approved by Engineer-in-charge. The item also includes the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field testson the assembled working structural glazing as specified, cleaning and protection till thehanding over of the building for occupation. In the end, the Contractor shall provide a water tight structural glazing having all the performance characteristics etc. all complete as required, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineerin- Charge.</p> <p><b>Note: - 1.</b> The cost of providing extruded aluminium frames, shadow boxes, extruded aluminium section capping for fixing in the grooves of the curtain glazing and vermin proof stainless steel wire mesh shall be paid for separately under relevant items under this sub-head. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the</p>		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>external face shall be measured in sqm. Upto two decimalplaces.</p> <p><b>Note: 2.</b> The following performance test are to be conducted on structural glazing system if area of structural glazing exceeds 2500 Sqm from the certified laboratories accredited by NABL (National Accreditation Board for Testing and Calibration Laboratories), Department of Science and Technologies, India. Cost of testing is inclusive in the rates. Performance Testing of Structural glazing system Teststo be conducted in the NABL Certified laboratories</p> <ol style="list-style-type: none"> <li>(1) Performance Laboratory Test for Air Leakage Test (-50pa to – 300pa) and (+50pa to +300pa) as per ASTM E-283-04 testing method for a range of testing limit 1 to 200 mVhr”</li> <li>(2) Static Water Penetration Test. (50pa to 1500pa) as per ASTM E- 331-09 testing method for a range upto 2000 ml.”</li> <li>(3) Dynamic Water Penetration (50pa to 1500pa) as per AAMA 501.01-05 testing method for a range upto 2000 ml”</li> <li>(4) Structural Performance Deflection and deformation by static air pressure test (1.5 times design wind pressure without any failure) as per ASTM E-330-10 testing method for arange upto 50 mm”</li> <li>(5) Seismic Movement Test (upto 30 mm) as per AAMA 501.4-09 testing method for Qualitative test” Tests to be conducted on site</li> </ol>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			(6) Onsite Test for WaterLeakage for a pressurange 50 kpa to 240 kpa (35psi) upto 2000ml”		
8.3		Hermetically-sealed vision glass panels	<p>Providing, assembling and supplying vision glass panels (IGUs) comprising of hermetically-sealed 6-12- 6 mm insulated glass (double glazed) vision panel units of size and shape as required and specified, comprising of an outer heat strengthened float glass 6mm thick, of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade, an inner Heat strengthened clear float glass 6mm thick, spacer tube 12mm wide, dessicants, including primary seal and secondary seal (structural silicone sealant) etc.all complete for the required performances, as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineer-in-Charge. The IGUs shall be assembled in the factory/ workshop of the glassprocessor. (Payment for fixing of IGU Panels in the curtain glazing is included in cost of item No.8.2) For payment, only the actual area of glass on face # 1 of the glass panels (excluding the areas of the grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm.</p> <p>(i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, + 12mm Airgap + 6mm Heat Strengthened clear Glass of approved make having properties as visible Light transmittance (VLT) of 25 to 35</p>	sqm	3200.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			%, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m <sup>2</sup> degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.		
8.4		Extra for openable side / top hung vision glass panels	Extra for openable side / top hung vision glass panels (IGUs) including providing and supplying at site all accessories and hardwares for the openable panels as specified and of the approved make such as heavy duty stainless steel friction hinges, min 4 -point cremone locking sets with stainless steel plates, handles, buffers etc. including necessary stainless steel screws/ fasteners, nuts, bolts, washers etc. all complete as per the Architectural drawings, as per the approved shop drawings, as specified and as directed by the Engineerin-Charge.	sqm	3009.00
8.5		Shadow box for spandrel portion	Providing, fabricating and supplying shadow box of required size and shape, for fixing in the spandrel portion of the structural glazing, in linearas well as curvilinear portions of the building by providing semi - rigid, inorganic, non-combustible fibre glass wool insulation 50 mm thick having density 48 kg/m <sup>3</sup> , conforming to IS: 8183 and BS: 3958 Part 5. The insulation layer shall have facing (factory bonded on surface # 1 of the fibre glass insulation layer), of black non-woven fibre glass tissue of nominal thickness 0.5 mm and nominal mass not less than 60 gm/sqm, made of randomly	sqm	1761.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			oriented glass fibres distributed in a binder by a wet-lay process including fixing 1.5 mm thick solid aluminum sheet backing using, 6 mm thick cement board including SS rivets, nuts, bolts, washers etc complete.		
8.6		Spandrel glass panels	Providing and supplying Spandrel Glass Panels comprising of 6 mm thick heat strengthened monolithic float glass of approved colour and shade with reflective soft coating on surface # 2 of approved colour and shade so as to match the colour and shade of the IGU in the vision panels etc., all complete for the required performances as specified, as per the Architectural drawings, as per the approved shop drawings, as specified, and as directed by the Engineer- in- Charge. For payment, only the actual area of glass on face # 1 of the glass panels (but excluding the area of grooves and weather silicone sealant) provided and fixed in position, shall be measured in sqm.(Payment for fixing of Spandrel Glass Panels in the curtain glazing is included in cost of relevant Item). (i) Coloured tinted float glass 6mm thick substrate with reflective soft coating on face # 2, having properties as visible Light transmittance (VLT) of 25 to 35 %, Light reflection internal 10 to 15%, light reflection external 10 to 20 %, shading coefficient (0.25- 0.28) and U value of 3.0 to 3.3 W/m <sup>2</sup> degree K etc. The properties of performance glass shall be decided by technical sanctioning authority as per the site requirement.	sqm	1706.00
8.7		Aluminium composite panel	Designing, fabricating, testing, installing and fixing in position		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
		(ACP)	<p>Curtain Wall with Aluminium Composite Panel (ACP) Cladding, with open grooves for linear as well as curvilinear portions of the building, for all heights and all levels etc. including:</p> <p>a) Structural analysis and design and preparation of shopdrawings for pressure equalisation or rain screen principle as required, proper drainage of water to make it watertight including checking of all the structural and functional design.</p> <p>b) Providing, fabricating and supplying and fixing panels of aluminium composite panel cladding in pan shape in metallic colour of approved shades. The aluminium composite panel cladding sheet shall be coil coated, with kynar 500 based PVDF / fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc.</p> <p>c) The fastening brackets of Aluminium alloy 6005 T5 / MS with Hot Dip Galvanised with serrations and serrated washersto arrest the wind load movement, fasteners, SS 316 Pins and anchor bolts of approved make in SS 316, Nylon separators to prevent bi-metallic contacts all complete required to perform as per specification and drawing The item includes cost of all material and labour component, the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			assembled working curtain wall with aluminium composite panel cladding, cleaning and protection of the curtain wall with aluminium composite panel cladding till the handing over of the building for occupation. Base frame work for ACP cladding is payable under the relevant aluminium items. The Contractor shall provide curtain wall with aluminium composite panel cladding, having all the performance characteristics all complete, as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge. However, for the purpose of payment, only the actual area on the external face of the curtain wall with Aluminum Composite Panel Cladding (including width of groove) shall be measured in sqm. upto two decimal places.		
	8.7.1	4 mm (0.5mm sheet)	4 mm thick aluminium composite panel material consisting of 3 mm thick FR grade mineral core sandwiched between two aluminium sheets (each 0.5mm thick)	sqm	3800.00
	8.7.2	4 mm (0.25mm sheet)	4 mm thick aluminium composite panel material consisting of 3.5 mm thick FR grade mineral core sandwiched between two aluminium sheets (each 0.25mm thick)	sqm	3556.00
	8.7.3	3 mm (0.25mm sheet)	3 mm thick aluminium composite panel material consisting of 2.5 mm thick FR grade mineral core sandwiched between two aluminium sheets (each 0.25mm thick)	sqm	3312.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
8.8		Spider glazing system	"Design, supply and installation of suspended Spider Glazing system designed to withstand the wind pressure as pr IS 875 (Part-III). The Suspended System held with Spider Fittings of SS-316 Grade Steel of approved manufacturer with glass panel having 12 mm thick clear toughened glass held together with SS- 316 Grade Stainless steel Spider and bolt assembly with laminated glass fins 21 mm thick. The Glass fins and glass panel assembly shall be connected to Slab/beams by means of SS-316 Grade stainless steel brackets and Anchor bolts and at the bottom using SS channel of 50x25x2mm using fastener and anchor bolts, non staining weather sealants of approved make, Teflon/ nylon bushes and separators to prevent bi-metallic contacts, all complete to perform as per specification and approved drawings. The complete system to be designed to accommodate thermal expansion and seismic movements etc. The joints between glass panels (6 to 8 mm) and gaps at the perimeter and in U channel of the assembly to be filled with non staining weather sealant, so as to make the entire system fully air tight, water proof and dust proof. The rate shall include all design, Engineering and shop drawing including approval from structural designer, labour, T and P, scaffolding, other incidental charges including wastage, enabling temporary services all fitting fixers nut bolts, washer, Buffer plates, fastener, anchors, SS channel laminated glass etc. all complete. For the purpose of payment,	Sqm	5983.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			actual elevation area of Glazing including thickness of joints and the portion of Glass panel inside the SS channel shall be measured.		
8.9		Aluminium magnesium alloy wall cladding	Providing and fixing aluminium magnesium alloy (FACADE) wall cladding system consisting of panels 200mm wide x 17mm deep x 0.5mm thick of maximum length of 6.0 mtr. coil coated on a continuous paint line double baked and roll formed from enamelled corrosion resistant GI pre-coated alloy for higher strength and roll forming characteristics, panel shall be clipped to baked enamel panel stringers of 34.5mm wide 48mm deep x 0.5mm thick GI alloy with cut-outs to hold the panel horizontally on the stringer in a module of 200mm centre to centre at a distance of maximum 1.20 mtr. The stringer shall be fixed to a suitable rigid structure. All panels shall be achromatised for maximum bond between metal and paint, enamelled twice under high temperature one side with full primer and the other side (inner side) with a primercoat on a continuous paint line, and fixed as per the direction of the Engineer-in-Charge.	sqm	4004.00
8.10		Alloy sun louvres	Providing and fixing Aluminium Magnesium alloy Plain Panel Sun Louvres of approved colour consisting of panel 84 mm wide x 16mm deep x 0.6mm thick with round edges panel length upto 6 mtrs coil coated on a continuous paint line double	sqm	3883.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>baked and roll formed from enamelled corrosion Resistance Aluminium Alloy AA3005 (Al.Mg.) for higher strength and good Roll forming characteristics. Panel shall be clipped to baked enamelled Aluminium panel stringer of 33mm wide and 86mm deep x 0.95 mm thick in a standard length of 5mtrs made of double baked enamelled Aluminium Alloy AA5050 (Al.Mg.) black with cut-outs to hold the panel in a module of 86mm centre to centre at a distance of 1mtr. The carrier shall be fixed to a suitable structure by means of rigid fixing details.</p> <p><b>Paint Finish:</b> Aluminium panels shall be chromatised for maximum bond between metal and paint, enamelled twice under high temperature one side with full primer and finish, the other side (inner side) with a primer coat and Skin Coat on a Continuous Paint Line.</p> <p><b>Note:</b> - 1. The cost of providing extruded aluminium frames, shadow boxes, extruded aluminium section capping for fixing in the grooves of the curtain glazing shall be paid for separately under relevant items under this subhead. However, for the purpose of payment, only the actual area of structural glazing (including width of grooves) on the external face shall be measured in sqm. upto two decimal places.</p>		

**CHAPTER – 9.0**  
**WOOD WORK, PVC WORK AND UPVC**  
**WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 204 (Part I)	Specification for tower bolts (ferrous bolt)
2	IS 204 (Part II)	Specification for tower bolts (non ferrous metals)
3	IS 205	Specification for non ferrous metal butt hinges
4	IS206	Specification for Tee and strap hinges
5	IS 207	Specification for Gate and shutter hook and eye
6	IS 208	Specification for door handles
7	IS 281	Specification for mild steel door bolts for use with pad locks
8	IS 287	Recommendations for maximum permissible moisture contents of timber used for different purpose
9	IS 303	Specification for plywood for general purposes
10	IS 362	Specification for parliament hinges
11	IS 363	Specification for hasps and staple
12	IS 364	Specification for fan light catch
13	IS 401	Code of practice for preservation of timber
14	IS 419	Putty for use on window frames
15	IS 451	Technical supply condition for wood screws
16	IS 452	Specification for door spring rat tail type
17	IS 453	Specification for double acting spring hinge
18	IS 707	Glossary of terms applicable to timber technology and utilization
19	IS 710	Specifications for Marine Plywood
20	IS 723	Specification for steel counter sunk head wire nails.
21	IS 729	Specification for drawer lock, cup board lock and box locks
22	IS 848	Specification for synthetic resin adhesive for plywood (phenoic and amino plastic)
23	IS 851	Specification for synthetic resin adhesive for const. work (non structural in wood)
24	IS 852	Specification for animal glue for general wood work purpose
25	IS 1003 (Part I)	Specification for timber panelled and glazed shutter Part I (door shutters)
26	IS 1003 (Part II)	Specification for timber panelled and glazed shutter Part II (window and ventilator shutter)
27	IS 1141	Specification for code of practice for seasoning of timber
28	IS 1200 Part XIV	Method of measurement of building and civil engg work glazing.

29	IS 1200 Part XII	Wood work and joinery
30	IS 1328	Specification for veneered decorative plywood
31	IS 1341	Specification for steel butt hinges
32	IS 1378	Specification for oxidized copper finishes
33	IS 1566	Specification for hard drawn steel wire fabric
34	IS 1568	Specification for wire cloth for general purpose
35	IS 1658	Specification for hard drawn steel wire fabric
36	IS 1659	Specification for block boards
37	IS 1708 (Part 1 to 18)	Testing of small clear specimen for timber
38	IS 1734	Determination of density and moisture content.
39	IS 1823	Specification for floor door stopper
40	IS 1868	Specification for anodic coating on aluminium and its alloy - do-
41	IS 2046	Decorative thermosetting synthetic resin bonded laminated sheet
42	IS 2095	Specification for gypsum plaster board
43	IS 2096	Specification for asbestos cement flat sheet.
44	IS 2202 (Part I)	Specification for wooden flush door shutter, solid core type (plywood face panels )
45	IS 2202 (Part II)	-do- (Particle boards and hard board face panels)
46	IS 2209	Specification for mortice lock (Vertical Type )
47	IS 2380	Method of test for wood particle board and board for lignocelluloses material
48	IS 2547	Specification for gypsum plaster
49	IS 2753	Method for estimation of preservatives in treated timber and in treating solutions.
50	IS 2681	Specification for non-ferrous metal sliding door bolts use with pad locks
51	IS 3087	Specification for wood particle boards (Medium density) for general purpose.
52	IS 3097	Specification for veneered particle board
53	IS 3828	Specification for ventilator chain
54	IS 3400 (Part II)	Method of test for Vulcanized rubber (hardness)
55	IS 3400 (Part IV)	Method of test for Vulcanized rubber (Accelerated aging)
56	IS 3400 (Part IX)	Method of test for Vulcanized rubber (Density)
57	IS 3564	Specification for door closer (hydraulically regulated)

58	IS 3618	Phosphate treatment of iron and steel for protection against corrosion
59	IS 3813	“C” hooks for use with swivels
60	IS 3818	Specification for continuous (Piano) hinges
61	IS 3847	Specification for mortice night latch
62	IS 4835	Specification for polyvinyl acetate dispersion based adhesive for wood
63	IS 4948	Specification for welded steel wire fabric for general use
64	IS 4992	Specification for rebated mortice lock
65	IS 5187	Specification for flush bolts
66	IS 5509	Specification for Fire Retardant Plywood
67	IS 5930	Specification for mortice latch
68	IS 6318	Specification for plastic wire window fastners
69	IS 6607	Specification for rebated mortice lock (Vertical type)
70	IS 6760	Specification for sloted counter sunk head wood screws.
71	IS 7196	Specification for hold fast
72	IS 7534	Specification for sliding locking bolts for use with pad lock
73	IS 7638	Wood/lignocellulosic based panel products - Method for sampling
74	IS 8756	Specification for mortice ball catch for use in wooden almirah
75	IS 9308 (Part II)	Specification for mechanically extracted coir fibres. (Mattress coir fibres)
76	IS 9308 (Part III)	-do- Decorated coir fibre
77	IS 11215	Moisture content of timber and timber products method of determination
78	IS 12049	Dimensions and tolerance relating to wood based panel materials
79	IS 12406	Specification for medium density fibre board
80	IS 12817	Specification for stainless steel Butt Hinges
81	IS 12823	Specification for wood products -Prelaminated particle Boards
82	IS 14616	Specifications for laminated veneer lumber
83	IS 14842	Specification for coir veneer board for general purposes
84	IS 14856	Specification for glass fibre reinforced plastic (FRP) panel type door
85	IS 14900	Specifications for transparent float glass

## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
1	2	3	4	5	6	7
Timber	9.1.6	Moisture content	Field (by moisture meter) laboratory test as required by Engineer-in- Charge	Appendix 'C'	1 cum	Every one cum or part thereof.
Flush door	9.7.10	End immersio n Test knife test Adhesion Test	Laboratory	IS 2202 Appendix 'F'	26 shutters	As per sampling and testiNg Specified in lause 9.7.11
Mortice Locks	9.15.1 3	Testing of spring	Laboratory	IS 2209- Appendix 'G'	50 Nos	100 or part thereof.

# **PREAMBLE**

## **WOODWORK AND P.V.C. WORK (CHAPTER: 9.0)**

### **9.1 Door, Window and Ventilator Frames**

Timber for door, window and ventilators frames shall be as specified. Timber shall be sawn in the direction of the grains. All members of a frame shall be of the same species of timber and shall be straight without any warp or bow. Frames shall have smooth, well-planed (wrought) surfaces except the surfaces touching the walls, lintels, sill etc., which may be left clean sawn. Rebates, rounding or moulding shall be done before the members are jointed into frames. The depth of the rebate for housing the shutters shall be 15 mm, and the width of the rebates shall be equal to the thickness of the shutters. A tolerance of  $\pm 2$  mm shall be permitted in the specified finished dimensions of timber sections in frames.

### **9.2 Joints**

The Jamb posts shall be through tenoned in to the mortise of the transoms to the full thickness of the transoms and the thickness of the tenon shall be not less than 2.5 cm. The tenons shall closely fit into the mortise without any wedging or filling. The contact surface of tenon and mortise before putting together shall be glued with polyvinyl acetate dispersion based adhesive conforming to IS 4835 or adhesive conforming IS 851 and pinned with 10 mm dia hard wood dowels, or bamboo pins or star shaped metal pins. The joints shall be at right angles when checked from the inside surfaces of the respective members. The joints shall be pressed in position. Each assembled door frame shall be fitted with a temporary stretcher and a temporary diagonal brace on the rebated faces.

### **9.3 Fixing of Frames**

The frames shall be got approved by the Engineer-in-Charge before being painted, oiled or otherwise treated and before fixing in position. The surface of the frames abutting masonry or concrete and the portions of the frames embedded in floors shall be given a coating of coal tar. Frames shall be fixed to the abutting masonry or concrete with holdfasts or metallic fasteners as specified. After fixing, the jamb posts of the frames shall be plugged suitably and finished neat. Vertical members of the door frames shall be embedded in the floor for the full thickness of the floor finish and shall be suitably strutted and wedged in order to prevent warping during construction. A minimum of three hold fasts shall be fixed on each side of door and window frames one at centre point and other two at 30 cm from the top and bottom of the frames. In case of window and ventilator frames of less than 1 m in height two hold fasts shall be fixed on each side at quarter point of the frames. Hold fasts and metallic fasteners shall be measured and paid for separately.

### **9.4 Panelled Glazed or Panelled and Glazed Shutters**

Panelled or glazed shutters for doors, windows, ventilators and cupboards shall be constructed in the form of timber frame work of stiles and rails with panel inserts of timber, plywood, block board, veneered particle board, fibre board wire gauze or float glass. The shutters may be single or multipanelled, as directed by the Engineer-in-Charge. Timber for frame work, material for panel inserts and thickness of shutters shall be as specified. All members of the shutters shall be straight without any warp or bow and shall have smooth well planed face at right angles to each other. Any warp or bow shall not exceed 1.5 mm for door shutter and 1 mm for window and ventilator shutters the right angle for the shutter shall be checked by measuring the diagonals and the difference between the two diagonals should not be more than 3 mm. Generally panelled glazed or panelled and glazed shutter shall conform to IS 1003 (Pt. 1 and 2).

### **9.5 Frame Work**

Timber for stiles and rails shall be of the same species and shall be sawn in the directions of grains. Sawing shall be truly straight and square. The timber shall be planed smooth and accurate to the required dimensions. The stiles and rails shall be joined to each other by plain or haunched mortise and tenon joints and the rails shall be inserted 25 mm short of the width of the stiles. The bottom rails shall have double tenon joints and for other rails single tenon joints shall be provided. The lock rails of door shutter shall have its centre line at a height of 800 mm from the bottom of the shutters unless otherwise specified. The thickness of each tenon shall be approximately one-third the finished thickness of the members and the width of each tenon shall not exceed three times its thickness.

**Gluing of Joints :** The contact surfaces of tenon and mortise shall be treated, before putting together, with bulk type synthetic resin adhesive conforming to IS 851 suitable for construction in wood or synthetic resin adhesive (Phenolic and aminoplastic) conforming to IS 848 or polyvinyl acetate dispersion based adhesive conforming to IS 4835 and pinned with 10 mm dia hardwood dowels or bamboo pins or star shaped metal pins; after the frames are put together and pressed in position by means of press.

Stiles and bottom rail shall be made out of one piece of timber only. Intermediate rail exceeding 200 mm in width may be of one or more pieces of timber. The width of each piece shall be not less than 75 mm. Where more than one piece of timber is used for rails, they shall be joined with a continuous tongued and grooved joint glued together and reinforced with metal dowels at regular intervals not exceeding 200 mm.

## 9.6 Window and Ventilator

### Shutters Rebating

The shutters shall be single-leaf or double leaved as directed by the Engineer-in-Charge. In case of double leaved shutters, the meeting of the stiles shall be rebated by one third the thickness of the shutter. The rebating shall be either splayed or square type.

### Panelling

The panel inserts shall be either framed into the grooves or housed in the rebate of stiles and rails. Timber, plywood, and particle board panels shall be fixed only with grooves. The depth of the groove shall be 12 mm and its width shall accommodate the panel inserts such that the faces are closely fitted to the sides of the groove. Panel inserts shall be framed into the grooves of stiles and rails to the full depth of the groove leaving space of 1.5 mm. Width and depth of the rebate shall be equal to half the thickness of stiles and rails. Glass panels, asbestos panels wire gauze panels and panel inserts of cupboard shutters shall be housed in the rebates of stiles and rails.

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

**Plywood Panels:** Plywood boards used for panelling of shutters shall be BWP type or grade as specified. Each panels shall be a single piece of thickness, 9 mm for two or more panel construction and 12 mm thickness for single panel construction unless otherwise specified.



**Veneered Particle Board Panels:** Veneered Particle board used for panelling of shutters shall be Exterior Grade bonded with BWP type synthetic resin adhesive as specified. Each panel shall be a single piece of thickness 12 mm unless otherwise specified.

**Fibre Board Panels:** Fibre board used for panelling of shutters shall be Exterior Grade bonded with BWP type synthetic resin adhesive each fibre board panel shall be a single piece unless otherwise specified.

**Wire Gauze Panels:** Wire Gauze used for panelling of shutters shall be woven with 0.63 mm dia galvanised mild steel wire to form average aperture size of 1.40 mm as specified. Wire gauze shall be securely housed into the rebates of stiles and rails by giving right angles bend turned back and fixed by means of suitable staples at intervals of 75 mm and over this wooden beading shall be fixed. The space between the rebate and the beading shall be fixed with putty to give a neat finish. Each wire gauze panel shall be a single piece, and the panels shall be so designed that no single panels exceeds 0.5 sqm in area. However, care shall be taken to prevent sagging of wire gauge, of panel by providing and fixing 20 x 20 mm square or equivalent beading to the external face to the required patterns as decided by the Engineer-in-Charge.

**Glass Panels:** Glass panelling (Glazing) shall be done as specified. Glazing in the shutters of doors, windows and ventilators of bath, WC and Lavatories shall be provided with frosted glass the weight of which shall be not less than 10 kg/sqm. Frosted glass panes shall be fixed with frosted face on the inside. Glass panels shall be fixed by providing a thin layer of putty conforming to IS 419 applied between glass pane and all along the length of the rebate and also between glass panes and wooden beading.

Putty can be prepared by mixing one part of white lead with three parts of finely powdered chalk and then adding boiled linseed oil to the mixture to form a stiff paste and adding varnish to the paste at the rate of 1 litre of varnish to 18 kg of paste. Fixing of glass panes without beading shall not be permitted. Glazing shall be done after the shutters have been primed and prepared for painting, so that wood may not draw oil out of putty.

**Finish:** Panels of shutters shall be flat and well sanded to a smooth and level surface.

### 9.7 Beading

Beadings in panelled shutter shall be provided where specified in architectural drawings or directed by the Engineer-in-Charge. Each length of beading shall be single piece. Joints at the corners shall be mitred and exposed edges shall be rounded. Beading shall be fixed with headless nails at 75 mm intervals. For external shutters, the beading shall be fixed on the outside face.

### 9.8 Machine/Factory made Shutters

Machine made shutters, where specified, shall be procured from an approved factory. For machine made shutters, operations like sawing, planing, making tongue and tenons, cutting grooves, mortises and rebates, drilling holes and pressing of joints shall be done by suitable machines. Machine made shutters shall be brought to the site fully assembled but without any priming coat. Panel inserts of sheet glass and wire gauze may, however, be fixed at site.

### 9.9 Fixing of Shutters

For side hung shutters of height upto 1.2 m, each leaf shall be hung on two hinges at quarter

points and for shutter of height more than 1.2 m, each leaf shall be hung on three hinges one at the centre and the other two at 200 mm from the top and bottom of the shutters. Top hung and bottom hung shutters shall be hung on two hinges fixed at quarter points of top rail or bottom rail. Centre hung shutter shall be suspended on a suitable pivot in the centre of the frame. Size and type of hinges and pivots shall be as specified. Flap of hinges shall be counter sunk into the recesses cut to the exact dimensions of flap. Screws for fixing the hinges shall be screwed in with screw driver and not hammered in. Unless otherwise specified, shutters of height more than 1.2 mm shall be hung on butt hinges of size 100 mm and for all other shutters of lesser height butt hinges of size 75 mm shall be used. For shutter of more than 40 mm thickness butt hinges of size 125 × 90 × 4 mm shall be used. Continuous (piano) hinges shall be used for fixing cup-board shutters where specified.

#### **9.10 Flush Door Shutters**

Flush door shutters shall have a solid core and may be of the decorative or non-decorative (Paintable type as per IS 2202 (Part I). Nominal thickness of shutters may be 25, 30 or 35 mm. Thickness and type of shutters shall be as specified.

Width and height of the shutters shall be as shown in the drawings or as indicated by the Engineer-in-Charge. All four edges of the shutters shall be square. The shutter shall be free from twist or warp in its plane. The moisture content in timbers used in the manufacture of flush door shutters shall be not more than 12 per cent when tested according to IS 1708.

#### **9.11 Core**

The core of the flush door shutters shall be a block board having wooden strips held in a frame constructed of stiles and rails. Each stile and rail shall be a single piece without any joint. The width of the stiles and rails including lipping, where provided shall not be less than 45 mm and not more than 75 mm. The width of each wooden strip shall not exceed 30 mm. Stiles, rails and wooden strips forming the core of a shutter shall be of equal and uniform thickness. Wooden strips shall be parallel to the stiles. End joints of the pieces of wooden strips of small lengths shall be staggered. In a shutter, stiles and rails shall be of one species of timber. Wooden strips shall also be of one species only but it may or may not be of the same species as that of the stiles and rails. Any species of timber may be used for core of flush door. However, any non-coniferous (Hard wood) timber shall be used for stiles, rails and lipping.

#### **9.12 Face Panel**

The face panel shall be formed by gluing, by the hot-press process on both faces of the core, either plywood or cross-bands and face veneers. The thickness of the cross bands as such or in the plywood shall be between 1.0 mm and 3.0 mm. The thickness of the face veneers as such or in the plywood shall be between 0.5 mm and 1.5 mm for commercial veneers and between 0.4 mm and 1.0 mm for decorative veneers, provided that the combined thickness of both is not less than 2.2 mm. The direction of the veneers adjacent to the core shall be at right angles to the direction of the wooden strips. Finished faces shall be sanded to smooth even texture. Commercial face veneers shall conform to marine grade plywood and decorative face veneers shall conform to type I decorative plywood in IS 1328.

#### **9.13 Tests**

Samples of flush door shutters shall be subjected to the following tests:

- (i) End Immersion Test
- (ii) Knife Test
- (iii) Glue Adhesion Test

One end of each sample shutter shall be tested for End Immersion Test. Two specimens of 150 x 150 mm size shall be cut from the two corners at the other end of each sample shutter

for carrying out Glue Adhesion Test. Knife Test shall be done on the remaining portion of each sample shutter. Test shall be done as laid down in Appendix P

#### 9.14 Sample Size

Shutters of decorative and non-decorative type from each manufacturer, irrespective of their thickness, shall be grouped separately and each group shall constitute a lot. The number of shutters (sample size) to be selected at random from each lot for testing shall be as specified in Table 9.1 If The total number of shutters of each type in a work (and not the lot) is less than twenty five, testing may be done at the discretion of the Engineer-in-Charge and in such cases extra payment shall be made for the sample shutter provided the sample does not fail in any of the test. For knife test, glue adhesive test, slamming test, the end immersion test, the number of shutters shall be as per col. 4 of Table 9.1

**TABLE 9.1**

**Sample Size and Criteria for Conformity**

Lot Size	Sample Size	Permissible no. of Defective	Sub. Sample size
1	2	3	4
Upto 26 to 50	8	0	1
51 – 100	13	1	2
101 – 150	20	1	2
151 – 300	32	1	3
301 – 500	50	2	4
501 and above	80	2	5

#### 9.15 Wire Gauze Fly Proof Shutters

Specified timber shall be used, and it shall be sawn in the direction of the grains. Sawing shall be truly straight and square. The timber shall be planed smooth and accurate to the full dimensions, rebates, roundings and mouldings as shown in the drawings made, before assembly. Patching or plugging of any kind shall not be permitted except as provided.

#### 9.16 Stile and Rails

The stiles and rails shall be given a rebate to receive the wire gauze which shall form the panels.

#### 9.17 Wire Gauze

The wire gauze shall be bent at right angles in the rebates of stiles and rails, turned back and fixed tight with blue tacks at about 75 mm centres, fixed alternately in the two faces of the rebates. Over this, wooden beading shall be fixed with brads or small screws at about 75mm centres. The space between the beading and rebates, where the wire gauze is bent, shall be neatly finished with putty, so that the end of the wire gauze may not be visible.

#### 9.18 Moisture Content

The average moisture content of three test specimens, when determined in accordance with IS 1734 (Part 1) shall be between 5 to 15%.

#### Tests

- The tests as per Table-1 of IS 14616 shall be carried out by the manufacturer on the LVL(Laminated Veneer Lumber) sections on each batch.
- The manufacturer shall get the tests done on at least three samples of each batch by the standard method of test to ensure quality and performance of the material as per para of IS 14616.

- The manufacturer shall provide a certificate with the delivery challan indicating that the material conforms to IS 14616 along with the copy of the test report of the relevant batch.

### **9.19 Laminated Veneer Lumber (LVL) Door Shutters**

This specification lays down requirements regarding types, sizes, material, construction, workmanship and finish, performance evaluation, sampling, measurements, rates and testing of Laminated Veneer Lumber (LVL) door shutter for use in domestic buildings, offices, schools, hospitals etc. This specification does not cover large size door shutters for industrial and special buildings such as workshops, garages, godowns etc.

The material of each lot shall be supported by a certificate to that effect: Each lot of LVL materials shall be accompanied by the test reports. Fabricator shall take up manufacturing of shutters only if provisions of IS 14616 are fulfilled; failing which, shutters so manufactured are liable for rejection.

### **9.20 Panelling Materials**

**Plain Particle Board:** Plain particle boards used for panels shall be FPT-1 conforming to IS 3087 and shall have been bonded with BWP type of synthetic resin adhesive as per IS 848.

**Pre-laminated Particle Board:** Pre-laminated particle boards used for panels shall conform to IS 12823. The plain particle boards used in pre-laminated particle boards conform to specifications.

**Medium Density Fibre Board:** Medium density fibre board used for panels shall conform to exterior grade as per IS 12406 made from agro-forest products or agricultural wastes or natural fibers.

**Pre-laminated Medium Density Fibre Board:** Pre-lamination in pre-laminated medium density fiber board shall conform to the requirements such as Abrasion Resistance, Resistance to Steam, Crack Resistance, Resistance to Cigarette Burn and Resistance to Stain as specified in IS 12823.

**Glass:** Glass for glazing shall conform to IS 2835 or IS 2553. The use of other types of glass, such as frosted glass, wired glass and coloured glass may also be specified by the Engineer-in-Charge.

**Wire Gauze:** Wire gauze shall generally conform to IS 1568 and shall be regularly woven with equally spaced galvanized mild steel wires of 0.63 mm nominal diameter in both warp and weft directions to form aperture of average width 1.40 mm.

### **9.21 UPVC Door Frame**

UPVC door frame shall be made of PVC material conforming to IS 10151. The door frame shall be made from extruded UPVC section having overall dimensions of 48 x 40 mm or 42 x 50 mm having wall thickness of 2.0 mm + 0.2 mm. Corners of the door frame to be jointed by M.S. galvanized brackets. Joints mitred and plastic welded. The hinge side vertical outer frames shall be reinforced by galvanized M.S. Tube of size 19 x 19 mm of wall thickness 1 mm + 0.1 mm and a tie rod shall be provided at the bottom of the frame. The frame shall be fabricated in factory as per nomenclature of the item and directions of Engineer-in-Charge.

### **9.22 Fixing of Frames**

The frames are to be fixed in prepared openings in the walls. All civil work and tiling should be completed before the fixing of the frames. The frames are to be fixed directly on

the plastered wall. In case tiling is to be done in the place the frames are to be fitted, a 50 mm strip should be left untilted at the location where the frames are to be fitted. The frames are erected in the prepared opening such that the vertical members of the door frame are embedded 50 mm in the floor. The frame shall be fitted truly in plumb. A minimum of three anchor bolts or screws of size 65/100 shall be used to fix each vertical member. One bolt shall be fixed at 200 mm from the top member and one bolt shall be fixed at 200 mm from the floor. The third anchor bolt shall be fixed in the center. The top horizontal member shall be fixed using two 65/100 size anchor bolts or screws at a distance of 200 mm from both the corners.

### 9.23 PVC Door Shutters

The shutters shall be fabricated at factory as per nomenclature of the item and directions of Engineer-in-Charge. Shutter shall be made of PVC material conforming to IS 10151.

24 mm thick PVC Door Shutter

30 mm Thick PVC Door

Shutters

Sampling and Criteria for Conformity

### 9.24 General Precautions

The test specimens shall not have been exposed to a temperature below 40°C for 24 hours immediately preceding the test and shall be free from all visible moisture. The specimen shall be inspected and any specimen with visible flaws shall be discarded.

If any test specimen fails because of mechanical reason, such as failure of testing equipment or improper specimen preparation, it shall be discarded and another specimen taken.

### 9.25 Test

The door shutters shall be subjected to the following tests in accordance with IS 4020 (Part 1 to 16).

- (i) Dimension and Squareness Test: Door shutters when tested in accordance with IS 4020 (Part 2) the dimensions of nominal width and height will be within a limit of + 5 mm. The door shutter shall not deviate by more than 1 mm on a length of 500 mm. The thickness of the door shutter shall be uniform throughout with the permissible variation of not more than 0.8 mm between any two points. The nominal thickness of the shutter shall be within a limit of + 1.5 mm.
- (ii) General Flatness Test: Door shutter, when tested in accordance with IS 4020 (Part 3) the twist, cupping and warping shall not exceed 6 mm.
- (iii) Local Planeness Test: Door shutters, when tested in accordance with IS 4020 (Part 4), the depth of deviation measured at any point shall not be more than 0.5 mm.
- (iv) Impact Indentation Test: Door shutters, when tested in accordance with IS 4020 (Part 5), shall have no defects such as cracking, tearing or delamination and the depth of indentation shall not be more than 0.2 mm.
- (v) Edge Loading Test: Door shutters, when tested in accordance with IS 4020 (Part 7) the deflection of the edge at the maximum load shall not be more than 5 mm. On removal of the loads, the residual deflection shall not be more than 0.5 mm, failing which the test may be repeated on the other edge in the reverse direction. Also there shall be no lateral

buckling by more than 2 mm during loaded condition and no residual lateral buckling after removal of the load.

- (vi) Shock Resistance Test: Door shutters, when tested in accordance with 2.1 of IS 4020 (Part 8), there shall be no visible damage in any part of the door after twenty five blows on each end.
- (vii) Buckling Test: Door shutters, when tested in accordance with IS 4020 (Part 9), shall not show any deterioration and any residual deformation more than 5 mm after 15 min. of unloading and the initial deflection also shall not be more than 50 mm.
- (viii) Slamming Test: Door shutters, when tested in accordance with 2.1 of IS 4020 (Part 10), shall not have any damage in any part of the door at the end of successive impacts. Door shutters, when tested in accordance with 3.1 of IS 4020 (Part 10), shall not have any visible damage in part of the door at the end of 100 successive impacts.
- (ix) Misuse Test : Door shutters, when tested in accordance with IS 4020 (Part 11), there shall not be any permanent deformation of the fixing or any other part of the door set in hindering its normal working after the test.
- (x) Screw Holding Test: Door shutters, when tested in accordance with IS 4020- Part 16, the load shall not be less than 1000 N.
- (xi) End Immersion Test: Door shutters, when tested in accordance with IS 4020- Part 13, the shutter shall not show any delamination.
- (xii) Knife Test: Door shutter, when tested in accordance with IS 4020 – Part 14, the grading shall be standard and excellent.
- (xiii) Glue Adhesion Test: Door shutters shall be tested in accordance with IS 4020 – Part 15. There should be no delamination.

## **9.26 Gypsum Partition Panels**

The material shall conform to IS: 2849

## **9.27 Dimensions**

As per the item nomenclature.

## **9.28 Laying**

- (i) Panels are stored in a dry place and water should not come in contact with panels during or after construction. If the panels get wet, they should be dried before use.
- (ii) The floor should be perfectly level before laying the first course. All panels must be properly aligned to the plumb. Successive layer of panels must be alternatively staggered so that vertical joints are not in the same line.
- (iii) The recommended quantity of Gypsum Bonding Plaster must be used for joints and filling the grooves made for conduits, pipelines, etc. Excess Bonding Plaster must be scooped and removed, so that the joints and the places where the grooves are filled in are flush and even.
- (iv) The walls should be dry and sanding done properly especially at joints before the primer is applied so that the surface is even and joints will not be visible after painting. Avoid



chasing with chisel and hammer. Use electrical saw or grooving tools for conduiting etc.

- (v) The recommended span of walls is maximum 6 meters and maximum height is 4.5 meters.
- (vi) Gypsum panel can easily be cut with coarse tooth hand saw, electric jigsaw, etc. The panels can be cut, sawn, drilled, milled or dowelled on the job. For concealed piping and conduit, the depth of groove should not exceed 50 mm. Hammer and chisel techniques to form chases must be avoided.

**9.29 Sanding:**

This application is to make the surface level without undulations. To make the gypsum wall surface level (in particular at joints, where there is excess bonding plaster), do sanding with sand paper at joints and other places, wherever you find uneven surface, otherwise joints will be visible after painting. It is important to sand all joints uniformly.

**9.30 Primer Application:**

The purpose of the primer is to give a better adhesion to the paint and also to reduce consumption of paint on the wall. Water thinable primers shall be used only.

**TABLE 9.2**

**TABLE FOR PERMISSIBLE DEFECTS FOR VARIOUS GRADES OF TIMBERS**

Sl. No.	Defects	First Grade	Second Grade
1	2	3	4
(i)	Cross-grain	Not steeper than 1 in 15	Not steeper than 1 in 10
(ii)	Sound knots and live knots	(i) Stiles and Rails (a) Short Exposed Face: Not more than 15 mm size and not more than 1 knot/metre (b) Long Exposed Face- Not more than 15 mm size and not more than 1 knot/m. No knot shall occur within 20 mm of the edges (ii) Panels – Not more than 20 mm size and not more than 2 knots/m <sup>2</sup> . No knot shall occur on edge of any component of a panel.	(i) Stiles and Rails (a) Short exposed Face – Not more than 15 mm size and not more than 3 knots per stile and 1 knot per rail (b) Long Exposed Face- Not more than 20 mm size and not more than 3 knots per stile and 1 knot per rail (ii) Panels – Not more than 20 mm size and not more the 4 knots/m <sup>2</sup> . No knots shall occur on edge of any component of a panel.

(iii)	Dead and loose knots (plugged)	(i) Stiles and Rails – Not more than 10 mm size – centrally located and not more than 1 knot / m (ii) Panels – Not more than 15 mm size and not more than 2 knots/m <sup>2</sup> . No knot shall occur on edges of any component of a panel.	(i) Stiles and Rails – Not more than 10 mm size, centrally located and not more than 3 knots per stile and 1 knot per rail. (ii) Panels – Not more than 15 mm size and not more than 4 knots/m <sup>2</sup> . No knot shall occur on edge of any Component of a panel.
(iv)	Pitch pockets or Streaks	None	Permissible except on exposed edges provided that they are clean and filled up with suitable putty or filler when pitch pockets or streaks
			are located on the exposed edges of the core, they shall be cut out and filled with piece of wood of Similar species with grain running in the same direction. The piece shall be well glued.
(v)	Sapwood	Total not exceeding 5 mm wide and 150 mm long per metre. (This restriction applies only to super group species).	Total not exceeding 10 mm wide and 300 mm long per metre. (This restriction applies only to super group species).
(vi)	Pin holes	Permitted provided they are not in Cluster	Permitted.
(vii)	Worm holes	None	Permitted provided they are not more than 10 mm in diameter and not more than one per metre and provided such worm holes are plugged with similar timber in such a manner that the plugging merges with the surrounding area both as to colour and grain.

**Note :**

- (i) Dead and loose knots are permitted only if they are suitably plugged.
- (ii) Knot shall not occur where hinges or locks are to be fixed.



**TABLE 9.3  
PHYSICAL AND MECHANICAL PROPERTIES OF PLYWOOD**

**Moisture content** 5 to 15 per cent.

**Shear Strength**

	<b>Dry State</b>	<b>Resistance to Moisture</b>
Average	135	100
Individual	110	80

**TABLE 9.4  
PHYSICAL AND MECHANICAL PROPERTIES OF FPT OR GRADED  
PARTICLE BOARD**

Sl. No.	Properties	Flat pressed Three layer multi layer and graded	
		Grade- I	Grade- II
(i)	Density variation, percent	± 10	± 10
(ii)	Water absorption, percent		
	(a) 2 h soaking	10	40
	(b) 24 h soaking	20	80
(iii)	Linear expansion (swelling in water). 2 h soaking-percent	0.5	0.5
	(a) Length	0.5	0.5
	(b) Width		
(iv)	Thickness, swelling, percent 2 h soaking	8	12
(v)	Swelling in thickness due to surface absorption, Percent	6	9
(vi)	Modulus of rupture, N/mm <sup>2</sup>	15	11
	(a) Average	13	10
	(b) Minimum		
(vii)	Modulus of elasticity, N/mm <sup>2</sup>	2500	2000
	(a) Average	2250	1800
	(b) Minimum		
(viii)	Tensile strength perpendicular to surface, N/mm <sup>2</sup>	0.45	0.3
	(a) Upto 20 mm thickness	0.45	0.3
	(b) Above 20 mm thickness		
(ix)	Tensile strength perpendicular to surface, N/mm <sup>2</sup>	0.2	-
	(a) After cyclic test	0.15	-
	(b) Accelerated water resistance test 2)		

(x)	Screw withdrawal strength, N/mm <sup>2</sup> (a) Face (b) Edge (for thickness >12mm)	1250	1250
		850	700

1) Cyclic Test— Specimen are immersed in water at  $27 \pm 2^\circ\text{C}$  for a period of 72 h, followed by drying in air at  $27 \pm 2^\circ\text{C}$  for 24 H and then heating in dry air at  $70^\circ\text{C}$  for 72 h. Three such cycles are to be followed and then the specimens are tested for tensile strength perpendicular to surface.

2) Accelerated Water Resistance Test— Specimen are immersed in water at  $27 \pm 2^\circ\text{C}$  and water is brought to boiling and kept at boiling temperature for 2 h. Specimen are then cooled in water to  $27 \pm 2^\circ\text{C}$  and then tested for tensile strength perpendicular to surface.

### TESTS FOR FLUSH DOOR SHUTTERS

#### END IMMERSION TEST

Door shutters shall be tested for resistance of their base to immersion in water as follows:

- The door shutter shall be immersed vertically to a height of 30 cm in water at roomtemperature for 24 hours
- Then allowed to dry for 24 hours at  $27 \pm 2^\circ\text{C}$  and relative humidity of  $65 \pm 5$  per cent.
- The cycle shall be repeated eight times.
- There shall be no delamination at the end of the test.

#### KNIFE TEST

**Apparatus:** The type of knife required to be used in the test is given in Fig. below. It may be made from a 250 x 25 mm file. The cutting edge should be kept chiselsharp. The test shall be carried out on a stout table to which a wooden batten is screwed against which the edge of test piece is placed.

#### KNIFE FOR TESTING PLYWOOD FOR ADHESION OF PLYS

##### Procedure:

- The knife is inserted with its cutting edge parallel to the grain of the outer veneer andworked into, or if possible along a glue line and the veneer is prised upwards.
- A hard and dense specie of plywood requires considerable force to effect entry and to priseand veneer.
- In a soft timber the knife tends to follow an easy course through the wood and in this case itis essential that the knife be firmly guided along the glue line.
- The bond should just pass the requirement, it is judged by the relative amount of wood fibreleft on the core veneer, and the area prised off.
- The grading is assessed chiefly on the appearance of the break.
- The force needed to effect separation is also an accompanying requirement. The bond is ‘excellent’, when it is difficult to find the glue line and impossible to keep the tool within it for more than 6 mm without cutting adjacent wood.
- On prising upwards, the veneer usually breaks off over a width slightly greater than that of the tool.
- The bond is ‘poor’ when knife meets little opposition in the glue line and the prise results inthe easy removal of almost all the veneers from one side of the test piece. The separated veneers are usually almost free from adherent fibre.
- Reporting of test results: The results shall be reported as ‘pass standard’ ‘excellent’ or ‘poor’.

### GLUE ADHESION TEST

- Four square sections, 150 x 150 mm shall be cut from the corners of the door.
- These four cornersections as cut from the door shall be immersed in boiling water for 4hours, then dried at  $27 \pm 2^{\circ}\text{C}$  and relative humidity of  $65 \pm 5$  per cent for 24 hours.
- At the end of the drying period, the samples shall be examined for delamination.
- In the case of the glue lines in the plywood, all the four exposed edges of the plywood on both faces of a specimen shall be examined for delamination. A specimen shall be considered to have passed the test if no delamination has occurred in the glue lines in the plywood and if no single delamination more than 50 mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood faces and the stile and rail.
- Delamination at the corner shall be measured continuously around the corner. Delamination at a knot, knot hole, a pitch pocket and worm hole or other permissible wood defects shall not be considered in assessing the sample. A door shall be deemed to have passed this test if three of the four specimens tested pass the test.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.1		Wood work in frames of doors, windows	Providing wood work in frames of doors, windows, clerestory windows and other frames, wrought framed and fixed in position with hold fast lugs or with dash fasteners of required dia and length (hold fast lugs or dash fastener shall be paid for separately).		
	9.1.1	2nd class teak wood	Second class teak wood	cum	90618.00
	9.1.2	Sal wood	Sal wood	cum	71309.00
	9.1.3	Kiln seasoned hard wood finger jointed	Kiln Head wood seasoned and chemically treated hard wood (Haldu, Kail, Bija wood.)	cum	72744.00
	9.1.4	Kiln seasoned hard wood	Factory made Kiln seasoned, chemically treated, finger jointed at spacing not closer than 50 cm, 2nd class hard wood.		
	9.1.4.1	Frame 100mmX60 mm	Frame of size 100mmX60mm single or double rebate	meter	389.00
	9.1.4.2	Frame 120mmX60 mm	Frame of size 120mmX60mm double rebate.	meter	457.00
9.2		Laminated veneer lumber frames	Providing laminated veneer lumber conforming to IS:14616 and TAD -15: 2001(Part-B) in factory made frames of doors, windows, clerestory windows and other frames, wrought framed and fixing in position with hold fast lugs or with dash fasteners of required dia and length ( hold fast lugs or dash fastener shall be paid for separately).	cum	92195.00
9.3		Wood work in frames of false ceiling	Providing wood work in frames of false ceiling, partitions etc. sawn and fixed in position ( with necessary stainless steel screw)		
	9.3.1	Sal wood	Sal wood	cum	76229.00
	9.3.2	Hard wood	Kiln seasoned and chemically treated hardwood Haldu, Kail, Bija wood.	cum	77538.00
	9.3.3	2 <sup>nd</sup> class, hard wood finger jointed	Factory made Kiln seasoned, chemically treated, finger jointed at spacing not closer than 50 cm, 2nd class hard wood.	cum	64833.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.4		Extra for circular shape	Extra for additional labour wood work in circular shape, such as in frames of fan light :		
	9.4.1	2 <sup>nd</sup> class teak wood	Second class teak wood	cum	9062.00
	9.4.2	Sal wood	Sal wood	cum	7131.00
	9.4.3	Hard wood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	cum	7275.00
	9.4.4	2 <sup>nd</sup> class hardwood finger jointed	Factory made Kiln seasoned, chemically treated, finger jointed at spacing not closer than 50 cm, 2nd class hard wood.	cum	6030.00
9.5		Paneled wooden shutters excluding, panelling/ glazing	Providing and fixing panelled or panelled and glazed shutters for doors, windows and clerestory windows including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws excluding, panelling/glazing which will be paid for separately, all complete as per direction of Engineer-in-charge.		
	9.5.1	2 <sup>nd</sup> class teak wood	Second class teak wood		
	9.5.1.1	35 mm	35 mm thick shutters	sqm	2776.00
	9.5.1.2	30 mm	30 mm thick shutters	sqm	2448.00
	9.5.2	Hard wood	Kiln seasoned and chemically treated hardwood Haldu, Kail, Bija wood.		
	9.5.2.1	35 mm	35 mm thick shutters	sqm	2205.00
	9.5.2.2	30 mm	30 mm thick shutters	sqm	1956.00
	9.5.3	Sheesham wood	Kiln seasoned selected planks of sheesham wood.		
	9.5.3.1	35 mm	35 mm thick shutters	sqm	2060.00
	9.5.3.2	30 mm	30 mm thick shutters	sqm	1816.00
	9.5.4	2nd class hard wood finger jointed	Factory made Kiln seasoned chemically treated and finger jointed at spacing not closer than 50cm, 2nd class hard wood shutters		
	9.5.4.1	35 mm	35 mm thick	sqm	1089.00
	9.5.4.2	30 mm	30 mm thick	sqm	969.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.6		Panelling, glazing and wire mesh in shutters	Providing and fixing panelling or panelling and glazing in panelled or panelled and glazed shutters for doors, windows and clerestory windows (Area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Panelling for panelled or panelled and glazed shutters 25 mm to 40 mm thick:		
	9.6.1	2 <sup>nd</sup> class teak wood	Second class teak wood	sqm	2215.00
	9.6.2	Hard wood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood	sqm	1763.00
	9.6.3	2 <sup>nd</sup> class hard wood finger jointed	15mm thick Factory made Kiln seasoned, chemically treated and finger jointed at spacing not closer than 50cm, 2nd class hard wood.	sqm	971.00
	9.6.4	Ply wood (5 ply)	Ply wood 5 ply, 9 mm thick :		
	9.6.4.1	Decorative both side	Decorative plywood both side decorative veneer (Type - I) conforming to IS 1328 BWR type.	sqm	1439.00
	9.6.4.2	Decorative one side	Decorative plywood one side decorative veneer and commercial veneer on other face (Type 1) conforming to IS 1328 BWR Type	sqm	1369.00
	9.6.5	7 ply	Ply wood 7 ply, 9 mm thick :		
	9.6.5.1	Decorative both side	Decorative plywood both side decorative veneer (Type- I) conforming to IS 1328 BWR type.	sqm	1861.00
	9.6.5.2	Decorative one side veneer on other face	Decorative plywood one side decorative veneer and commercial veneer on other face (Type-1) conforming to IS 1328 BWR Type	sqm	1650.00
	9.6.6	Particle board	Particle Board 12 mm thick		
	9.6.6.1	Plain	Plain particle board flat pressed, 3 layer or graded wood particle board medium density Grade I, IS: 3087 marked.	sqm	791.00
	9.6.6.2	Veneered flat	Veneered flat pressed three layer or graded wood particle board with commercial veneering on both sides conforming to IS: 3097, grade I.	sqm	1087.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.6.6.3	Pre-laminated one side	Pre-laminated particle board with decorative lamination on one side and balancing lamination on other side, Grade I, Type II IS: 12823 marked.	sqm	1333.00
	9.6.6.4	Pre-laminated both sides	Pre-laminated particle board with decorative lamination on both sides, Grade I, Type II, IS: 12823 marked.	sqm	1390.00
	9.6.6.5	Coir veneer board	Coir Veneer Board (conforming to IS 14842) 12 mm thick	sqm	1298.00
	9.6.7	Float glass	Float glass panes		
	9.6.7.1	4 mm	4 mm thick glass pane (weight not less than 10 kg/sqm)	sqm	973.00
	9.6.7.2	5 mm	5 mm thick glass pane (weight not less than 12.5 kg/sqm)	sqm	1046.00
	9.6.8	Wire gauge	Fly proof stainless steel grade 304 wire gauge with 0.5 mm dia. Wire and 1.4 mm wide aperture with matching wood beading	sqm	1532.00
	9.6.8.1	PVC sheet 4mm to 5mm thick	4mm to 5mm thick integral PVC form sheet with Celluka finish surface on both side with density not less than 600 kg/cum	sqm	580.00
	9.6.8.2	laminated PVC sheet 4mm to 5mm thick	4mm to 5mm thick laminated PVC form sheet with density not less than 600 kg/cum, laminated on both sides by 0.12 mm thick laminated sheet with density not less than 1400 kg/cum	sqm	754.00
9.7		Factory made laminated veneer lumber door shutter	Providing and fixing 35 mm thick factory made laminated veneer lumber door shutter conforming to IS : 14616 and TADS 15:2001 (Part B) including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws, all complete as per directions of Engineer-in-charge and panelling with panels of:		
	9.7.1	Plain particle board	12mm thick plain grade - 1, medium density flat pressed three layer particle board FPT - I or graded wood particle board FPT - I IS : 3087 marked bonded with BWP type synthetic resin adhesive as per IS : 848 :	sqm	2717.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.7.2	Particle board pre-lamination decorative both sides	12 mm thick pre-laminated particle board (decorative lamination on both sides) grade - 1, medium density flat pressed, three layer particle board FPT - I or graded wood particle board FPT - I, conforming to IS : 3087 bonded with BWP type synthetic resin adhesive as per IS : 848 and pre-lamination conforming to IS : 12823 Grade1, Type - II marked:	sqm	2868.00
	9.7.3	Particle board pre-lamination on one side	12 mm thick one side pre-laminated particle board (decorative lamination on one side and other sides balancing lamination) grade - 1 medium density flat pressed, three layer particle board FPT - I or graded wood particle board FPT-1 conforming to IS : 3087 bonded with BWP type synthetic resin adhesive as per IS : 848 and prelamination conforming to IS : 12823 Grade -1, Type II marked:	sqm	2775.00
9.8		Glazed shutters using 4 mm thick float glass	Providing and fixing glazed shutters for doors, windows and clerestory windows using 4 mm thick float glass panes including ISI marked M.S. pressed butt hinges bright finished of required size with necessary screws.		
	9.8.1	2 <sup>nd</sup> class teak wood	Second class teak wood		
	9.8.1.1	35 mm	35 mm thick	sqm	3408.00
	9.8.1.2	30 mm	30 mm thick	sqm	3033.00
	9.8.2	hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood		
	9.8.2.1	35 mm	35 mm thick	sqm	2758.00
	9.8.2.2	30 mm	30 mm thick	sqm	2474.00
	9.8.3	sheesham wood plank	Kiln seasoned selected planks of sheesham wood.		
	9.8.3.1	35 mm	35 mm thick	sqm	2594.00
	9.8.3.2	30 mm	30 mm thick	sqm	2331.00
	9.8.4	2 <sup>nd</sup> class hardwood finger jointed	Factory made Kiln seasoned chemically treated and finger jointed at spacing not closer than 50cm, 2nd class hard wood		
	9.8.4.1	30 mm	30 mm thick shutters	sqm	1469.00
	9.8.4.2	35 mm	35 mm thick shutters	sqm	1589.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.9		Factory made laminated veneer lumber glazed shutter 4mm thick float glass	Providing and fixing factory made laminated veneer lumber glazed shutter conforming to IS: 14616 and TADS 15:2001 (Part B) , using 4mm thick float glass panes for doors, windows and clerestory windows including ISI marked fixing with M.S. pressed butt hinges bright finished of required size with necessary screws as per directions of Engineer-in-charge. 30 mm thick shutters.	sqm	2311.00
9.10		Extra for heavy glass panes	Extra for providing heavy sheet float glass panes instead of ordinary float glass in glazed doors, windows and clerestory window shutters. (Area of opening for glass panes excluding portion inside rebate shall be measured)		
	9.10.1	5 mm float glass	5 mm thick instead of 4 mm thick.	sqm	73.00
	9.10.2	10 to 12 mm float glass	10 to 12 mm float glass	sqm	132.00
	9.10.3	5.5 mm safety glass	5.5 mm safety glass	sqm	400.00
	9.10.4	10-12mm safety glass	10-12mm safety glass	sqm	960.00
9.11		Extra for frosted glass panes	Extra for providing frosted glass panes 4 mm thick instead of ordinary float glass panes 4 mm thick in doors, windows and clerestory window shutters. (Area of opening for glass panes excluding portion inside rebate shall be measured).	sqm	236.00
9.12		Deduct for pin headed glass	Deduct for providing pin headed glass panes instead of ordinary float glass panes 4 mm thick in doors, windows and clerestory windows, shutters (Area of opening for glass panes excluding portion inside rebate shall be measured).	sqm	15.00
9.13		Extra for S.S. butt hinges	Extra for S.S, hinges providing ISI marked Stainless Steel butt hinges instead of M.S. pressed butt hinges bright finished of required size with necessary screws. (Shutter area to be measured).	sqm	117.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
9.14		Deduct for not providing hinges	Deduct for not providing hinges in doors, windows or clerestory window shutters with :		
	9.14.1	S.S. hinges	Stainless steel butt hinges with stainless steel screws for 2nd class teak wood and other class of wood shutters.	sqm	170.00
	9.14.2	M.S. hinges	ISI marked M.S. pressed butt hinges bright finished of required size For 2nd class teak wood and other class of wood shutters.	sqm	53.00
9.15		Shutters for cup board	Providing and fixing 25 mm thick Second class teak wood shutters using 4mm float glass for cup board etc. :		
	9.15.1	Panelled shutters	Panelled or panelled and glazed shutters :		
	9.15.1.1	Aluminium butt hinges	Using ISI marked anodised aluminium butt hinges with necessary screws.	sqm	2736.00
	9.15.1.2	M.S. piano hinges	Using ISI marked nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	2753.00
	9.15.2	Glazed shutters	Glazed shutters :		
	9.15.2.1	2 <sup>nd</sup> class teak shutters butt hinges	Second class teak wood including ISI marked anodised aluminium butt hinges with necessary screws.	sqm	2815.00
	9.15.2.2	2 <sup>nd</sup> class teak shutters piano hinges	2nd class teak wood including ISI marked nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	2759.00
9.16		Particle board to frames, backing or studding	Providing and fixing flat pressed 3 layer particle board medium density exterior grade (Grade I) or graded wood particle board IS : 3087 marked to frame, backing or studding with screws etc. complete (Frames, backing or studding to be paid separately) :		
	9.16.1	12 mm	12 mm thick	sqm	555.00
	9.16.2	18 mm	18 mm thick	sqm	654.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.17		Pre-laminated particle board in shelves	Providing and fixing Pre-laminated flat pressed 3 layer (medium density) particle board or graded wood particle board IS : 3087 marked with one side decorative and other side balancing lamination Grade I, Type II exterior grade IS : 12823 marked in shelves with screws and fittings wherever required, edges to be painted with polyurethane primer (fittings to be paid separately).		
	9.17.1	18 mm	18 mm thick	sqm	1270.00
	9.17.2	25 mm	25 mm thick	sqm	1383.00
9.18		shutters decorative type 1st class hard wood and well matched teak 3 ply	Providing and fixing ISI marked flush door shutters conforming to IS: 2202 (Part I) decorative type, core of block board construction with frame of 1st class hard wood and well matched teak 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutter.		
	9.18.1	35 mm butt hinges	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	sqm	2600.00
	9.18.2	30 mm butt hinges	30 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	sqm	2370.00
	9.18.3	25 mm Piano hinges	25 mm thick (for cupboard) including ISI marked nickel plated bright finished M.S. Piano hinges IS: 3818 marked with necessary screws.	sqm	2119.00
9.19		Flush door shutters non-decorative type 1st class hard wood and well matched teak 3 ply	Providing and fixing ISI marked flush door shutters conforming to IS: 2202 (Part I) non-decorative type, core of block board construction with frame of 1st class hard wood and well matched commercial 3 ply veneering with vertical grains or cross bands and face veneers on both faces of shutters.		
	9.19.1	35 mm butt hinges	35 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	sqm	1622.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.19.2	30 mm butt hinges	30 mm thick including ISI marked Stainless Steel butt hinges with necessary screws.	sqm	1564.00
	9.19.3	25 mm Piano hinges	25mm thick (for cupboard) including ISI marked nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	1533.00
9.20		Extra for decorative veneering one side	Extra for Providing and fixing flush doors with decorative veneering instead of non decorative ISI marked flush door shutters conforming to IS: 2202 (Part I) On one side only.	sqm	440.00
9.21		Extra for lipping	Extra for providing lipping with 2nd class teak wood battens 25 mm minimum depth on all edges of flush door shutters (over all area of door shutter to be measured).	sqm	401.00
9.22		Extra for vision panel	Extra for providing vision panel not exceeding 0.1 sqm in all type of flush doors (cost of glass excluded) (overall area of door shutter to be measured) :		
	9.22.1	Rectangular or square.	Rectangular or square.	sqm	157.00
	9.22.2	Circular.	Circular.	sqm	244.00
9.23		Extra for louvers	Extra if louvers (not exceeding 0.2 sqm) are provided in flush door shutters (overall area of door shutters to be measured).	sqm	354.00
9.24		Extra for rebate	Extra for cutting rebate in flush door shutters (Total area of the shutter to be measured).	sqm	93.00
9.25		Wire gauze shutters	Providing and fixing wire gauze shutters using galvanised M.S. wire gauze of average width of aperture 1.4mm in both direction with wire of dia. 0.63 mm for doors, windows and clerestory windows with hinges and necessary screws:		
	9.25.1	35 mm thick shutter	35 mm thick shutters with ISI marked M.S. pressed butt hinges bright finished of required size.		
	9.25.1.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3174.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	9.25.1.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2599.00
	9.25.1.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2452.00
	9.25.2	35 mm ss hinges	35 mm thick shutters with ISI marked stainless steel butt hinges of required size.		
	9.25.2.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3291.00
	9.25.2.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2716.00
	9.25.2.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2569.00
	9.25.3	30 mm thick shutters	30 mm thick shutters with ISI marked M.S. pressed butt hinges bright finished of required size.		
	9.25.3.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	2797.00
	9.25.3.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2306.00
	9.25.3.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2179.00
	9.25.4	30 mm ss butt hinges	30 mm thick shutters with ISI marked stainless steel butt hinges of required size.		
	9.25.4.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	2914.00
	9.25.4.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2423.00
	9.25.4.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2296.00
9.26		Wire gauge laminated veneer lumber shutter	Providing and fixing wire gauge laminated veneer lumber shutters conforming to IS : 14616, and as per TADS 15 :2001 (Part B) using galvanised wire gauge with average width of aperture 1.4 mm in both directions with wire of dia 0.63 mm as per IS :1568 for doors, windows and clerestory windows including ISI marked M.S. pressed fixing with butt hinges bright		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			finished of required size with necessary screws as per directions of Engineer-in-charge:		
	9.26.1	35 mm	35 mm thick shutters	sqm	2427.00
	9.26.2	30 mm	30 mm thick shutters	sqm	2102.00
9.27		Teak wood plugs	Providing 50x50x50mm 2nd class teak wood plugs including cutting brick work and fixing in cement mortar 1:3 (1 cement : 3 sand) and making good the walls etc.	each	18.00
9.28		Expandable fasteners	Providing and fixing expandable fasteners of specified size with necessary plastic sleeves and galvanised M.S. screws including drilling holes in masonry work /CC/ R.C.C. and making good etc. complete.		
	9.28.1	25 mm	25 mm long	each	16.00
	9.28.2	32 mm	32 mm long	each	18.00
	9.28.3	40 mm	40 mm long	each	21.00
	9.28.4	50 mm	50 mm long	each	25.00
	9.28.5	60 mm	60 mm long	each	28.00
9.29		Wall lining teak wood tongued and grooved	Providing and fixing 2nd class teak wood plain lining tongued and grooved including wooden plugs complete with necessary screws and priming coat on unexposed surface.		
	9.29.1	40 mm	40 mm thick.	sqm	5407.00
	9.29.2	25 mm	25 mm thick.	sqm	3469.00
	9.29.3	20 mm	20 mm thick	sqm	2802.00
	9.29.4	12 mm	12 mm thick	sqm	1768.00
9.30		Wall lining particle board	Providing and fixing in wall lining flat pressed three layer (medium density) particle board or graded wood Pre-laminated one side decorative lamination on other side balancing lamination Grade I, Type II, IS : 12823 marked including priming coat on unexposed surface, with necessary fixing arrangement and screws etc. complete :		
	9.30.1	12 mm	12 mm thick	sqm	1174.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.30.2	18 mm	18 mm thick	sqm	1410.00
	9.30.3	25 mm	25 mm thick	sqm	1525.00
9.31		Wood frame work battens 50x25mm	Providing and fixing specified wood frame work consisting of battens 50x25mm fixed with rawl plug and drilling necessary holes for rawl plug etc. including priming coat complete. Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	cum	96415.00
9.32		Plain lining / cladding with plywood 4mm thick cladding	Providing and fixing plywood 4 mm thick one side decorative veneer conforming to IS: 1328 (type-1) for plain lining / cladding with necessary screws, priming coat on unexposed surface with: Decorative veneer facings of approved manufacture.	sqm	1068.00
9.33		Plain lining with coir veneer board	Providing and fixing 4mm thick coir veneer board, ISI marked IS: 14842, plain lining with necessary screws, priming coat on unexposed surface etc., complete.	sqm	818.00
9.34		Skirting of pre-laminated particle board	Providing and fixing skirting of Pre-laminated with (one side decorative and other side balancing lamination) flat pressed, 3 layer or graded particle board (medium density) Grade I, Type II, IS :12823 marked, with necessary fixing arrangements and screws including drilling necessary holes for rawl plugs etc. and priming coat on unexposed surface complete :		
	9.34.1	18 mm	18 mm thick	sqm	1626.00
	9.34.2	25 mm	25 mm thick	sqm	1741.00
9.35		Wooden moulded beading to door and window frames	Providing and fixing wooden moulded beading to door and window frames with iron screws, plugs and priming coat on unexposed surface etc. complete :		
	9.35.1	2nd class teak wood	2nd class teak wood		
	9.35.1.1	50x12 mm	50x12 mm	metre	102.00
	9.35.1.2	50 x 20 mm	50 x 20 mm	metre	147.00
	9.35.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.35.2.1	50x12 mm	50x12 mm	metre	85.00
	9.35.2.2	50x20 mm	50x20 mm	metre	119.00
9.36		Plain jaffri wooden	Providing and fixing plain jaffri of 35x10 mm laths placed 35 mm apart (frames to be paid separately) including fixing 50x12 mm beading complete with : Second class teak wood.	sqm	1773.00
9.37		Pelmet of wood particle board	Providing and fixing 18 mm thick, 150 mm wide pelmet of flat pressed 3 layer or graded wood particle board medium density grade I, IS : 3087 marked, including top cover of 6 mm commercial ply wood conforming to IS: 303 BWR grade, nickel plated M.S. pipe 20 mm dia (heavy type) curtain rod with nickel plated brackets, including fixing with 25x3 mm M.S. flat 10 cm long fixed to pelmet with Haldu, Kail, Bija wood cleats of size 100 mm x 40 mm x 40 mm on both inner side of pelmet and rawl plugs 75 mm long etc. all complete.	metre	333.00
9.38		Pelmet of coir veneer board	Providing and fixing 18 mm thick, 150 mm wide pelmet of coir veneer board ISI marked IS: 14842, including top cover of 6 mm coir veneer board, nickle plated M.S. Pipe 20 mm dia. (heavy type) curtain rod with nickel plated brackets, including fixing with 25x3 mm M.S. Flat 10 cm long fixed to pelmet with Haldu, Kail, Bija wood cleats of size 100 mm x 40 mm x 40 mm on both inner side of pelmet and rawl plugs 75 mm long etc. all complete.	metre	466.00
9.39		Extra for veneered pelmet	Extra for using veneered particle board conforming to IS 3097 Grade I, in item of pelmet 18mm thick 150mm wide.		
	9.39.1	Non Decorative	Non decorative veneer on both sides.	metre	34.00
	9.39.2	Decorative	Particle board with decorative veneering on both sides.	metre	102.00
9.40		Lipping in pelmet	Providing and fixing teak wood lipping of size 25x3 mm in pelmet.	metre	41.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.41		Curtain rod chromium plated brass plate	Providing and fixing of 1.25 mm thick chromium plated brass plate, with two chromium plated curtain rods brass brackets fixed with C.P. brass screws and wooden plugs, etc., wherever necessary complete:		
	9.41.1	12 mm	12 mm dia.	metre	289.00
	9.41.2	20 mm	20 mm dia.	metre	377.00
	9.41.3	25 mm	25 mm dia.	metre	382.00
9.42		Curtain rods nickel plated curtain rods M.S. pipe	Providing and fixing nickel plated curtain rods M.S. pipe with nickel plated brackets :		
	9.42.1	20 mm	20 mm dia (heavy type)	metre	127.00
	9.42.2	25 mm	25 mm dia (heavy type)	metre	141.00
9.43		M.S. grills and windows	Providing and fixing M.S. grills of required pattern in frames of windows etc. with M.S. flats, square or round bars etc. including priming coat with approved steel primer all complete.		
	9.43.1	Fixed to steel windows	Fixed to steel windows by welding.	Kg	91.00
	9.43.2	Fixed to openings /wooden frames	Fixed to openings /wooden frames with rawl plugs screws etc.	Kg	100.00
9.44		Expanded metal for windows	Providing and fixing expanded metal 20x60 mm strands 3.25 mm wide and 1.6 mm thick for windows etc. including 62 x19 mm beading of II nd class teak wood and priming coat with approved steel primer all complete.	sqm	952.00
9.45		Steel wire fabric to window	Providing and fixing hard drawn steel wire fabric 75x25 mm mesh of weight not less than 7.75 Kg per sqm to window frames etc. including 62x19 mm beading of second class teak wood and priming coat with approved steel primer all complete.	sqm	1224.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.46		M.S. wire mesh	Providing and fixing fly proof galvanized M.S. wire gauge to windows and clerestory windows using wire gauge with average width of aperture 1.4 mm in both directions with wire of dia. 0.63 mm all complete.		
	9.46.1	With 2nd class teak wood beading	With 2nd class teak wood beading 62x19 mm.	sqm	1000.00
	9.46.2	With mild steel beading	With 12 mm mild steel U beading.	sqm	681.00
9.47		Deduct for Steel wire instead of glass	Deduct for fixing 75x25 mm hard drawn steel wire fabric of weight not less than 7.75 Kg. per sqm in panelled and glazed door and window shutter instead of glass sheet 4 mm thick.	sqm	166.00
9.48		Flat iron hold fast	Providing 40x5 mm flat (iron hold fast 40 cm long) (0.628 kg) including fixing to frame with 10 mm diameter bolts, nuts and wooden plugs and embeddings in cement concrete block 30x10x15cm 1:3:6 mix (1 cement : 3 sand : 6 graded stone aggregate 20mm nominal size)	each	95.00
9.49		Wooden beams	Providing wooden beams including hoisting, fixing in position and applying wood preservative for the unexposed surfaces, etc. complete with :		
	9.49.1	Sal	Sal wood.	cum	72600.00
	9.49.2	Hardwood	Haldu, Kail, Bija wood.	cum	72550.00
9.50		M.S. Butt hinges	Providing and fixing ISI marked M.S. pressed butt hinges bright finished with necessary screws etc. complete :		
	9.50.1	125 mm	125x65x2.12 mm	each	30.00
	9.50.2	100 mm	100x58x1.90 mm	each	23.00
	9.50.3	75 mm	75x47x1.70 mm	each	18.00
	9.50.4	50 mm	50x37x1.50 mm	each	10.00
9.51		Heavy weight butt hinges	Providing and fixing IS : 1341 marked M.S. heavy weight butt hinges with necessary screws etc. complete :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.51.1	125 mm	125x90x4.00 mm	each	53.00
	9.51.2	100 mm	100x75x3.50 mm	each	35.00
	9.51.3	75 mm	75x60x3.10 mm	each	21.00
	9.51.4	50 mm	50x40x2.50 mm	each	13.00
9.52		Oxidised butt hinges	Providing and fixing ISI marked oxidised M.S. pressed butt hinges with necessary screws etc. complete.		
	9.52.1	125 mm	125x65x2.12 mm	each	32.00
	9.52.2	100 mm	100x58x1.90 mm	each	23.00
	9.52.3	75 mm	75x47x1.70 mm	each	17.00
	9.52.4	50 mm	50x37x1.50 mm	each	10.00
9.53		Parliamentary hinges	Providing and fixing ISI marked oxidised M.S. pressed Parliamentary hinges with necessary screws etc. complete :		
	9.53.1	150 mm	150x125x27x2.80 mm	each	58.00
	9.53.2	125 mm	125x125x27x2.80 mm	each	55.00
	9.53.3	100 mm	100x125x27x2.80 mm	each	46.00
	9.53.4	75 mm	75x100x20x2.24 mm	each	39.00
9.54		Single acting spring hinges	Providing and fixing ISI marked oxidised M.S. single acting spring hinges with necessary screws etc. complete :		
	9.54.1	150 mm	150 mm	each	169.00
	9.54.2	125 mm	125 mm	each	163.00
	9.54.3	100 mm	100 mm	each	131.00
9.55		Double acting spring hinges	Providing and fixing oxidised M.S. double acting spring hinges with necessary screws etc. complete.		
	9.55.1	150 mm	150 mm	each	174.00
	9.55.2	125 mm	125 mm	each	163.00
	9.55.3	100 mm	100 mm	each	137.00
9.56		Piano hinges	Providing M.S. Piano hinges ISI marked IS: 3818 finished with nickel plating and fixing with necessary screws etc., complete.		
	9.56.1	35 mm	Overall width 35 mm.	metre	133.00
	9.56.2	50 mm	Overall width 50 mm.	metre	138.00
	9.56.3	65 mm	Overall width 65 mm.	metre	141.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.57		Sliding door bolts	Providing and fixing ISI marked oxidised M.S. sliding door bolts with nuts and screws etc. complete:		
	9.57.1	300 mm	300x16 mm	each	170.00
	9.57.2	250 mm	250x16 mm	each	157.00
9.58		Tower bolt	Providing and fixing ISI marked oxidised M.S. tower bolt black finish, (Barrel type) with necessary screws etc. complete :		
	9.58.1	250 mm	250x10 mm	each	68.00
	9.58.2	200 mm	200x10 mm	each	60.00
	9.58.3	150 mm	150x10 mm	each	42.00
	9.58.4	100 mm	100x10 mm	each	35.00
9.59		Pull bolt lock	Providing and fixing ISI marked 85x42mm oxidised M.S. pull bolt lock conforming to IS: 7534 with necessary screws bolts, nut and washers etc. complete	each	71.00
9.60		Door latches	Providing and fixing ISI marked oxidised M.S. door latches conforming to IS:5930 with screws etc. complete :		
	9.60.1	300 mm	300x20x6 mm	each	72.00
	9.60.2	250mm	250x20x6 mm	each	67.00
9.61		Oxidised M.S. handles	Providing and fixing ISI marked oxidised M.S. handles conforming to IS:4992 with necessary screws etc. complete :		
	9.61.1	125mm	125 mm	each	27.00
	9.61.2	100mm	100 mm	each	25.00
	9.61.3	75mm	75 mm	each	24.00
9.62		Oxidised M.S. hasp and staple	Providing and fixing oxidised M.S. hasp and staple (safety type) conforming to IS : 363 with necessary screws etc. complete :		
	9.62.1	150 mm	150 mm	each	23.00
	9.62.2	115 mm	115 mm	each	20.00
	9.62.3	90 mm	90 mm	each	17.00
9.63		Oxidised M.S. casement stays	Providing and fixing oxidised M.S. casement stays (straight peg type) with necessary screws etc. complete.		
	9.63.1	300 mm	300 mm weighing not less than 200 gms.	each	40.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	9.63.2	250 mm	250 mm weighing not less than 150 gms.	each	34.00
	9.63.3	200 mm	200 mm weighing not less than 120 gms.	each	28.00
9.64		Oxidised M.S. safety chain	Providing and fixing oxidised M.S. Safety chain with necessary fixtures for doors. (Weighing not less than 450 gms.)	each	93.00
9.65		S.S. sliding door	Providing and fixing ISI marked stainless steel sliding door bolts with nuts and screws etc. complete:		
	9.65.1	300 mm	300x16 mm	each	389.00
	9.65.2	250 mm	250x16 mm	each	326.00
9.66		S.S. tower bolt	Providing and fixing ISI marked stainless steel tower bolt black finish, (Barrel type) with necessary screws etc. complete :		
	9.66.1	250 mm	250x10 mm	each	148.00
	9.66.2	200 mm	200x10 mm	each	93.00
	9.66.3	150 mm	150x10 mm	each	71.00
	9.66.4	100 mm	100x10 mm	each	50.00
9.67		S.S. pull bolt lock	Providing and fixing ISI marked 85x42mm stainless steel pull bolt lock with necessary screws bolts, nut and washers etc. complete.	each	86.00
9.68		S.S. door latches	Providing and fixing ISI marked stainless steel door latches with screws etc. complete :		
	9.68.1	300 mm	300x20x6 mm	each	211.00
	9.68.2	250mm	250x20x6 mm	each	173.00
9.69		S.S. handles	Providing and fixing ISI marked stainless steel handles with necessary screws etc. complete :		
	9.69.1	125 mm	125 mm	each	60.00
	9.69.2	100 mm	100 mm	each	54.00
	9.69.3	75 mm	75 mm	each	48.00
9.70		S.S. hasp and staple	Providing and fixing stainless steel hasp and staple (safety type) conforming to IS specification with necessary screws etc. complete :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.70.1	150 mm	150 mm	each	37.00
	9.70.2	115 mm	115 mm	each	33.00
	9.70.3	90 mm	90 mm	each	26.00
9.71		S.S. casement stays straight peg type	Providing and fixing stainless steel casement stays (straight peg type) conforming to IS specification with necessary screws etc. complete.		
	9.71.1	300 mm	300 mm weighing not less than 200 gms.	each	79.00
	9.71.2	250 mm	250 mm weighing not less than 150 gms.	each	61.00
	9.71.3	200 mm	200 mm weighing not less than 120 gms.	each	49.00
9.72		S.S. safety chain	Providing and fixing stainless steel safety chain with necessary fixtures for doors. Conforming to IS specification (Weighing not less than 450 gms.)	each	272.00
9.73		S.S. butt hinges	Providing and fixing IS : 12817 marked stainless steel butt hinges with stainless steel screws etc. complete :		
	9.73.1	125mm	125x64x1.90 mm	each	67.00
	9.73.2	100 mm	100X58X1.90 mm	each	59.00
	9.73.3	75 mm	75x47x1.80 mm	each	39.00
	9.73.4	50 mm	50x37x1.50 mm	each	25.00
9.74		S.S. butt hinges (heavy weight)	Providing and fixing IS : 12817 marked stainless steel butt hinges (heavy weight) with stainless steel screws etc. complete :		
	9.74.1	125 mm	125x64x2.50 mm	each	76.00
	9.74.2	100 mm	100x60x2.50 mm	each	60.00
	9.74.3	75 mm	75x50x2.50 mm	each	46.00
9.75		Knob	Providing and fixing 50 mm Stainless steel cup board or wardrobe knob with necessary screws (best make of approved quality)	each	62.00
9.76		Stainless steel hanging type floor	Providing and fixing Stainless steel hanging type floor door stopper with necessary screws, etc. complete.	each	103.00
9.77		Brass butt hinges	Providing and fixing bright finished brass butt hinges with necessary screws etc. complete :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.77.1	125x5.5 mm	125x85x5.5 mm (heavy type)	each	456.00
	9.77.2	125x4 mm	125x70x4 mm (ordinary type)	each	148.00
	9.77.3	100x5.5 mm	100x85x5.5 mm (heavy type)	each	387.00
	9.77.4	100x4 mm	100x70x4 mm (ordinary type)	each	117.00
	9.77.5	75x4 mm	75x65x4 mm (heavy type)	each	145.00
	9.77.6	75x2.5 mm	75x40x2.5 mm (ordinary type)	each	74.00
	9.77.7	50x2.5 mm	50x40x2.5 mm (ordinary type)	each	32.00
9.78		Brass parliamentary hinges	Providing and fixing bright finished brass parliamentary hinges with necessary screws etc. complete :		
	9.78.1	150mm	150x125x27x5 mm	each	385.00
	9.78.2	125 mm	125x125x27x5 mm	each	345.00
	9.78.3	100mm	100x125x27x5 mm	each	304.00
	9.78.4	75mm	75x100x20x3.2 mm	each	239.00
9.79		Brass tower bolts	Providing and fixing bright finished brass tower bolts (barrel type) with necessary screws etc. complete :		
	9.79.1	400mm	400x10 mm	each	400.00
	9.79.2	250mm	250x10 mm	each	329.00
	9.79.3	200mm	200x10 mm	each	261.00
	9.79.4	150mm	150x10 mm	each	221.00
	9.79.5	100mm	100x10 mm	each	142.00
9.80		Brass door latch	Providing and fixing bright finished brass door latch with necessary screws etc. complete.		
	9.80.1	300 mm	300x16x5 mm	each	237.00
	9.80.2	250mm	250x16x5 mm	each	225.00
9.81		Brass handles	Providing and fixing bright finished brass handles with necessary screws etc. complete.		
	9.81.1	125 mm	125 mm	each	205.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.81.2	100 mm	100 mm	each	181.00
	9.81.3	75 mm	75 mm	each	141.00
9.82		Brass sliding door bolts	Providing and fixing bright finished brass sliding door bolts with nuts and screws etc complete.		
	9.82.1	300mm	300x16mm	each	407.00
	9.82.2	250mm	250x16mm	each	374.00
9.83		Brass mortice latch and lock lever handles	Providing and fixing bright finished brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles with necessary screws etc. complete (best make of approved quality).	each	539.00
9.84		Brass mortice latch and lock aluminium lever handles	Providing and fixing bright finished brass 100 mm mortice latch and lock ISI marked with six levers and a pair of anodised (anodic coating not less than grade AC 10 as per IS : 1868) aluminium lever handles with necessary screws etc. complete (Best make of approved quality).	each	820.00
9.85		Brass mortice latch with one dead bolt	Providing and fixing bright finished brass 100 mm mortice latch with one dead bolt and a pair of lever handles with necessary screws etc. complete (best make of approved quality).	each	475.00
9.86		Brass night latch	Providing and fixing bright finished brass night latch including necessary screws etc. complete (best make of approved quality).	each	678.00
9.87		Special quality brass cupboard or wardrobe locks	Providing and fixing special quality bright finished brass cupboard or wardrobe locks with four levers including necessary screws etc. complete (best make of approved quality) :		
	9.87.1	40 mm	40 mm	each	144.00
	9.87.2	50 mm	50 mm	each	150.00
	9.87.3	65 mm	65 mm	each	162.00
	9.87.4	75 mm	75 mm	each	185.00
9.88		Brass cup board or wardrobe knob	Providing and fixing 50 mm bright finished brass cup board or wardrobe knob with necessary screws (best make of approved quality)	each	51.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.89		Brass hanging type floor door stopper	Providing and fixing bright finished brass hanging type floor door stopper with necessary screws, etc. complete.	each	91.00
9.90		Brass casement window window fastener	Providing and fixing bright finished brass casement window fastener with necessary screws etc. complete.	each	72.00
9.91		Brass casement stays (straight peg type)	Providing and fixing bright finished brass casement stays (straight peg type) with necessary screws etc. complete :		
	9.91.1	300 mm	300 mm weighing not less than 330 gms	each	184.00
	9.91.2	250 mm	250 mm weighing not less than 280 gms	each	147.00
	9.91.3	200 mm	200 mm weighing not less than 240 gms	each	136.00
9.92		Brass hasp and staple (safety type)	Providing and fixing bright finished brass hasp and staple (safety type) with necessary screws etc. complete:		
	9.92.1	150 mm	150 mm	each	115.00
	9.92.2	115 mm	115 mm	each	94.00
	9.92.3	90 mm	90 mm	each	80.00
9.93		C.P. brass hanging type floor door stopper	Providing and fixing Cromium plated brass hanging type floor door stopper with necessary screws, etc. complete.	each	92.00
9.94		Aluminium hydraulic door closer door weight upto 35 kg	Providing and fixing aluminium die cast body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 35 kg and door width upto 700 mm) with necessary accessories and screws etc. complete.	each	780.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.95		Aluminium hydraulic door closer door weight upto 36 kg to 80 kg	Providing and fixing aluminium extruded section body tubular type universal hydraulic door closer (having brand logo with ISI, IS : 3564, embossed on the body, door weight upto 36 kg to 80 kg and door width from 701 mm to 1000 mm) with double speed adjustment with necessary accessories and screws etc. complete.	each	1186.00
9.96		C.P. brass mortice latch	Providing and fixing chromium plated brass 100 mm mortice latch and lock with 6 levers and a pair of lever handles with necessary screws etc. complete (best make of approved quality).	each	777.00
9.97		C.P. brass mortice latch with one dead bolt	Providing and fixing chromium plated brass 100 mm mortice latch with one dead bolt and a pair of lever handles with necessary screws etc. complete (best make of approved quality).	each	835.00
9.98		C.P. brass night latch	Providing and fixing chromium plated brass night latch including necessary screws etc. complete (Best make of approved quality).	each	766.00
9.99		Special quality C.P cupboard brass locks	Providing and fixing special quality chromium plated brass cupboard locks with six levers including necessary screws etc. complete (Best make of approved quality) of :		
	9.99.1	40 mm	Size 40 mm	each	144.00
	9.99.2	50mm	Size 50 mm	each	156.00
	9.99.3	65mm	Size 65 mm	each	167.00
	9.99.4	75 mm	Size 75 mm	each	196.00
9.100		C.P. brass cupboard knobs	Providing and fixing chromium plated brass 50 mm cupboard or wardrobe knobs with nuts complete.	each	68.00
9.101		C.P.Brass sliding door bolts	Providing and fixing chromium plated brass sliding door bolts ISI marked with nuts and screws etc complete.		
	9.101.1	300 mm	300x16mm	each	268.00
	9.101.2	250mm	250x16mm	each	245.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.102		C.P. brass tower bolts	Providing and fixing chromium plated brass tower bolts ISI marked with nuts and screws etc complete.		
	9.102.1	400mm	400X10mm	each	260.00
	9.102.2	300 mm	300x10mm	each	198.00
	9.102.3	250mm	250x10mm	each	164.00
	9.102.4	200mm	200x10 mm	each	113.00
	9.102.5	150mm	150x10 mm	each	91.00
	9.102.6	100mm	100x10 mm	each	73.00
9.103		Chromium plated brass door latch	Providing and fixing chromium plated brass door latch ISI marked with necessary screws etc complete.		
	9.103.1	300 mm	300x16x5mm	each	255.00
	9.103.2	250 mm	250x16x5mm	each	243.00
9.104		Chromium plated brass night latch	Providing and fixing chromium plated brass night latch ISI marked with necessary screws etc complete.	each	249.00
9.105		Chromium plated brass handles	Providing and fixing chromium plated brass handles with necessary screws etc. complete:		
	9.105.1	125 mm	125 mm	each	241.00
	9.105.2	100 mm	100 mm	each	206.00
	9.105.3	75 mm	75 mm	each	182.00
9.106		Chromium plated brass casement window fastener	Providing and fixing chromium plated brass casement window fastener with necessary screws etc. complete.	each	137.00
9.107		Chromium plated brass casement stays (straight peg type)	Providing and fixing chromium plated brass casement stays (straight peg type) with necessary screws etc. complete :		
	9.107.1	300 mm	300 mm weighing not less than 330 gms	each	207.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.107.2	250mm	250 mm weighing not less than 280 gms	each	178.00
	9.107.3	200mm	200 mm weighing not less than 240 gms	each	149.00
9.108		Aluminium butt hinges	Providing and fixing ISI marked aluminium butt hinges anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade with necessary screws etc. complete: Note:- Aluminum hinges shall not be used in wooden shutters.		
	9.108.1	125x75mm	125x75x4 mm	each	115.00
	9.108.2	125x63 mm	125x63x4 mm	each	108.00
	9.108.3	100x75 mm	100x75x4 mm	each	95.00
	9.108.4	100x63x4 mm	100x63x4 mm	each	93.00
	9.108.5	100x63x3.2 mm	100x63x3.2 mm	each	90.00
	9.108.6	75x63x4 mm	75x63x4 mm	each	77.00
	9.108.7	75x63x3.2 mm	75x63x3.2 mm	each	75.00
	9.108.8	75x45x3.2 mm	75x45x3.2 mm	each	67.00
9.109		Aluminium sliding door bolts	Providing and fixing aluminium sliding door bolts ISI marked anodised (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour or shade with nuts and screws etc. complete:		
	9.109.1	300mm	300x16 mm	each	241.00
	9.109.2	250mm	250x16 mm	each	195.00
9.110		Aluminium tower bolts	Providing and fixing aluminium tower bolts ISI marked anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade with necessary screws etc. complete:		
	9.110.1	400mm	400X10mm	each	123.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.110.2	300mm	300x10 mm	each	114.00
	9.110.3	250mm	250x10 mm	each	102.00
	9.110.4	200mm	200x10 mm	each	82.00
	9.110.5	150mm	150x10 mm	each	69.00
	9.110.6	100mm	100x10 mm	each	55.00
9.111		Aluminium pull bolt lock	Providing and fixing aluminium pull bolt lock anodised ISI marked (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour and shade with necessary screws bolts, nut and washers etc. complete.	each	74.00
9.112		Aluminium kicking plate	Providing and fixing 50cm long aluminium kicking plate 100x3.15 mm anodised (anodic coating not less than grade AC 10 as per IS :1868) transparent or dyed to required colour or shade with necessary screws etc. complete.	each	167.00
9.113		Aluminium handles	Providing and fixing aluminium handles ISI marked anodised (anodic coating not less than grade AC 10 as per IS : 1868) transparent or dyed to required colour or shade with necessary screws etc. complete:		
	9.113.1	125 mm	125 mm	each	75.00
	9.113.2	100 mm	100 mm	each	55.00
	9.113.3	75 mm	75 mm	each	46.00
9.114		Aluminium hanging floor door stopper	Providing and fixing aluminium hanging floor door stopper ISI marked anodised (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour and shade with necessary screws etc. complete.		
	9.114.1	Single	Single rubber stopper	each	35.00
	9.114.2	Double	Twin rubber stopper	each	86.00
9.115		Aluminium casement stays	Providing and fixing aluminium casement window stays ISI marked anodised (anodic coating not less than grade AC 10 as per IS: 1868) transparent or dyed to required colour and shade with necessary screws etc. complete.	each	67.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
9.116		Aluminium tee channels	Providing and fixing aluminium tee channels (heavy duty) with rollers, stop end in pelmets as curtain rod.	metre	68.00
9.117		Aluminum U beading to flush door shutter	Providing and fixing aluminum U beading of required size to Pre-laminated /flush door shutter including fixing etc. complete as per direction of Engineer-in-charge.	kg	441.00
9.118		PTMT handles	Providing and fixing PTMT handles with necessary screws etc. complete.		
	9.118.1	125mm	125x34x24 mm weighing not less than 23 gms.	each	44.00
	9.118.2	150mm	150x34x24 mm weighing not less than 26 gms.	each	48.00
9.119		PTMT Butt hinges	Providing and fixing PTMT Butt hinges with necessary screws etc. complete.		
	9.119.1	75mm	75x60x10 mm fitted with 5.5 mm dia M.S. Bright Bar Rod weighing not less than 34 gms.	each	62.00
	9.119.2	100mm	100x75x10 mm fitted with 5.5 mm dia MS Bright Bar Rod weighing not less than 53 gms.	each	82.00
9.120		PTMT tower bolts	Providing and fixing PTMT Tower Bolts with 12 mm one piece rod inside and necessary screws etc., complete.		
	9.120.1	152mm	152x42x18 mm weighing not less than 60 gms.	each	87.00
	9.120.2	202mm	202x42x18 mm weighing not less than 78 gms.	each	106.00
9.121		PTMT door catcher	Providing and fixing PTMT door catcher of length 72 mm and dia. of 42 mm with suitable washers weighing not less than 33 gms.	each	37.00
9.122		PTMT hanging type floor door stoper	Providing and fixing PTMT hanging type floor door stoper with necessary screws etc complete.	each	35.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.123		Wire gauge shutters using s.s. 304 wire gauge for doors and windows	Providing and fixing wire gauge shutters using stainless steel grade 304 wire gauge with wire of dia 0.5 mm and average width of aperture 1.4 mm in both directions for doors, windows and clerestory windows with necessary screws:		
	9.123.1	35mm M.S. butt hinges	35 mm thick shutters with ISI marked M.S. pressed butt hinges bright finished of required size.		
	9.123.1.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3583.00
	9.123.1.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	3008.00
	9.123.1.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2862.00
	9.123.2	35 mm s.s. butt hinges	35 mm thick shutters with ISI marked stainless steel butt hinges of required size.		
	9.123.2.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3700.00
	9.123.2.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	3125.00
	9.123.2.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2979.00
	9.123.3	30 mm M.S. butt hinges	30 mm thick shutters with ISI marked M.S. pressed butt hinges bright finished of required size.		
	9.123.3.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3206.00
	9.123.3.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2715.00
	9.123.3.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2589.00
	9.123.4	30 mm s.s. butt hinges	30 mm thick shutters with ISI marked stainless steel butt hinges of required size.		
	9.123.4.1	2 <sup>nd</sup> class teak wood	Second class teak wood.	sqm	3323.00
	9.123.4.2	Hardwood	Kiln seasoned and chemically treated Haldu, Kail, Bija wood.	sqm	2832.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.123.4.3	Sheesham wood	Kiln seasoned selected class of sheesham wood.	sqm	2706.00
9.124		Fly proof stainless steel wire gauge, to windows	Providing and fixing fly proof stainless steel grade 304 wire gauge, to windows and clerestory windows using wire gauge with average width of aperture 1.4 mm in both directions with wire of dia. 0.50 mm all complete.		
	9.124.1	T.W. beading	With 2nd class teak wood beading 62x19 mm.	sqm	1689.00
	9.124.2	M.S. beading	With 12 mm mild steel U beading.	sqm	1370.00
9.125		Bamboo jaffery/ fencing	Providing and fixing Bamboo jaffery/ fencing consisting of superior quality 25mm dia (Average) half cut bamboo placed vertically and fixed together with three numbers horizontal running members of Haldu, Kail, Bija wood in scantling of section 50x25mm fixed with nails and G.I wire on existing support complete as per direction of Engineer-in-charge.	sqm	379.00
9.126		Corner beading of triangular shape	Providing and fixing wooden moulded corner beading of triangular shape to the junction of panelling etc. with iron screws, plugs and priming coat on unexposed surface etc. complete 2nd class teak wood. 50x50mm (base and height).	metre	182.00
9.127		Lipping/ moulded beading	Providing and fixing 2nd class teak wood lipping/ moulded beading or Taj beading of size 18x5mm fixed with wooden adhesive of approved quality and screws/ nails on the edges of the Pre-laminated particle board as per direction of Engineer-in-charge.	metre	47.00
9.128		Mortice lock for aluminum door	Providing and fixing bright finished 100mm mortice lock with 6 levers without pair of handles for aluminium door with necessary screws etc complete (Best make of approved quality) as per direction of Engineer-in-charge.	each	480.00
9.129		Magnetic catcher in cupboard /ward robe shutters	Providing and fixing magnetic catcher in cupboard / ward robe shutters including fixing with necessary screws etc. complete (Best make of approved quality).		



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	9.129.1	Triple	Triple strip vertical type.	each	28.00
	9.129.2	Double	Double strip (horizontal type).	each	23.00
9.130		Magic eye	Providing and fixing magic eye in door shutters including fixing. Complete (Best make of approved quality).	each	329.00
9.131		Telescopic drawer channels	Providing and fixing powder coated telescopic drawer channels with necessary screws etc. complete as per directions of Engineer-in-charge.		
	9.131.1	300mm	300mm long	each set	209.00
	9.131.2	450mm	450mm long	each set	256.00
	9.131.3	500mm	500mm long	each set	302.00
9.132		Sliding rollers in racks/ cupboards/abinets	Providing and fixing sliding arrangement in racks/ cupboards/cabinets shutter by P/F stainless steel rollers to run inside C or E aluminium channel section (The payment of C or E channel shall be made separately)	each	14.00
9.133		Ply wood Paneling for doors, windows	Providing and fixing 12mm thick panelling or panelling and glazing in panelled or panelled and glazed shutters for doors, windows and clerestory windows (area of opening for panel inserts excluding portion inside grooves or rebates to be measured). Panelling for panelled or panelled and glazed shutters 25mm to 40mm thick.		
	9.133.1	Marine ply	Marine plywood conforming to IS: 710	sqm	1591.00
	9.133.2	Fire retardant ply	Fire retardant plywood conforming to IS: 5509.	sqm	1660.00
9.134		Laminated sheet	Providing and Fixing decorative high pressure laminated sheet of plain / wood grain in gloss / matt / suede finish with high density protective surface layer and reverse side of adhesive bonding quality conforming to IS : 2046 Type S including cost of adhesive of approved quality.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.134.1	1.5 mm	1.5 mm thick.	sqm	851.00
	9.134.2	1.0 mm	1.0 mm thick.	sqm	691.00
9.135		Cup board shutters 25mm thick with Pre-laminated particle board	Providing and fixing cup board shutters 25mm thick, with Pre-laminated flat pressed three layer particle board or graded wood particle board IS: 12823 marked exterior grade (Grade I Type II) having one side decorative lamination and other side balancing lamination including IInd class teak wood lipping of 25mm wide x12 mm thick with necessary screws and bright finished stainless steel piano hinges complete as per direction of the Engineer-in-Charge.	sqm	1688.00
9.136		Cup board shutters with veneered particle board	Providing and fixing cup board shutters with 25mm thick veneered particle board IS : 3097 marked exterior grade (Grade I) of approved make including IInd class teak wood lipping of 25mm wide x 12 mm thick with necessary screws and bright finished stainless steel piano hinges complete as per direction of Engineer-in- Charge.		
	9.136.1	One side	With decorative veneering on one side and commercial veneering on other side.	sqm	1433.00
	9.136.2	Both side	With non decorative veneering on both sides.	sqm	1322.00
9.137		Factory made flush door shutters of Pre-laminated particle board as per architectural drawing	Providing and fixing factory made shutters of 25 mm thick Pre-laminated particle board flat pressed three layer or graded wood particle board with one side decorative finish and other side balancing lamination conforming to IS: 12823 Gradel Type II, of approved design, and edges sealed with water resistant paint and lipped with aluminium 'U' type edge beading all-round the shutter, including fixing with angle cleat, grip strip, cadmium plated steel screws including fixing of aluminium hinges 100x63x4 mm etc. complete as per architectural drawing and direction of Engineer-in-Charge (Cost of 'U' beading and hinges will be paid for separately).	sqm	1412.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.138		Wall lining with Pre-laminated fibre board	Providing and fixing in wall lining MDF board medium density fibre board IS: 14587:1998 marked, Pre-laminated one side decorative lamination and other side balancing lamination, with necessary fixing arrangement and screws etc. complete.		
	9.138.1	12 mm	12 mm thick.	sqm	919.00
	9.138.2	18 mm	18 mm thick.	sqm	1161.00
	9.138.3	25 mm	25 mm thick.	sqm	1230.00
9.139		Pre-laminated cup board shutters Fibre board piano hinges	Providing and fixing 25mm thick pre-laminated medium density fibre board exterior grade(Grade-I) IS:14587:1998 marked one side decorative and other side balancing lamination for cupboard shutters edges to be sealed with PVC edge bending tape 2.00 mm thick of approved brand including ISI marked nicked plated bright finishing M.S. piano hinges IS:3818 marked with necessary screwed complete	sqm	1726.00
9.140		Skirting with pre-laminated fibre board	Providing and fixing skirting with Pre-laminated medium density fibre board exterior grade (Grade-I) IS: 14587:1998 marked, (one side decorative and other side balancing lamination) with necessary fixing arrangements and screws, including drilling necessary holes for rawl plugs etc. and edges to be sealed with PVC edge bending tape 2.00 mm thick of approved brand complete.		
	9.140.1	18 mm	18 mm thick	sqm	1493.00
	9.140.2	25 mm	25 mm thick	sqm	2017.00
9.141		Partition wall with G.I. frame and required board	Providing and fixing partition upto ceiling height consisting of G.I. frame and required board including providing and fixing of frame work made of special section power pressed/ roll form G.I. sheet with zinc coating of 120 gms/sqm(both side inclusive), consisting of floor and ceiling channel 50mm wide having equal flanges of 32 mm and 0.50 mm thick, fixed to the floor and ceiling at the spacing of 610 mm centre to centre with dash fastener of 12.5 mm diameter 50 mm length or		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>suitable anchor fastener or metal screws with nylon plugs and the studs 48 mm wide having one flange of 34 mm and other flange 36 mm and 0.50 mm thick fixed vertically within flanges of floor and ceiling channel and placed at a spacing of 610mm centre to centre by 6 mm dia bolts and nuts, including fixing of studs along both ends of partition fixed flush to wall with suitable anchor fastener or metal screws with nylon plugs at spacing of 450 mm centre to centre, and fixing of boardsto both side of frame work by 25 mm long dry wall screws on studs, floor and ceiling channels at the spacing of 300 mm centre to centre. The boards are to be fixed to the frame work with joints staggered to avoid through cracks, Galvanized M.S. fixing channel of 99 mm width (0.9 mm thick having two flanges of 9.5 mm each with zinc coating of 120 gm both side inside) to be provided at the horizontal joints of two boards, fixed to the studs using metal to metal flat head screws, including jointing and finishing to a flush finish with recommended jointing compound, jointing tape, angle beads at corner (25 mm x 25 mm x 0.5 mm), joint finisher and two coatsof primer suitable for board as per manufacture's specification and direction of engineer in charge all complete.</p>		
	9.141.1	75 mm with GRG board	75mm overall thickness partition with 12.5 mm thick double skin fire rated glass reinforced gypsum (GRG) plaster board conforming to IS: 2095: part 3 1996 Board with BIS certification marks.	sqm	1212.00
	9.141.2	75 mm with gypsum board	75mm overall thickness partition with 12.5 mm thick double skin tapered edged plain Gypsum plaster board conforming to IS:2095: part I 1996 Board with BIS certification marks.	sqm	905.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.141.3	66 mm with calcium silicate board	66mm overall thickness Partition with 8mm thick double skin Calcium Silicate Board made with Calcareous and Siliceous materials reinforced with cellulose fiber manufactured through autoclaving process with Compressive Strength 225 kg/sq.cm, Bending Strength 100 kg./sq.cm.	sqm	1491.00
	9.141.4	66 mm with cement board	66mm overall thickness partition using 8mm thick double skin non- asbestos multipurpose cement board reinforced with cellulose fibre manufactured through autoclaving process (High pressure steam cured) as per IS: 14862 with suitable fibre cement screw.	sqm	1212.00
	9.141.5	68mm with heavy duty fiber cement board	68mm overall thickness partition using 9mm thick Heavy Duty Fibre Cement Board double skin non asbestos, reinforced with cellulose fibre,manufactured through autoclaving proces(High presssure steam cured)Type A, Category 4 conforming to IS 14862:2000. (for wet areas)	sqm	1450.00
	9.141.6	70 mm with cement bonded particle board	70 mm overall thickness Partition using 10mm thick double skin non-asbestost multipurpose termite, fire & moisure resistance (acoustic 30db) cement bonded particle board as per IS: 14276 withsuitable cement bonded board screw.	sqm	1359.00
9.142		Wall paneling using boards	Providing and fixing, in position concealed G.I. section for wall paneling using board of required thickness fixed on the 'W' profile (0.55mm thick ) having a knurled web of 51.55mm and two flanges of 26mm each with lips of 10.55 mm, placed @ 610mmC/C in perimeter channel having one flange of 20mm and another flange of 30mm with thickness of 0.55mm and web of length 27mm. Perimeter channel is fixed on the floor and the ceiling with the nylon sleeves @ 610mm C/C with fully threaded self- tapping dry wall screws. Board is fixed tothe 'W' profile with 25 mm countersunk ribbed head screws @ 200mm C/C., all complete as per the drawing and directions of engineer-in-charge the joints of the boards are finished with specially formulated jointing compound and 48mm wide jointing tape to provide seamless finish.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.142.1	Calcium silicate board	10 mm thick tapered edge calcium silicate board made with calcareous and siliceous materials reinforced with cellulose fibre manufactured through autoclaving process to give stable crystalline structure, with compressive strength 225 kg/sq.cm, Bending strength 100 kg/sq.cm.	sqm	834.00
	9.142.2	Gypsum board	12 mm thick Gypsum board conforming to IS: 2095 Part-I.	sqm	550.00
	9.142.3	Cement bonded particle board	8 mm thick non-asbestost multipurpose termite, fire & moisure resistance cement bonded particle board as per IS: 14276 with suitable cement bonded board screw.	sqm	675.00
	9.142.4	Cement bonded prelamiante d particle board	8mm Both side Factory Prelamiante d particle board as per IS: 15786.	sqm	1072.00
	9.142.5	Heavy duty fiber cement board	9mm thick non asbestos,heavy duty fibre cement board reinforced with cellulose fibre manufactured through autoclaving process(High pressure steam cured) Type A,Category 4, conforming to IS 14862.	sqm	760.00
9.143		Frame work for partitions/ wall lining of hollow MS tubes	Providing and fixing frame work for partitions/ wall lining etc. made of 50x50x1.6mm hollow MS tube, placed along the walls, ceiling and floor in a grid pattern with spacing @ 60 cm centre to centre both ways (vertically and horizontally ) or at required spacing near opening, with necessary welding at junctions and fixing the frame to wall/ ceiling/ floors with steel dash fasteners of 8 mm dia, 75 mm long bolt, includingmaking provision for opening for doors,windows, electrical conduits, switch boards etc., including providing with two coats of approved steel primer etc. complete, all as per direction of Engineer- in-charge.	kg	101.00
9.144		Panelling prelamiante d MDF board	Providing and fixing panelling or paneling and glazing in panelled or panelled and glazed shutters for doors, windows and clerestory windows (area of opening for panel inserts excluding portion inside grooves or rebated to be measured). Panelling for panelled and glazed shutters	sqm	1087.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			25mm to 40mm thick: Pre-laminated with decorative lamination on both side exterior Grade - I MDF Board 12 mm thick confirming to IS:14587		
9.145		Fibre board to frame	Providing and fixing Pre -laminated medium density fibre board exterior grade (Grade-I) IS: 14587:1998 marked, to frame, backing or studding with screws etc. complete (Frames, backing or studding to be paid separately).		
	9.145.1	12 mm	Board 12 mm thick	sqm	811.00
	9.145.2	18 mm	Board 18 mm thick	sqm	943.00
9.146		Pre-laminated fibre board for shelves	Providing and fixing Pre-laminated medium density fibre board IS: 14587:1998 marked, with one side decorative lamination other side balancing lamination Grade-I(exterior grade) in shelves with screws and fittings wherever required, edges to be sealed with PVC edge bending tape 2.00 mm thick of approved brand (fittings to be paid separately).		
	9.146.1	18 mm	18 mm thick	sqm	1055.00
	9.146.2	25 mm	25 mm thick	sqm	1420.00
9.147		Acoustical wall panelling fabric finish	Providing and Installation of acoustical wall panelling fabric finish hardened square edge, FR grade fabric (colour as approved by Egnineer in charge) wrapped soft fibre core (glass fibre) panel having metal framing, of size 600x2100x25mm having density 100-120Kgs/ m3, weight 3.0kg/m2 NRC up to 0.9 installed by using impaling clip. Impaling clips are attached directly to the wall/frame work with the points extending outward. Then panels shall positioned and pressed into place.	sqm	7566.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.148		Acoustical wall panelling with perforated HDF board	Providing and installation of acoustical wall panelling wood finish Slats made out of HDF board , Melamine / veneer laminated finish, perforated wooden grooved slats (2mm grooves @ 8mm centers) / (2mm Slats @16mm pitch) / (2mm grooves @ 32mm centers) / (2mm grooves @ 64mm centers), backlined with black acoustical fleece, tongue-groove edge for a seamless look, FR grade, of lineal dimension size 128mm x 2440mm x 16mm thick having density 1000Kg /m <sup>3</sup> , weight 12.8Kgs/m <sup>2</sup> installed by using GI strut system. The GI strut system includes GI Cross channel having thickness 0.45mm, length 3600mm, knurled web 40mm, depth 10mm and equal flanges 15mm is fastened vertically/ horizontally at every 600mm centers. Aluminium core cross channel having thickness 0.5mm, length 2400mm, web 15mm and 27mm, depth 18mm and flanges of 7mm with suitable edge and centre brackets is then fixed perpendicular to the cross channel with the help of fasteners at every 400mm centers. Contractor to Provide expansion joints of 3mm at every 5mts bothways.	sqm	5179.00
9.149		Acoustic wall panelling paintble consisting magnesite bonded wood fiber wt. 8.20 kg/m <sup>2</sup>	Providing and installation of paintble acoustic wall panelling consisting of strand kerfed edge paint finished as approved by Engineer in charge. magnesite bonded wood fiber panels of size 600x2400x20mm having density 400kg/m <sup>3</sup> , weight 8-20kg/m <sup>2</sup> which is fixed to GI strut system. The GI strut work includes Cross channel having thickness 0.45mm, length 3600mm, knurled web 40, depth 10mm and equal flanges 15mm is fastened to wall positioned horizontally in a regular manner at 600mm centers. PVC Vinyl core UV treated H-Spline having thickness 2mm and length 2400mm to be fixed perpendicular to the Cross channel at 600mm centers. The Kerfed edge panels shall be then inserted into the H-spline against wall to perfect fit.		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.149.1	Wt. 8.20 kg/m <sup>2</sup>	Wt. 8.20 kg/m <sup>2</sup>	sqm	1427.00
	9.149.2	Wt. 4.2 kg/m <sup>2</sup>	Wt. 4.2 kg/m <sup>2</sup>	sqm	1303.00
9.150		Plywood lining with ply on wooden /steel frame	Providing and fixing plain lining with necessary screws/nuts and bolts/ nails including a coat of approved primer on one face and fixed on wooden /steel frame complete as per direction of Engineer-in-charge. (Frame work shall be paid for separately) 12mm thick commercial ply conforming to IS: 1328 BWR type.	sqm	1040.00
9.151		Acoustic wall panelling soak cord of fabric wrapped wood fiber panels inserted into the H-spline	Providing and Installation of acoustic wall panelling consisting of Soak Cord of selected colours as approved by Engineer in charge. Kerf edge Fabric wrapped wood fiber panels of size 600x2400x20mm having density 400Kgs/m <sup>3</sup> , weight 4-20kg/m <sup>2</sup> installed by using GI strut system. The GI strut works includes Cross channel having thickness 0.45mm, length 3600mm, knurled web 50, depth 50mm and equal flanges of 13mm is fastened to Wall positioned horizontally in a regular manner at 600mm centers. PVC Vinyl core UV treated H-Spline having thickness 2mm and length 2400mm to be fixed perpendicular to the Cross channels at 600mm centers. Kerfed edge Fabricwrapped panels shall be then inserted into the H-spline against wall to perfect fit.	sqm	3716.00
9.152		Acoustic wall panelling soak cord of fabric wrapped wood fiber panels	Providing and Installation of acoustic wall panelling consisting of Soak Cord of selected colours as approved by Engineer in charge, square edge Fabric wrapped wood fiber panels of size 600x1200x10mm having density 400Kgs/m <sup>3</sup> , weight 4-20kg/m <sup>2</sup> installed by using GI struts,Z bars. The GI strut systems includes Cross channel having thickness 0.45mm, length 3600mm, knurled web 40, depth 10mm and equal flanges 15mm is fastened to wallpositioned vertically in a regular manner at 600mm c/c.GI Z bars having 40mm height,	sqm	3358.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			thickness 1.2mm is first fixed behind the panels by identifying resin spots by using suitable fasteners.Clean exposed surfaces of wall and ensure walls are in plumb line before installing on wall (provide necessary packing shims if required). Soak cord square edge panels shall be slid into the Z bars fixed on wall.		
9.153		Acoustic wall panelling fabric panels	Providing and installation of acoustic wall panelling consisting of Stretch NRC by using FR Grade NRC fabric of size 1700mm width, shall be stretched by using wooden base 10mm thick, rigid vinyl Stretch Tracks half wrap/ full wrap 25mm and Midseam 25mm , strand, synth PF with requisite accessories and tools.Wooden base 10mm is first installed on the wall along the marking lines with metal fasteners at 300mm centers. Tracks to be installed on wooden base, by using Base tape (by removing the protective cover) for a true and continuous secure grip, and heavy-duty fasteners at 15mm centers on one/both sides of Stretch Tracks. Strand square edge magnesite bonded wood fiber panels of size 600x1200x15mm having density 400kg/m <sup>3</sup> , weight 4-8kg which is fixed to wall. Synth PF 10x10mm thick adhered on strand panel by using Stick 7 adhesive. Fabric of width 1700mm is then aligned to the Stretch tracks by following the fabric thread line or pattern. The fabric is stuck on the Align Tape (by removing the protective cover) at the same time as being stretched and tucked into the Stretch tracks and secure into the locking jaws so that it will be smooth, free of wrinkles with the tucking tools. Note -minimum 50mm additional fabric is required for tucking hence maximum module width would be 1600mm.	sqm	3348.00
9.154		Wall panelling of magnesia core panels	Providing and Installation of wall panelling consisting of Square edge Magnesia core panels of size	sqm	771.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			1100x2400x8mmmm having density 1000kgs/m3, weight 8kg/m2 installed by using GI Strut system. The GI struct system includes Cross channel having thickness 0.45mm, length 3600mm, knurled web 40, depth 10mm and equal flanges of 15mm is fastened to wall positioned horizontally in a regular manner at 600mm c/c. The panels to be fixed on the cross channel with suitable fasteners.		
9.155		Drywall partition magnesia block 66 mm thick	<p>Supplying and installation of magnesia block 66 mm thick drywall partition including Framework includes Floor/ Head GI channels having thickness 0.5mm, length 3600mm, equal flanges of 32mm and web of 50mm fixed to floor and ceiling with suitable fasteners at 300mm centers staggered. Noise and fire rated silicon bead sealant to be caulked along the perimeter of the partition frame before fixing channels. Then Stud channel having thickness 0.45mm, length 3600mm, unequal flanges of 34/36mm and web of 48mm should be placed into the floor/head channel positioned vertically at 600mm centers. Extra reinforcement to be provided at openings (doors, windows, etc.,) The first layer of magnesia oxide block 8mm thick should be fixed on one side of the Stud framework in a staggered pattern by using suitable metal fasteners at 300mm centers. Second layer of magnesia oxide block 8mm thick should be fixed other side of the frame work similar fashion as the first layer. 3mm gap should be maintained between boards. 3 mm gap shall be filled with jointing compound.</p> <p>Magnesia oxide block shall have following physical characteristics.</p> <ul style="list-style-type: none"> <li>• Core - Magnesia</li> <li>• Fire Rating – upto 150mins</li> <li>• Acoustics – STC upto 44-50</li> <li>• Climate (OC RH) – 50, 99</li> <li>• Moisture Absorption - 6.8% after 2hrs</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>and 11.3% after 24hrs soaking</li> <li>• Wet Expansion - &lt; 0.02% from ambient to saturation</li> <li>• Dry Contraction - ≤ 0.02% from evaporation</li> <li>• Moisture Movement - 0.02%</li> <li>• Light reflectance – 80 %• Green (RC %) – 30</li> <li>• Strength - Antisag</li> <li>• Impact - 4kg hammer 175mm</li> </ul>		
	9.155.1	66mm thick dry well	Using 8mm thick magnesia block	sqm	1578.00
	9.155.2	70mm thick dry wall	Using 10mm thick magnesia block	sqm	1868.00
	9.155.3	74mm thick dry wall	Using 12mm thick magnesia block	sqm	1984.00
	9.155.4	94 mm thick dry wall	Using 12mm thick magnesia block	sqm	3320.00
9.156		Extra for thermal insulation to the dry wall	Add extra for providing and fixing Thermal insulation by providing 50mm thick synth PF having density 1000 GSM within the cavity held in position by using chicken wire mesh/ cross bracing/ pasting to the wall.	sqm	768.00
9.157		Gypsum panel partitions	Providing and laying Gypsum panel partitions 100mm thick with water proof Gypsum panels of size 666x500x100mm, made of calcite phosphor Gypsum fixed with tongue and groove, jointed with bonding plaster as per manufacturers specifications in superstructure above plinth level up to floor II level. Gypsum blocks will have a minimum compressive strength of 9.3 kg/cm <sup>2</sup> .	sqm	810.00
9.158		UPVC door frame wall thickness 2.0mm	Providing and fixing factory made UPVC door frame made of UPVC extruded sections having an overall dimension as below (tolerance ±1mm), with wall thickness 2.0 mm (± 0.2mm), corners of the door frame to be Jointed with galvanized brackets and stainless steel screws, joints mitred and Plastic welded. The hinge side vertical of the frame reinforced by galvanized M.S. tube of size 19 X 19mm and 1mm (± 0.1 mm) wall thickness and 3 nos. stainless steel hinges		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			fixed to the frame complete as per manufacturers specification and direction of Engineer-in-charge:		
	9.158.1	48x40 mm.	Extruded section Profile size 48x40 mm.	metre	203.00
	9.158.2	42x50 mm.	Extruded section Profile size 42x50 mm.	metre	208.00
9.159		Panelled UPVC door shutter 24 mm thick	Providing and fixing Panelled UPVC door shutter to existing door frames. 24 mm thick factory made UPVC door shutters made of styles and rails of a UPVC hollow section of size 59x24 mm and wall thickness 2 mm ( $\pm$ 0.2 mm) with inbuilt edging on both sides. The styles and rails mitred and joint at the corners by means of M.S. galvanised/plastic brackets of size 75x220 mm having wall thickness 1.0 mm and stainless steel screws. The styles of the shutter reinforced by inserting galvanised M.S. tube of size 20x20 mm and 1 mm ( $\pm$ 0.1 mm) wall thickness. The lock rail made up of a UPVC hollow 'H' section, section of size 100x24 mm and 2 mm ( $\pm$ 0.2 mm) wall thickness, fixed to the shutter styles by means of plastic/galvanised M.S. 'U' cleats. The shutter frame filled with a UPVC multi-chambered single panel of size not less than 620 mm, having over all thickness of 20 mm and 1 mm ( $\pm$ 0.1 mm) wall thickness. The panels filled vertically and tie bar at two places by inserting horizontally 6 mm galvanised M.S. rod and fastened with nuts and washers, complete as per manufacturer's specification and direction of Engineer-in-charge. (For W.C. and bathroom door shutter).	sqm	1750.00
9.160		Panelled door shutter UPVC 30 mm thick	Providing and fixing UPVC panelled door shutter UPVC 30 mm thick factory made PVC or UPVC door shutter made of styles and rails of a UPVC hollow section of size 60x30 mm and wall thickness 2 mm ( $\pm$ 0.2 mm), with inbuilt decorative moulding edging on one side. The styles and rails mitred and joint at the corners by means of M.S. galvanised/plastic brackets of size 75x220 mm having wall thickness 1.0 mm and stainless steel screws. The styles of the	sqm	2026.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			shutter reinforced by inserting galvanised M.S. tube of size 25x20 mm and 1 mm ( $\pm$ 0.1 mm) wall thickness. The lock rail made up of 'H' section, a UPVC hollow section of size 100x30 mm and 2 mm ( $\pm$ 0.2 mm) wall thickness fixed to the shutter styles by means of plastic/ galvanised M.S.'U' cleats. The shutter frame filled with a UPVC multi-chambered single panel of size not less than 620 mm, having over all thickness of 20 mm and 1 mm ( $\pm$ 0.1 mm) wall thickness. The panels filled vertically and tie bar at two places by inserting horizontally 6 mm galvanised M.S. rod and fastened with nuts and washers, complete as per manufacturer's specification and direction of Engineer-in-charge.		
9.161		Flush door shutter PVC, 25mm	Providing and fixing 25mm thick PVC flush door shutters made out of a one piece Multi chamber extruded PVC section of the size of 762mmx25mm or less as per requirement with an average wall thickness of 1mm ( $\pm$ 0.3mm). PVC foam end cap of size 23x10mm are provided on both vertical edges to ensure the overall thickness of 25mm. An M.S. tube having dimensions 19mm x 19mm and 1.0 mm ( $\pm$ 0.1mm) is inserted along the hinge side of the door. Core of the door shutter should be filled with High Density Polyurethane foam. The Top and Bottom edges of the shutter are covered with an end-cap of the size 25mmx11mm. Door shutter shall be reinforced with special polymeric reinforcements as per required specification and direction of Engineer-in-charge to take up necessary hardware and fixtures. Stickers indicating the locations of hardware will be pasted at appropriate places.	sqm	1968.00
9.162		Panelled door shutter factory made PVC 37 mm	Providing and fixing 37 mm thick factory made PVC door shutter, styles and rails made of PVC hollow section of size 100mmx37mm with wall thickness 2mm ( $\pm$ 0.2mm), with inbuilt bead on one side, styles and rails mitered cut and joint at the corners by means of 2 nos. of plastic brackets of	sqm	2142.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			size 75mm x 220 mm at each corner and stainless steel screws, reinforcing the hinge side of style by inserting PVC profile of size 28mm x 30mm, with wall thickness 2 mm ( $\pm 0.2$ mm). Lockrail of size 100mmx37mm, wall thickness 2mm ( $+0.2$ mm) will be fixed to the vertical styles. Providing with PVC snapfit beads and panel of size 100mmx20 mm, and inserting 2 nos. tie bar of 6 mm dia and fastening with nuts and washers complete, all as per manufacturer's specification and direction of Engineer-in-charge.		
9.163		Door frame PVC size 75mmx53 mm	Providing and Fixing, factory made, PVC door frame made of PVC extruded sections of size 75mmx53 mm, having wall thickness 2.0mm ( $\pm 0.2$ mm). Both verticals sides of the frame reinforced with PVC profile of cross section size 28mm x 30mmx2mm thickness ( $\pm 0.2$ mm) and 75mmx200 mm long, including reinforcing both ends of the top frame with PVC profile. PVC Door Frame and PVC reinforcement profile to be mitred cut jointed and fusion welded together, including providing and fixing 3 nos. of 125mm long stainless steel hinges to frame, fixing the frame with jamb with required nos. and sizes of anchor dash fastener, all complete as per manufacturer's specification and direction of engineer-in-charge.	metre	342.00
9.164		PVC door shutter	Providing and fixing 37 mm thick factory made PVC Door shutter, styles and rails made of PVC hollow extruded printed and laminated section having overall dimension 115mm x 37mm with wall thickness 2 mm ( $\pm 0.2$ mm) with inbuilt beading on one side, the styles and rails mitred cut and joint at corners by inserting 2 nos. PVC profile reinforcement of size 75 mm x 200 mm long with cross section size of 28mm x 30mm having wall thickness 2 mm ( $\pm 0.2$ mm). Styles, rails and reinforcements to be fusion welded together. Only hinge side vertical style to be reinforced with PVC profile	sqm	2153.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			reinforcement in full length. Printed and laminated PVC lock rail of size 110mm x 37mm having wall thickness 2 mm ( $\pm 0.2$ mm) to be welded horizontally with the vertical styles after inserting PVC profile reinforcement as in styles and rails, providing with PVC snap fit beading, panels of 100 x 20 mm printed and laminated and inserting 2 nos. 6 mm dia. bright steel rod horizontally with both side threaded and tightened with check nuts and washers complete, all as per manufacturer's specification and direction of Engineer-in-Charge.		
9.165		P.V.C. door frame size 50x47mm wall thickness 5mm	Providing and fixing factory made P.V.C. door frame of size 50x47mm with a wall thickness of 5mm, made out of extruded 5mm rigid PVC foam sheet, mitred at corners and joined with 2 Nos. of 150mm long brackets of 15x15mm M.S. square tube, the vertical door frame profiles to be reinforced with 19x19mm M.S. square tube of 19 gauge, EPDM rubber gasket weather seal to be provided through out the frame. The door frame to be fixed to the wall using M.S. screws of 65/100mm size, complete as per manufacturer's specification and direction of Engineer-in-Charge.	metre	371.00
9.166		Panelled PVC door shutter	Providing and fixing factory made 30 mm thick PVC door shutter consisting of frame made out of M.S. tubes of 19 gauge thickness and size of 19mm x 19mm for styles and 15x15mm for top and bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture. M.S. frame covered with 5mm thick heat moulded PVC 'C' channel of size 30mm thickness, 70mm width out of which 50mm shall be flat and 20mm shall be tapered in 45degree angle on both side forming styles; and 5mm thick, 95mm wide PVC sheet out of which 75mm shall be flat and 20mm shall be tapered in 45 degree on the inner side to form top and bottom rail and 115mm wide PVC sheet out of which 75mm shall be flat and 20mm shall be tapered on both sides to form lock rail. Top, bottom and lock rails shall be		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			provided both side of the panel. 10mm (5mmx2) thick, 20mm wide cross PVC sheet be provided as gap insert for top rail and bottom rail. paneling of 5mm thick both side PVC sheet to be fitted in the M.S. frame welded/ sealed to the styles and rails with 7mm (5mm+2mm) thick x 15mm wide PVC sheet beading on inner side, and joined together with solvent cement adhesive. An additional 5mm thick PVC strip of 20mm width is to be stuck on the interior side of the 'C' Channel using PVC solvent adhesive etc. complete as per direction of Engineer-in-charge. Manufacturer's specification and drawing.		
	9.166.1	Plain PVC	Plain PVC door shutters.	sqm	2026.00
	9.166.2	Pre-laminated PVC	Pre laminated PVC door shutters.	sqm	2490.00
9.167		Door frame (single rebate) extruded solid PVC foam profile	Providing and fixing factory made door frame (single rebate) made out of single piece extruded solid PVC foam profile with homogenous fine cellular structure having smooth outer integral skin having 62 mm width and 32 mm thickness, frame will be mitred and Jointed with self driven self tapping screws of size 38 mm x 4 mm and PVC solvent cement, including fixing the frame to wall with suitable dia and length anchor fastener as per manufacturer's specification and direction of Engineer-in-charge.	metre	313.00
9.168		Door shutter (paneled) 30mm thick solid PVC foam profile	Providing and fixing factory made 30 mm thick door shutter made of solid PVC foam profile. The styles and rails shall be of size 75 mm x 30 mm having wall thickness 5mm. The styles, top and bottom rails shall have one side wall thickness of 15 mm integrally extruded on the hinge side of the profile for better screw holding power. The styles and rails shall be reinforced with M.S. tubes of size 33 mm x 17 mm x 1 mm, painted with primer, all four corners of reinforcement to be welded or sealed. Solid PVC extruded bedding (push fit type) will be set inside the styles and the rails with a cavity, to receive single piece extruded 5		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			mm PVC sheet as panel. The styles and rails will be mitred cut and joint with the help of PVC solvent cement and self driven self tapping screws. Single piece extruded solid PVC lock rail of size 100 mm x 30 mm with wall thickness 5 mm and 15 mm integrally extruded in the middle of the lock rail and fixed with styles with the help of PVC solvent cement and self driven self tapping screws of size 100 mm x 8 mm complete as per manufacturer's specifications and direction of Engineer-in-charge:		
	9.168.1	Non decorative	Non decorative finish.	sqm	2026.00
	9.168.2	Decorative	Decorative finish (both side wood grained finish).	sqm	2432.00
9.169		Factory made solid wood plastic composite (WPC) doorframes	Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid door/window/ceosetory windows and other frames/chowkhat comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice .husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) fabricated with miter joints after applying PVC solvent cement and screwed with full body threaded star headed S.S. screws having minimum density of 750 kg/m <sup>3</sup> and screw withdrawal strength of 2200 N (Face) & 900 N (Edge), minimum compressive strength 58 N/mm <sup>2</sup> , modulus of elasticity 900 N/ mm <sup>2</sup> and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixed in position with M.S. hold fast/lugs/S.S.dash fasteners of required dia and length complete as per direction of Engineer-in-Charge. (M.S. hold fast/lugs or S.S. dash fasteners shall be paid separately)		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.169.1	75 mm X 50 mm	Single rebate (75 mm X 50 mm)	RM	459.00
	9.169.2	100 mm X50mm	Single rebate (100 mm X50 mm)	RM	720.00
	9.169.3	125 mm X 65 mm	Single or double rebate (125 mm X 65 mm)	RM	923.00
9.170		WPC flush door (plain)	Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid plain flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength 50 N/mm <sup>2</sup> , modulus of elasticity 850 N/mm <sup>2</sup> and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixing with stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws, all as per direction of Engineer-InCharge. (Note: stainless steel butt hinges and necessary S.S screws shall be paid separately)		
	9.170.1	24 mm thick	24 mm thick WPC (Wood polymer composite) solid plain flush door shutter	sqm	2250.00
	9.170.2	28 mm thick	28 mm thick WPC (Wood polymer composite) solid plain flush door shutter	sqm	3250.00
	9.170.3	30 mm thick	30 mm thick WPC (Wood polymer composite) solid plain flush door shutter	sqm	3693.00
	9.170.4	35 mm thick	35 mm thick WPC (Wood polymer composite) solid plain flush door shutter	sqm	4135.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
9.171		WPC flush door (decorative type)	Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid decorative type flush door shutter of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice .husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) & 900 N (Edge), minimum compressive strength 50 N/mm <sup>2</sup> , modulus of elasticity 850 N/mm <sup>2</sup> and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant. WPC to be laminated with PVC foil of minimum 14 microns thick of approved design pasted with hot melt adhesive on both faces of shutter and fixing with stainless steel butt hinges of required size with necessary full body threaded star headed counter sunk S.S screws, all as per direction of Engineer-InCharge. (Note: stainless steel butt hinges and necessary S.S screws shall be paid separately)		
	9.171.1	30 mm thick	30 mm thick WPC (Wood Polymer Composite) solid decorative type flush door shutter	sqm	3858
	9.171.2	35 mm thick	35 mm thick WPC (Wood Polymer Composite) solid decorative type flush door shutter	sqm	4417

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.172		WPC solid board	<p>Providing and fixing factory made single extruded WPC (Wood Polymer Composite) solid board one side white colour and other side of board laminated with PVC foil of minimum 14 micron thickness of approved design pasted with hot melt adhesive for cup boards, work stations and bathroom/ kitchen cabinet etc. of required sizes comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawal strength of 1800 N (Face) &amp; 900 N(Edge), minimum compressive strength 50 N/mm<sup>2</sup>, modulus of elasticity 850 N/mm<sup>2</sup> and resistance to spread of flame of Class A category with property of being termite/borer proof, water/moistureproof and fire retardant and fixing with stainless steel piano hinges/soft close clip on concealed hinges of required size with necessary full body threaded star headed counter sunk S.S screws, all as per direction of Engineer-In-Charge.</p> <p>(Note: stainless steel piano hinges/soft close clip on concealed hinges and necessary S.S screws shall be paid separately)</p>		
	9.172.1		18 mm thick	sqm	2423.65
	9.172.2		25 mm thick	sqm	3083.95
9.173		WPC solid board for cupboard	<p>Providing and fixing factory made single extruded WPC (Wood polymer composite) solid plain white color board for backing of cupboards and bathrooms/ kitchen cabinets etc. of required size comprising of virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and naturalfibers (wood powder/rice husk/wheat husk) and non toxic additives (maximum toxicity index of 12 for 100 gms.), having minimum density of 650 kg/cum and screwwithdrawal strength of 1800 N (Face) &amp; 900 N (Edge), minimum compressivestrength 50 N/mm<sup>2</sup>, modulus of elasticity 850 N/mm<sup>2</sup> and resistance to spread of</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			flame of Class A category with property of being termite/borer proof, water/moisture proof and fire retardant and fixing with stainless steel screws etc. all as per direction of Engineer-in-Charge. (Note:stainless steel screws shall be paid separately)		
	9.173.1	6 mm	6 mm thick	sqm	800.00
	9.173.2	12 mm	12 mm thick	sqm	1300.00
9.174		18 mm thick WPC Jali	Providing and fixing factory made 18 mm thick single extruded WPC (Wood Polymer Composite) solid plain white colour board Jali CNC (Computer numeric control) routed of approved design by Engineer-in -charge which are machine cut for duct/shaft covering, partitions and facades comprisingof virgin polymer of K value 58-60 (Suspension Grade), calcium carbonate and natural fibers (wood powder/ rice husk/wheat husk) and non toxic additives(maximum toxicity index of 12 for 100 gms) having minimum density of 650 kg/cum and screw withdrawalstrength of 1800 N (Face) minimumcompressive strength 50 N/mm <sup>2</sup> , modulus of elasticity 850 N/mm <sup>2</sup> and resistance to spread of flame of Class A category with properties of being termite/borer proof, water/ moisture proofand fire i etardant and fixing on M.S (mild steel) frame made of 25 x 25 x 1.5 mm square hollow box section including applying a priming coat of approved steel primer, placed at grid made at 1.0 x 1.0 mor as per requirement at site with necessary stainless steel fasteners and SS screws etc., all complete as per direction of Engineer-In-Charge. (Note: M.S (mild steel) framework with priming coat and necessary SS fasteners and SS screws shall be paid separately.	sqm	2700.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.175		Door frame PVC single piece extruded PVC profile	Providing and fixing PVC Door Frame of size 50x47mm with a wall thickness of 5 mm ( $\pm 0.2$ mm) made out of single piece extruded PVC profile, with mitred cut joints and joint with 2nos of PVC bracket of size 190 mm x 100 mm long arms of cross section size 35x15mm and self driven self tapping screws, the vertical door profiles to be reinforced with 40x20mm M.S. rectangular tube of 0.8 mm , including providing EPDM rubber gasket weather seal throughout the frame, including jointing 5mm PVC frame strip with PVC solvent cement on the back of the profile. The door frame to be fixed to the wall using 8x100mm long anchorfasteners complete, all as per manufacturer's specification and direction of Engineer -in- charge.	metre	517.00
9.176		Door shutter (panelled) 35mm thick made out of single piece extruded solid PVC	35 mm thick factory made Solid panel PVC Door shutter made out of single piece extruded solid PVC profiles, 5mm ( $\pm 0.2$ mm) thick, having styles and rails (except lock rail) of size 95 mm x 35 mm x 5 mm, out of which 75 mm shall be flat and 20 mm shall be tapered (on both side), having one side thickness of 15 mm integrally extruded on the hinge side of the profile for better screw holding power, including reinforcing with MS tube of size 40 mm x 20 mm x 1 mm, joints of styles and rails to be mitred cut and joint with the help of PVC solvent cement, self driven self tapping screws and M.S. rectangular pipes bracket of size 190 mm x 100 mm of cross section size 35 mm x 17 mm x 1 mm at each corner. Single piece extruded 5mm thick solid PVC Lock rail of size 115 mm x 35 mm x 35 mm, out of which 95 mm to be flat and 20 mm to be tapered at both ends, having 15 mm solid core in middle of rail section integrally extruded, fixing the styles and rails with the help of solvent and self driven self tapping screws of 125 mm x 11 mm, including providing 5mm Single piece solid PVC extruded sheet inserted in the door as panel, all complete as per manufacturer's specification and direction of Engineer-in-charge.		

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	9.176.1	Non decorative	Non decorative finish (matt finish).	sqm	2037.00
	9.176.2	Decorative	Decorative finish (wood grained finish).	sqm	2142.00
9.177		PVC rigid foam sheet 1mm thick on existing door	Providing and fixing PVC rigid foam sheet 1mm thick on existing door shutters (bathroom and W.C. doors) using synthetic rubber based adhesive.	sqm	313.00
9.178		Door frames fibre glass reinforced plastic (FRP)	Providing and fixing Fibre Glass Reinforced plastic (FRP) Door Frames of cross-section 90mm x 45mm having single rebate of 32mmx15mm to receive shutter of 30mm thickness .The laminate shall be moulded with fire resistant grade unsaturated polyester resin and chopped mat .Doorframe laminate shall be 2mm thick and shall be filled with suitable wooden block in all the three legs. The frame shall be covered with fibreglass from all sides. MS stat shall be provided	metre	535.00
9.179		Door shutter glass fibre reinforced plastic (FRP) panelled 30mm	Providing and fixing to existing doorframes. 30 mm thick glass Fibre Reinforced Plastic (FRP) panelled door shutter of required colour and approved brand and manufacture, made with fire - retardant grade unsaturated polyester resin, moulded to 3 mm thick FRP laminate for forming hollow rails and styles, with wooden frame and suitable blocks of seasoned wood inside at required placesfor fixing of fittings, cast monolithically with 5mm thick FRP laminate for panels conforming to IS: 14856 including fixing to frames.	sqm	2574.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.180		Existing door frame door frame FRP 30mm	Providing and fixing door frame FRP30mm thick fiberglass reinforced Plastic (F.R.P.) flush door shutter in different plain and wood inish made with fire retardant grade unsaturated polyester resin,moulded to 3mm thick FRP laminate all around, with suitable wooden blocks inside at required places for fixing of fittings and polyurethane foam (PUF)/Polystyrenefoam to be used as filler material throughout the hollow panel, casted monolithically with testing parameters of F.R.P. laminate conforming to table - 3 of IS: 14856, complete as per direction of Engineer-in-charge.	sqm	2806.00
9.181		Fibreglass reinforced plastics chajja	Providing and fixing factory made Fibreglass Reinforced plastics (F.R.P.) chajja 4mm thick of required colour, size and design made by Resin Transfer Moulding (RTM) Machine Technology, resulting in void free compact laminate in single piece, having smooth gradual slope curvature for easy drainage of water and duly reinforced by 2nos. vertically and 1nos. horizontally 50x2mm thick M.S. flat with 12mm in built hole for grouting on the existing wall along with the 50mm flanges duly inserted and sealed in the wall complete in one single piece casted monolithically, including all necessary fittings . The FRP Chajja should be manufactured using unsaturated Polyester resin as per IS: 6746 duly reinforced with fibre glass chopped strand mat (CSM) as per IS: 11551 complete with protective Gelcoat U/V coating on Top for complete resistance from the extreme of temperature, weather and sunlight.	sqm	4625.00
9.182		Door frame fire resistant made out of 16 SWG G.I.sheet (1 hr fire rating)	Providing and fixing fire resistant door frame of section 143x57 mm having built in rebate made out of 16 SWG G.I.sheet (zinc coating not less than 120 gm/sqm) duly filled with vermiculite based concrete mix, suitable for mounting 60 minutes fire rated door shutters. The frame is fitted with intumescent fire seal strip of size 10x4 mm (minimum) around the frame and fixing with dash fastener of approved size and	metre	1191.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			make, including applying a coat of approved brand fire resistant primer etc. complete as per direction of Engineer-in-charge (Dash fastener to be paid for separately).		
9.183		Door shutters fire resistant made out of 16 SWG G.I.sheet (1 hr fire rating)	Providing and fixing 50 mm thick glazed fire resistant door shutters of 60 minutes fire rating conforming to IS:3614 (Part-II) tested and certified as per laboratory approved by Engineer-in-charge with suitable mounting on door frame,consisting of vertical styles, lock rail, top rail 100mm wide, bottom rail 200mm wide, made out of 16 SWG G.I.sheet (zinc coating not less than 120 gm/m2) duly filled FR insulation material and fixing with necessary stainless steel ball bearing hinges of approved make, includingapplying a coat of approved fire resistant primer etc. all complete as per direction of Engineer-in-charge (panneling to be paid for separately).	sqm	5850.00
9.184		Door shutters glazing in fire resistant (1 hr fire rating)	Providing and fixing glazing in fire resistant door shutters, fixed panels,ventilators and partitions etc., with G.I. beading of appropriate size made out of 20 SWG G.I.sheet (zinc coating not less than 120 gm/m2), fire resistant sealant, including applying a coat of approved fire resistant primer on G.I. beading etc. complete all as per direction of Engineer-in-charge. With clear fire resistant glass panes 6mm thick of approved brand, having minimum 60 minutes fire resistance.	sqm	27797.00
9.185		Panic bar / latch (double point)	Providing and fixing panic bar / latch (Double point) fitted with a single body, Trim Latch and Lock on back side of the Panic Latch of reputed brand and manufacture to be approved by the Engineer- in- charge, all complete.	Nos.	6091.00
9.186		Door frame UPVC size	Providing and Fixing factory made UPVC door frame made of UPVC exturded	metre	435.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		65 mmx55	sections, of size 65 mmx55 mm with wall thickness 2.0 mm ( $\pm 0.2$ mm), corners of the door frame to be mitred cut and jointed with plastic brackets and stainless steel screws, reinforcing hinge side vertical of the frames with PVC profile of Size 28mmx30 mm having wall thickness 2 mm ( $\pm 0.2$ mm), including providing and fixing 3 nos. of 125 mm long stainless steel hinges to the frame, fixing the frame with jamb with required number and size of anchor dash fastners, all complete as per manufacturer's specification and direction of Engineer-in-charge.		
9.187		UPVC white opnable casement / sliding window and door	Providing and Fixing, UPVC factory made, white colour casement/sliding window and door made of extruded profiles. Profiles of frames and sash will be mitred cut and fusion welded at allcorners including drilling of holes for fixing hardware and drainage of water etc.,making arrangement for fixing ofhardware, EPDM gasket, 1.2 $\pm$ 0.2mm thick galvanised steel profile to be inserted in required profile, frame will be fixed to the wall with 8 mmx100 mm long fasteners, all complete as per direction of Engineer-in-charge. (Glazing, hardware hinges and fitting etc. to be paidseparately.)		
	9.187.1	Casement window (outward openable)	Casement Window (Outward/Inward opening) with hinge System.		
	9.187.1.1	Frame	Frame (50 mm x 50mm)	metre	422.00
	9.187.1.2	Sash	Sash (Style and Rail) (62 mm x 34 mm)	metre	403.00
	9.187.1.3	Mullion	Mullion (intermediate Section) (66mm x 50 mm)	metre	434.00
	9.187.1.4	'T' Profile	'T' Profile (one vertical length in between two shutters) (24mm x 34.5mm)	metre	99.00
	9.187.1.5	Glazing bead	Glazing bead (12mm x 18mm)	metre	130.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.187.2	Casement window (outward openable)	Casement Window (With friction hinge and outward opening)		
	9.187.2.1	Casement Frame	Casement Frame (67mm x 62mm)	metre	495.00
	9.187.2.2	Sash/Mullion	Casement Window Sash/Mullion (67mm x 75mm) (style, rail and intermediate section)	metre	519.00
	9.187.2.3	Glazing bead	Casement Glazing bead (35mm x 18 mm)	metre	178.00
	9.187.3	Sliding window 2 track	Sliding Window (Two Track, 2/4 Shutters)		
	9.187.3.1	Frame	Two Track Sliding Frame (67mm x 52mm)	metre	566.00
	9.187.3.2	Sash	Sliding window Sash (60mm x 44mm)	metre	529.00
	9.187.3.3	Interlock	Sliding Interlock for Window (one vertical length in each shutter)(45.5 mm x 28 mm)	metre	139.00
	9.187.3.4	Glazing bead	Sliding Glazing bead (35 mm x 18 mm)	metre	178.00
	9.187.4	Sliding door 2 track	Sliding Door (Two Track, 2/4 Shutters)		
	9.187.4.1	Frame	Two Track Sliding Frame (67mm x 52mm)	metre	539.00
	9.187.4.2	Sash	Sliding Door Sash (80mm x 44mm)	metre	653.00
	9.187.4.3	Interlock	Sliding Interlock for Door (one vertical length in each shutter) (45.5 mm x 28 mm)	metre	139.00
	9.187.4.4	Glazing bead	Sliding Glazing bead (35 mm x 18 mm)	metre	178.00
9.188		Friction hinges to the side/ top hung UPVC windows	Providing and fixing stainless steel (SS- 304 grade) friction hinges to the side/ top hung UPVC windows, of approved quality with necessary stainless steel screws etc. as per direction of Engineer-in-charge.		
	9.188.1	200 mm	200 x 19 x 1.9 mm	each	321.00
	9.188.2	250 mm	250 x 19 x 1.9 mm	each	369.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	9.188.3	300 mm	300 x 19 x 1.9 mm	each	462.00
	9.188.4	350 mm	350 x 19 x 1.9 mm	each	526.00
	9.188.5	400 mm	400 x 19 x 1.9 mm	each	636.00
9.189		Handle for UPVC casement windows	Providing and fixing casement handle made of zinc alloyed (white powder coated) for UPVC casement window with necessary screws etc. complete.	each	214.00
9.190		Lock for UPVC sliding window	Providing and fixing zinc alloyed (white powder coated) touch lock for UPVC sliding window with necessary screws etc. complete.	each	144.00
9.191		Steel roller for UPVC sliding window	Providing and fixing steel roller for UPVC sliding window with necessary screws etc. complete.	each	74.00
9.192		Steel roller for UPVC sliding door	Providing and fixing steel roller for UPVC sliding door with necessary screws etc. complete.	each	115.00
9.193		Steel crescent lock for UPVC sliding window/ door	Providing and fixing steel (white powder coated) crescent lock for UPVC sliding window/ door with necessary screws etc. complete.	each	127.00
9.194		UPVC white colour casement	Providing and fixing factory made UPVC white colour casement/casement cum fixed glazed windows comprising of UPVC multi-chambered frame, sash and mullion (where ever required) extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to UPVC profile), UPVC extruded glazing beads of appropriate dimension EPDM gasket, stainless steel (SS 304 grade) friction hinges, zinc alloy (white powder coated) casement handles, G.I fasteners 100 x 8 mm size for fixing frame to finished wall, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, mullion (if required) shall be also fusion welded including drilling of		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing &amp; direction of Engineer-in-Charge. (Single / double glass panes and silicon sealant shall be paid separately)</p> <p>Note: For UPVC frame, sash and mullion extruded profiles minus 5% tolerance in dimension i.e. in depth &amp; width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.</p>		
	9.194.1	Single panel upto 0.75 sqm	Casement window single panel with S.S. friction hinges (300 x 19 x 1.9 mm), made of (small series) frame 47 x 50 mm & sash 47 x 68 mm both having wall thickness of $1.9 \pm 0.2$ mm and single glass pane glazing bead of appropriate dimension. (Area of window upto 0.75 sqm.)	sqm	6798.00
	9.194.2	Double panels 0.75 sqm upto 1.50 sqm	Casement window double panels with S.S. friction hinges (300 x 19 x 1.9 mm) made of (small series) frame 47 x 50 mm, sash 47 x 68 mm & mullion 47 x 68 mm all having wall thickness of $1.9 \pm 0.2$ mm and single glazing bead of appropriate dimension. (Area of window above 0.75 sqm upto 1.50 sqm).	sqm	6221.00
	9.194.3	Double panels top fixed upto 2.50 sqm	Casement window double panels with top fixed with S.S. friction hinges (350 x 19 x 1.9 mm) made of (small series) frame 47 x 50 mm, sash 47 x 68 mm & mullion 47 x 68 mm all having wall thickness of $1.9 \pm 0.2$ mm and single glazing bead of appropriate dimension. (Area of window upto 2.50 sqm).	sqm	4842.00
	9.194.4	Single panel big series	Casement window single panel with S.S. friction hinges (400 x 19 x 1.9 mm) made of (big series) frame 67 x 60 mm & sash 67 x 80 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead /	sqm	6681.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			double glazing bead of appropriate dimension. (Area of window above 0.75 sqm.)		
	9.194.5	Duble panel big series	Casement window duble panel with S.S. friction hinges (400 x 19 x 1.9 mm) made of (big series) frame 67 x 60 mm & sash 67 x 80 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of window above 1.50 sqm.)	sqm	6942.00
	9.194.6	Both and single casement panel	Casement cum fixed panel window having both and single casement panel, middle fixed panels and at top completely fixed ventilator with S.S. friction hinges (350 x 19 x 1.9 mm) made of (big series) frame 67 x 60 mm & sash 67 x 80 mm & mullion 67 x 80 all having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of window above 3.00 sqm. Upto 5.00 sqm.)	sqm	5290.00
9.195		UPVC white colour fixed glazed windows/ventilators	Providing and fixing factory made UPVC white colour fixed glazed windows/ventilators comprising of UPVC multi-chambered frame and mullion (where ever required) extruded profiles duly reinforced with $1.60 \pm 0.2$ mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to UPVC profile), UPVC extruded glazing beads of appropriate dimension, EPDM gasket, G.I fasteners 100 x 8 mm size for fixing frame to finished wall, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame shall be mitred cut and fusion welded at all corners, mullion (if required) shall be also fusion welded including drilling of holes for fixing hardware's and drainage of water etc. Afterfixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			Charge. (Single / double glass panes and silicon sealant shall be paid separately).  <b>Note:</b> - For UPVC frame, sash and mullion extruded profiles minus 5% tolerance in dimension i.e. in depth & width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.		
	9.195.1	Window / ventilator	Fixed window / ventilator made of (small series) frame 47 x 50 mm & mullion 47 x 68 mm both having wall thickness of $1.9 \pm 0.2$ mm and single glazing bead of appropriate dimension. (Area upto 0.75 sqm.)	sqm	4860.00
9.196		Casement/ casement cum fixed glazed door	Providing and fixing made UPVC white colour casement/ casement cum fixed glazed door comprising of UPVC multi-chambered frame, sash and mullion (where ever required) extruded profiles duly reinforced with $1.60 \pm 0.2$ mm thick galvanized mild steel section made from roll forming process of required length(shape & size according to UPVC profile),UPVC extruded glazing beads of appropriate dimension, EPDM gasket, zinc alloy (white powder coated) 3D hinges and one handle on each side of panels along with zinc plated mild steel multi point locking having transmission gear, cylinder with keeps and one side key, G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws, etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, mullion (if required) shall be also fusion welded including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. (Single / double glass panes and silicon sealant shall be paid separately). <b>Note:</b> - For UPVC frame, sash and mullion extruded profiles minus 5% tolerance in		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			dimension i.e. in depth & width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.		
	9.196.1	Casement door with 3D hinges	Casement door with 3D hinges made of (big series) frame 67 x 64 mm & sash 67 x 110 mm both having wall thickness of 2.3 ± 0.2 mm and single glazing bead / double glazing bead of appropriate dimension. (Area of door upto 2.00 sqm).	sqm	7085.00
	9.196.2	Casement door with top hung ventilator	Casement door with top hung ventilator with 3D and S.S. friction hinges (400 x 19 x 1.9 mm) made of (big series) frame 67 x 64 mm, sash 67 x 110 mm & mullion 67 x 80 mm all having wall thickness of 2.3 ± 0.2 mm and single glazing bead /double glazing bead of appropriate dimension. (Area of door upto 2.50 sqm).	sqm	7063.00
9.197		UPVC white colour sliding glazed window	Providing and fixing factory made UPVC white colour sliding glazed window upto 1.50 m in height dimension comprising of UPVC multi-chambered frame with in-built roller track and sash extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to UPVC profile), appropriate dimension of UPVC extruded glazing beads and UPVC extruded interlocks, EPDM gasket, wool pile, zinc alloy (white powder coated) touch locks with hook, zinc alloy body with single nylon rollers (weight bearing capacity to be 40 kg), G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. (Single / double glass panes, wire mesh and silicon sealent shall be paid separately) <b>Note:</b> - For UPVC frame, sash and mullion extruded profiles minus 5% tolerance in dimension i.e. in depth & width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.		
	9.197.1	Two track two panels sliding window	Two track two panels sliding window made of frame 52 x 44 mm & sash 32 x 60 mm both having wall thickness of $1.9 \pm 0.2$ mm and single glazing bead of appropriate dimension. (Area of window upto 1.75 sqm)	sqm	5060.00
	9.197.2	Three track three panels sliding window with fly proof SS wire mesh	Three track three panels sliding window with fly proof SS wire mesh (Two nos. glazed & one no. wire mesh panels) made of frame 92 x 44 mm & sash 32 x 60 mm both having wall thickness of $1.9 \pm 0.2$ mm and single glazing bead of appropriate dimension (Area of window upto 1.75 sqm).	sqm	6880.00
	9.197.3	Two track two panels sliding window made of (big series)	Two track two panels sliding window made of frame 67 x 50 mm & sash 46 x 62 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension (Area of window above 1.75 sqm upto 2.50 sqm).	sqm	5134.00
	9.197.4	Three track three panels sliding window with fly proof S.S wire mesh (big series)	Three track three panels sliding window with fly proof S.S wire mesh (Two nos. glazed & one no. wire mesh panels) made of frame 116 x 45 mm & sash 46 x 62 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead/double glazing bead of appropriate dimension. (Area of window above 1.75 sqm).	sqm	6371.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.197.5	Three track three panels sliding window made of (big series)	Three track three panels sliding window made of frame 116 x 45 mm & sash 46 x 62 mm both having wall thickness of 2.3 ± 0.2 mm and single glazing bead / double glazing bead of appropriate dimension. (Area of window above 1.75 sqm)	sqm	5913.00
9.198		UPVC white colour sliding glazed window	<p>Providing and fixing factory made UPVC white colour sliding glazed window above 1.50 m in height dimension comprising of UPVC multi-chambered frame with in-built roller track and sash extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanized mild steel section made from roll forming process of required length (shape &amp; size according to UPVC profile), appropriate dimension of UPVC extruded glazing beads, UPVC extruded interlocks and UPVC extruded Inline sash adaptor (if required), EPDM gasket, wool pile, zinc alloy (white powder coated) handle on one side of extreme panel along with zinc plated mild steel multi point locking having transmission gear with keeps, zinc alloy (white powder coated) touch lock with hook (if required for wire mesh panel), stainless steel (SS 304 grade) body with adjustable double nylon rollers (weight bearing capacity to be 120 kg), G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws etc. Profile of frame &amp; sash shall be mitred cut and fusion welded at all corners. Including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealent over backer rod of required size and of approved quality, all complete as per approved drawing &amp; direction of Engineer-in-Charge. (Single / double glass panes, wire mesh and silicon sealent shall be paid separately).</p> <p><b>Note:</b> - For UPVC frame, sash and mullion extruded profiles minus 5% tolerance in dimension i.e. in depth &amp; width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.198.1	Two track two panels sliding window made of (big series)	Two track two panels sliding window made of frame 67 x 50 mm & sash 46 x 62 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of window above 2.50 sqm upto 4.00 sqm).	sqm	4332.00
	9.198.2	Two track four panels sliding window made of (big series)	Two track four panels sliding window made of frame 67 x 50 mm & sash 46 x 62 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of window above 4.00 sqm upto 8.00 sqm).	sqm	3532.00
9.199		UPVC white colour sliding glazed door	Providing and fixing factory made UPVC white colour sliding glazed door comprising of UPVC multi-chambered frame with in-built roller track and sash extruded profiles duly reinforced with $1.60 \pm 0.2$ mm thick galvanized mild steel section made from roll forming process of required length (shape & size according to UPVC profile), appropriate dimension UPVC extruded glazing beads, UPVC extruded interlock and UPVC extruded Inline sash adaptor (if required), EPDM gasket, wool pile, zinc alloy (white powder coated) handle with key on one side of extreme panels along with zinc plated mild steel multi point locking having transmission gear with keeps, zinc alloy (white powder coated) crescent lock (if required), stainless steel (SS 304 grade) body with adjustable double nylon rollers (weight bearing capacity to be 120 kg), G.I fasteners 100 x 8 mm size for fixing frame to finished wall and necessary stainless steel screws etc. Profile of frame & sash shall be mitred cut and fusion welded at all corners, including drilling of holes for fixing hardware's and drainage of water etc. After fixing frame the gap between frame and adjacent finished wall shall be filled with weather proof silicon sealant over backer rod of required size and of approved quality, all complete as per approved drawing & direction of Engineer-in-Charge. (Single / double glass panes,		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			wire mesh and silicon sealant shall be paid separately).  <b>Note:</b> - For UPVC frame and sash extruded profiles minus 5% tolerance indimension i.e. in depth & width of profile shall be acceptable. Variation in profile dimension in higher side shall be accepted but no extra payment on this account shall be made.		
	9.199.1	Two track two panels sliding door made of (big series)	Two track two panels sliding door made of frame 67 x 50 mm & sash 46 x 82 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of door above 2.00 sqm upto 10.00 sqm).	sqm	3676.00
	9.199.2	Two track four panels sliding door made of (big series)	Two track four panels sliding door made of frame 67 x 50 mm & sash 46 x 82 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of door above 8.00 sqm upto 10.00 sqm).	sqm	3810.00
	9.199.3	Three track three panels sliding door made of (big series)	Three track three panels sliding door made of frame 116 x 45 mm & sash 46 x 82 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of door above 5.00 sqm)	sqm	4361.00
	9.199.4	Three track three panels sliding door with fly proof S.S wire mesh	Three track three panels sliding door with fly proof S.S wire mesh (Two nos. glazed & one no. wire mesh panels) made of frame 116 x 45 mm & sash 46 x 82 mm both having wall thickness of $2.3 \pm 0.2$ mm and single glazing bead / double glazing bead of appropriate dimension. (Area of door above 2.00 sqm upto 5.00 sqm)	sqm	5617.00
9.200		Door shutter solid panel pre-laminated PVC	Providing and fixing 30mm thick factory made solid panel pre-laminated PVC internal door shutter consisting of frame made out of M.S. tubes of 19 gauge thickness and size of 40mm x 20mm for	sqm	3908.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			styles top, lock and bottom rails. M.S. frame shall have a coat of steel primers of approved make and manufacture.		
			M.S. frame shall be covered with 5mm thick prelaminated heat moulded PVC 'C' channel of size 30mmx100mm forming stiles and 5mm thick prelaminated 125mm wide PVC sheets for top rail, lock rail and bottom rail on either side of panel and 15mm (5mmx3) thick, 20mm wide cross PVC sheet as gap insert for top and bottom rail. Panelling of 10mm thick prelaminated PVC sheet to be fitted in the M.S. Frame welded/sealed to the stiles and rails with 30mm wideX5mm thick prelaminated PVC sheet beading on either side and additional 30mm wide PVC beading as gap insert below top and bottom rail joined together using solvent cement adhesive. An additional 5mm thick Prelaminated PVC strip of 20mm width is to be stuck on the interior side of the 'C' channel using PVC solvent cement adhesive etc. complete as per direction of Engineer-in-charge. Manufacturer's specification and drawing. 30 mm thick pre laminated PVC door shutters.		
9.201		Factory made integral PVC flush door shutter	Providing and fixing factory made integral PVC flush door shutter made from rigid PVC foam sheet (Single Extruded) with density not less than 600 kg/cum, conforming to IS: 2380 part 14 for screw holding strength with Celluka finish surfaces on both sides at the manufacturing process itself, manufactured by an ISO : 9001 -2000 certified company.		
	9.201.1	24 to 25 mm	24 to 25 mm thick plain solid PVC flush door shutter	sqm	2250.00
	9.201.2	28 to 30 mm	28 to 30 mm thick plain solid PVC flush door shutter	sqm	3229.00
9.202		Laminated solid PVC flush door co-extruded	Providing and fixing factory made pre laminated solid PVC flush door shutters 28 to 30 mm thick made from co-extruded		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		three layer rigid PVC foam sheet	three layer rigid PVC foam sheet with density not less than 600 kg/cum, conforming to IS: 2380 part 14, for screw		
			holding strength and outer layers laminated on both sides by laminated sheet with density not less than 1400 kg/cum, lamination shall be at the manufacturing process itself and manufactured by an ISO: 9001-2000 certified company.		
	9.202.1	1mm thick lamination	1mm thick laminated sheet	sqm	3693.00
	9.202.2	0.12 mm thick lamination	0.12 mm thick laminated sheet	sqm	3461.00
9.203		Laminated flush door shutters core of block board construction frame of finger jointed 1 <sup>st</sup> class hard wood	Providing and fixing ISI marked factory made flush door shutters conforming to IS: 2202(Part-I) laminated type, core of block board construction with kiln seasoned and chemically treated 2nd class hard wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1st class hard wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Block board shall be provided with well matched 3mm thick commercial 3ply veneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed 2 <sup>nd</sup> class teakwood internal lipping battens fixed in jointed 2nd class teakwood internal lipping (battens) fixed in factory by using pneumatic gun, of depth not less than 25 mm on all edges of shutters. Spacing of finger joints in wood as above shall not be less than 50cm. Both surfaces of shutters to be provided with 1.00 mm thick decorative high pressure laminated sheet on plain/ wood grain in gloss/matt/suede finish with high density protective surface. Adhesive on reverse side of lamination sheet shall be as per IS: 2046 type S of approved (opening) within frame of door/cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			product and conformity with IS: 2202. The rate shall be inclusive of all material and labour complete and as per specification and direction of Engineer-in-Charge.		
	9.203.1	35mm 4 hinges	35mm thick including 4 nos. 100mm long, ISI marked heavy weight (2.5mm thick) Stainless steel butt hinges with necessary screws.	sqm	3339.00
	9.203.2	35mm 3 hinges	35mm thick including 3 nos. 100mm long, ISI marked heavy weight (2.5mm thick) Stainless steel butt hinges with necessary screws.	sqm	3171.00
	9.203.3	25mm 3 hinges (cupboard)	25mm thick (for cupboard) including 3 nos. 75mm long, ISI marked heavy weight (2.5mm thick) nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	3005.00
9.204		Flush door non decorative type, core of block board frame of finger jointed 1st class hard wood	Providing and fixing ISI marked factory made flush door shutters conforming to IS: 2202(Part-I) non decorative type, core of block board construction with kiln seasoned and chemically treated 2nd class hard wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1st class hard wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Block board shall be provided with well matched 3mm thick commercial 3ply veneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed 2 <sup>nd</sup> class teak wood external lipping (battens) fixed in factory by using pneumatic gun, of depth not less than 25 mm on all edges of shutters including all material and labour complete as per specification and direction of engineer-in-charge. Spacing of finger joints in wood as above shall not be less than 50cm. Each shutter shall be factory made to the exact opening size within frame of doors/cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of product and conformity with IS:2202.		
	9.204.1	35mm	35mm thick including 4 nos. 100mm long, ISI marked heavy weight (2.5mm thick) Stainless steel butt hinges with necessary.	sqm	1953.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.204.2	30mm	30mm thick including 3 nos. 100mm long, ISI marked heavy weight (2.5mm thick) Stainless steel butt hinges with necessary screws.	sqm	1772.00
	9.204.3	25mm	25mm thick including 3 nos. 100mm long, ISI marked heavy weight (2.5mm thick) Stainless steel butt hinges with necessary screws.	sqm	1532.00
9.205		Deduct for not providing 2nd class teak wood atten lipping	Deduct for not providing 2 <sup>nd</sup> class teak wood batten lipping in factory made shutters i.e. item no 9.203 and 9.204.	sqm	401.00
9.206		Acrylic solid surface	Providing & fixing acrylic solid surface in thickness 4/6/12 mm of approved colour made out of non-porous surfacing material homogeneously composed of $\pm$ 1/3 acrylic resin (also known as PolyMethyl Methacrylate -PMMA), and $\pm$ 2/3 Aluminium Trihydrate (ATH). The sheet size should be 2.44 mts X 0.76 mts. The material should have been manufactured by using high-tech and computerized controlled processes divided into various units such as mixing of raw materials, casting process on 4th generation steel belt (double belt) production technology with online quality testing process. The material should conform to National Science Foundation (NSF), Society General Surveillance (SGS), Green Guard, Korea Testing & Research Institute (KTRI), Central Institute of plastics Engineering &v FCWS) norms. The installation should be done as per the Standard Operating Procedure (SOP) & finished installation should be supported with conformation card issued by the company Technology (CIPET) teng standard and Fabricatrion Components Warranty System (with installation photographs. Suggested base substrates are water proof plywood of minimum 10-12 mm thickness, finished kota stone, fully levelled plastered wall or any hard Substrate which prevents water & moisture seepage through it. Cost of substrate to be paid seperatly. The solid surface sheet should be applied on the substrate with natural silicon sealant, water clear polyurethane sealant, PVC fixit, or other material depending upon application / usage of solid surface sheet.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			Final finish must be obtained as per FCWS process and norms. Thermoforming (banding) process must be as per standard FCWS guidelines and fabrication manual. The joint / groove between sheets should be filled with "Solid Surface Adhesive" with same shade of sheet, manufactured by the same manufacturer. NO extra shall be paid for joint adhesive, silicon or related accessories and for transportation. Item should cover 5 years, commercial warranty of product as per FCWS norms. The product should be UV protected for exterior applications & LGA hyginene tested anti bacterial for health care application areas. Area of application are Table Tops, Exterior facade cladding, health care areas like modular operation theater hospital scrubs, wash basins, partition & paneling, laboratory commercial show room, hotels, office & residential areas.		
	9.205.1	Snow white	Acrylic Solid Surface sheet – Glacier white designer white		
	9.206.1.1	6.0 mm	6 mm thick sheet	sqm	5920.00
	9.206.1.2	12.0 mm	12 mm thick sheet	sqm	7212.00
	9.206.2	Any Solid colours	Acrylic Solid Surface sheet - Any Solid colours/Hospital use Medi Blue		
	9.206.2.1	6.0 mm	6 mm thick sheet	sqm	6512.00
	9.206.2.2	12.0 mm	12 mm thick sheet	sqm	8826.00
	9.206.3	Any Solid colours	Acrylic Solid Surface sheet - Any other		
	9.206.3.1	6.0 mm	6 mm thick sheet	sqm	7550.00
	9.206.3.2	12.0 mm	12 mm thick sheet	sqm	9960.00
9.207		Wall cladding/ façade with 8 mm thick decorative non asbestos	Providing and fixing of 8 mm thick non asbestos multipurpose board reinforced with cellulose fibers for wall cladding will consist of following operations: 1. Fixing of a layer of 6mm Moisture/fire Resistance Heavy Duty fibre cement Boards (High Pressure Steam Cured) Type	sqm	1769.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		fiber cement board	<p>A,Category 4 conforming to IS 14862:2000, fixed over steel framework of Aluminium/GI section/MS Section.The Aluminium section /GI section/MS Section of minimum SHS 50mm x 25mm x 2.6mm thick.the Main vertical members are placed @ 610mm c/c and secured to the existing wall, floor and soffit with the help of MS/Aluminium cleat fixed @ 610mm c/c vertically.The main member should be fixed horizontally @ 1220mm c/c. with the help of 25mm self drilling, self tapping Fibre Cement Screws.</p> <p>2. Fixing of 8mm thick pre-painted, self-embossed, reinforced cement board Type B,Category 3 conforming to IS 14862:2000 , of size 3000 mm x 150mm in overlap (maximum 25 mm) or groove manner (the grooves are to be sealed with any exterior grade sealant) over above mentioned 6 mm heavy duty fibre cement board with the help of 25mm self drilling, self tapping Fibre Cement screws @ 300mm c/c. All external corners are to be protected with the use of suitable corner profile of GI or PVC. All above operation is to be done in order and as directed by Engineer-in-Charge. (frame work to be paid separately).</p>		
9.208		HDF veneer decorative pine wood flush door:	<p>Providing and fixing IS marked factory made veneer High Density Fibre (HDF) flush door shutters conformity to IS: 15380(2003), eco-friendly, termiteresistant, borer free, anti warping phenol formaldehyde (PF), decorative designe moulded or plain construction with kiln seasoned chemically treated 1<sup>st</sup> class pine wood frame 65 mm style rails, top rail, bottom rail and 125 mm for lock rail, particle board shall be used as a core material between the style and rail 3mm thick HDF ply fixed on face and at back side in facing using PF ply pasting glue, having density between 1000-1200 Kg/m<sup>3</sup>. Each shutter shall be factory made to the</p>		

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			exact opening size within frame of door/capboards and shall be stamped & hologramed Test report by the manufacturer displaying name and batch number of product and conformity with IS:15380(2003) shall be produced. The rate shall be inclusive of all material and labour complete as per specifications and direction of engineer-in-charge. Material supply company' gujcon, century, green shall be registered by Bureau of Indian Standards, Member of Indian GreenBuilding Council, ISO 9001, ISO 14001 (Environment management system), National small industries corporation(NSIC), SME Rating Agency of Indian Ltd.(SMERA), Dun and Bradstreet (D&B).		
	9.208.1	35 mm	35 mm thick including 4 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3366.00
	9.208.2	30 mm	30 mm thick including 3 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3268.00
	9.208.3	25 mm	25 mm thick ISI marked heavy weight nickel plated bright finished M.S. piano hinges with screws.	sqm	3056.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
9.209		HDF non decorative pine wood flush door with primer	Providing and fixing IS marked factory made veneer High Density Fibre (HDF) flush door shutters conformity to IS:15380(2003), eco-friendly, termite resistant borer free, anti warping phenol formaldehyde (PF), non decorative design moulded or plain construction with kiln seasoned chemically treated 1 <sup>st</sup> class pine wood frame 65 mm style rails, top rail, bottom rail and 125 mm for lock rail, particle board shall be used as a core material between the style and rail 3mm thick HDF ply fixed on face and at back side in facing using PF ply pasting glue, having density between 1000-1200 Kg/m <sup>3</sup> . Each shutter shall be factory made to the exact opening size within frame of door and shall be stamped & hologramed and Test report by the manufacturer displaying name and batch number of product and conformity with IS:15380(2003) shall be reproduced. The rate shall be inclusive of all material and labor complete as per specifications and direction of engineer-in-charge. Material supply company shall be registered by Bureau of Indian Standards, Member of Indian Green Building Council, ISO 9001, ISO 14001 (Environment management system), National small industries corporation (NSIC), SME Rating Agency of Indian Ltd. (SMERA), Dun and Bradstreet (D&B).		
	9.209.1	35 mm	35 mm thick including 4 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	2175.00
	9.209.2	30 mm	30 mm thick including 3 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws	sqm	2075.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.209.3	25 mm	25 mm thick ISI marked heavy weight nickel plated bright finished M.S. piano hinges with screws.	sqm	1975.00
9.210		HDF non decorative pine wood panel door with glass/wire mesh and primer	Providing and fixing IS marked factory made High Density Fibre (HDF) flush door shutters conformity to IS:15380(2003), eco-friendly, termite resistant borer free, anti warping phenol formaldehyde (PF), 2 and 4 Panel designe moulded or plain construction with kiln seasoned chemically treated 1 <sup>st</sup> class pine wood frame 100 mm style rails, top rail, bottom rail and 125 mm for lock rail, particle board shall be used as a core material between the style and rail 3mm thick HDF ply fixed on face and at back side in facing using PF ply pasting glue, having density between 1000-1200 Kg/m <sup>3</sup> . SS grade 304 wire gouge dia 0.5mm and average width of aperture 1.4mm in both directions for door. Each shutter shall be factory made to the exact opening size within frame of door and shall be stamped & hologramed Test report by the manufacturer displaying name and batch number of product and conformity with IS:15380(2003) shall be produced. The rate shall be inclusive of all material and labour complete as per specifications and direction of engineer-in-charge. Material supply company shall be registered by Bureau of Indian Standards, Member of Indian Green Building Council, ISO 9001, ISO 14001 (Environment management system), National small industries corporation(NSIC), SME Rating Agency of Indian Ltd.(SMERA), Dun and Bradstreet (D&B).		
	9.210.1	35 mm	35 mm thick including 4 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3789.00
	9.210.2	30 mm	30 mm thick including 3 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3643.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.211		HDF decorative pre-laminated pipe wood door glass / wiremesh	HDF decorative pre-laminated pine wood panel door with glass / wiremesh:- Providing and fixing IS marked factory made veneer High Density Fibre (HDF) flush door shutters conformity to IS:15380(2003), eco-friendly, termite resistant borer free, anti warping phenol formaldehyde (PF), decorative designe moulded or plain construction with kiln seasoned chemically treated 1 <sup>st</sup> class pine wood frame 100 mm style rails, top rail, bottom rail and 125 mm for lock rail, particle board shall be used as a core material between the style and rail 3mm thick HDF ply fixed on face and at back side in facing using PF ply pasting glue, having density between 1000-1200 Kg/m <sup>3</sup> complete without any coating on finish product. Each shutter shall be factory made to the exact opening size within frame of door and shall be stamped & hologramed and Test report by the manufacturer displaying name batch number of product and conformity with IS:15380(2003) shall be produced. The rate shall be inclusive of all material and labour complete as per specifications and direction of engineer-in-charge. Material supply company shall be registered by Bureau of Indian Standards, Member of Indian Green Building Council, ISO 9001, ISO 14001 (Environment management system), National small industries corporation(NSIC), SME Rating Agency of Indian Ltd.(SMERA), Dun and Bradstreet (D&B).		
	9.211.1	35 mm	35 mm thick including 4 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	4483.00
	9.211.2	30 mm	30 mm thick including 3 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	4269.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.212		HDF decorative pre-laminated pipe wood decorative flush door	Providing and fixing IS marked factory made veneer High Density Fibre (HDF) flush door shutters conformity to IS:15380(2003), eco-friendly, termite resistant borer free, anti warping phenol formaldehyde (PF), decorative design moulded or plain construction with kiln seasoned chemically treated 1 <sup>st</sup> class pine wood frame 65 mm style rails, top rail, bottom rail and 125 mm for lock rail, particle board shall be used as a core material between the style and rail 3mm thick HDF ply fixed on face and at back side in facing using PF ply pasting glue, having density between 1000-1200 Kg/m <sup>3</sup> complete without any coating on finish product. Each shutter shall be factory made to the exact opening size within frame of door and shall be stamped & hologramed Test report by the manufacturer displaying name and batch number of product and conformity with IS:15380(2003) shall be produced. The rate shall be inclusive of all material and labour complete as per specifications and direction of engineer-in-charge. Material supply company shall be registered by Bureau of Indian Standards, Member of Indian Green Building Council, ISO 9001, ISO 14001 (Environment management system), National small industries corporation(NSIC), SME Rating Agency of Indian Ltd.(SMERA), Dun and Bradstreet (D&B).		
	9.212.1	35 mm	35 mm thick including 4 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	4350.00
	9.212.2	32 mm	32 mm thick including 3 nos 100 mm long ISI marked heavy weight (2.5 mm thick) Stainless Steel butt hinges with necessary screws.	sqm	4150.00
	9.212.3	25 mm	25 mm thick ISI marked heavy weight nickel plated bright finished M.S. piano hinges with screws.	sqm	3950.00
9.213		Non decorative	Non Decorative Pine Wood Flush Door:- Providing and fixing ISI marked factory		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		pine wood flush door	made flush door shutters conforming to IS: 2202 (Part I) non decorative type, core of block board construction with kiln seasoned and chemically treated 1 <sup>st</sup> class pine wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1st class pine wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Blockboard shall be provided with well matched 3mm thick commercial 3 ply veneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed all material and labour complete as per specification and direction of engineer-in-charge. Spacing of finger joints in wood as above shall not be less than 50 cm. Each shutter shall be factory made to the exact opening size within frame of doors/ cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of product and conformity with IS:2202.		
	9.213.1	35 mm	35 mm thick including 4 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	2775.00
	9.213.2	30 mm	30 mm thick including 3 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	2675.00
	9.213.3	25mm	25mm thick (for cupboard) including 3 nos. 75 mm long, ISI marked heavy weight (2.5mm thick) nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	2575.00
9.214		Laminated pine wood flush door	Providing and fixing ISI marked factory made flush door shutters conforming to IS: 2202 (Part I) laminated type, core of block board construction with kiln seasoned and chemically treated 1 <sup>st</sup> class pine wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1st class pine wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Block board shall be provided with well matched 3mm thick		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			commercial 3 ply veneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed. Spacing of finger joints in wood as above shall not be less than 50 cm. Both surfaces of shutters to be provided with 1.00mm thick decorative high pressure laminated sheet on plain/wood grain in gloss/matt/suede finish with high density protective surface layer of make thereby not requiring polish, putty or painting work. Adhesive on reverse side of lamination sheet shall be as per IS: 2046 type S of approved quality. Each shutter shall be factory made to the exact size (opening) within frame of doors/cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of product and conformity with IS:2202. The rate shall be inclusive of all material and labour complete and as per specification and direction of engineer-in-charge.		
	9.214.1	35 mm	35 mm thick including 4 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	2775.00
	9.214.2	30mm	30 mm thick including 3 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	2675.00
	9.214.3	25mm	25mm thick (for cupboard) including 3 nos. 75 mm long, ISI marked heavy weight (2.5mm thick) nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	2575.00
9.215		Laminated pine wood flush door	Providing and fixing ISI marked factory made flush door shutters conforming to IS: 2202 (Part I) laminated type, core of block board construction with kiln seasoned and chemically treated 1 <sup>st</sup> class pine wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1 <sup>st</sup> class pine wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Block board shall be provided with well matched 3mm thick commercial 3 ply veneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed. Spacing of finger joints in wood as above shall not be less than 50 cm. Both surfaces of shutters to be provided with 1.00mm thick decorative high pressure laminated sheet on plain/wood grain		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			in gloss/matt/suede finish with high density protective surface layer thereby not requiring polish, putty or painting work. Adhesive on reverse side of lamination sheet shall be as per IS: 2046 type S of approved quality. Each shutter shall be factory made to the exact size (opening) within frame of doors/ cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of product and conformity with IS:2202. The rate shall be inclusive of all material and labour complete and as per specification and direction of engineer-in-charge.		
	9.215.1	35 mm thick	35 mm thick including 4 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3650.00
	9.215.2	30 mm thick	30 mm thick including 3 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3550.00
	9.215.3	25mm thick	25mm thick (for cupboard) including 3 nos. 75 mm long ISI marked heavy weight (2.5mm thick) nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	3450.00
9.216		Veneer decorative pine wood flash door	Providing and fixing ISI marked factory made flush door shutters conforming to IS: 2202 (Part I) veneer decorative type, core of block board construction with kiln seasoned and chemically treated 1 <sup>st</sup> class pine wood battens (strips) and frame of kiln seasoned and chemically treated, finger jointed 1st class pine wood of width not less than 65mm for style, top rail, bottom rail and 125mm for lock rail. Block board shall be provided with well matched 3mm thick commercial 3 plyveneering consisting of vertical grains, cross bands and commercial grade face veneers on both outer faces of shutters including kiln seasoned and chemically treated, finger jointed all material and labour complete as per specification and direction of engineer-in- charge. Spacing of finger joints in wood as above shall not be less than 50 cm. Each shutter shall be factory made to the exact opening size within frame of doors/ cupboards and shall be stamped by the manufacturer to display name of manufacturer, batch number of product and conformity with IS:2202.		
	9.216.1	35 mm thick	35 mm thick including 4 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3121.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	9.216.2	30 mm thick	30 mm thick including 3 nos. 100 mm long, ISI marked heavy weight (2.5mm thick) Stainless Steel butt hinges with necessary screws.	sqm	3021.00
	9.216.3	25mm thick	25mm thick (for cupboard) including 3 nos. 75 mm long, ISI marked heavy weight (2.5mm thick) nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	2921.00
9.217		UPVC kitchen cabinet frame	Providing and fixing factory made solid Foam uPVC profile for kitchen cabinet frame (45 x 20 mm) of approved shade, quality and make. The profile shall be laminated on both sides, made from rigid foam sheets (Single extruded) having density 600 Kg/cum and the exposed edges sealed with PVC edge beading of same shade and colour. The frame shall be fire retardent with necessary screw holding capacity. Frame shall be fixed to wall using Expendable Fastne with necessary stainless steel screws, all complete as per direction of Engineer-in-charge.	metre	238.00
9.218		UPVC kitchen cabinet shutter/ partition	Providing and fixing factory made Kitchen Cabinet Shutter/Partition 20 mm nominal thickness of approved shade, quality and make, made from rigid foam sheets (Single extruded) having density 600 Kg/cum and laminated on both side by laminate Sheet/PVC foil lamination. The exposed edges shall be sealed with PVC edge beading of same shade and colour. The shutter shall be fire retardent having necessary screw holding capacity. Shutter shall be fixed to frame using approved hinges with necessary stainless steel screws, all complete as per direction of Engineer-in-charge.	sqm	2742.00
9.219		Fire resistant door frame (2 hr fire rating)	Providing and fixing fire resistant door frame of section 50 x 60 mm on horizontal side & 35 x 60 mm on vertical sides having built in rebate made out of 1.6 mm thick GI sheet (Zink coating not less than 120 gm/m <sup>2</sup> ) suitable for mounting 120 min fire Rated Glazed Door Shutters. The frame shall be filled with Mineral wool insulation provision of GI. Anchor fasters 14 nos (5 each on vertical style & 4 on horizontal style of size M10 x 80) suitable for fixing in the opening along with factory made Template for ss Ball Bearing Hinges of size 100x89x3mm for fixing of fire rated glazer shutter. The frame shall be finished with a approved fire resistant primer or Powder coating of not less than 30 micron in desired shade as per the direction of Engineer-in-charge.(Coast of ss ball beating hinges is excluded).	Meter	1260.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.221		Fire resistant door frame (2 hr fire rating)	Providing and fixing non load bearing fixed frame for fire resistant glazed Partition for 120 minutes Fire Rating, made out to a profile of dimension 60mm x 70 mm of 1.6 mm thick galvanised steel sheet as per test evidence suitable for fixing fire rated glass for 120 minutes of both integrity & radiation control (EW120) & minimum 20 minutes of insulation (EI20).The profile has to be fixed to the supporting construction by means of anchor fasteners of size M10 x 80, every 150 mm from the edges and every 500 mm (approx) c/c. Linear measurement of frame shall be measured for payment. The frame shall be filled with mineral wool insulation of density min 96kg/m <sup>3</sup> . and finished with a approved fire resistant primer or Powder coating of not less than 30 micron in desired shade as per NBC 2016, IS 16231 (Part 3):2016 and directions of Engineer - in- charge.	meter	1260.00
9.222		Fire resistant door glazing (2 hr fire rating)	Providing and fixing glazing in fire resistant door shutters, fixed panels & partitions etc., with G.I. beading made out of 1.6 mm thick G.I. sheet (zinc coating not less than 120 gm/m <sup>2</sup> ) of size 20 x 33 mm screwed with M4 x 38 mm SS screws at distance 75 mm from the edges and 150 mm c/c , including applying a coat of approved fire resistant primer/powder coating of not less than 30 micron on G.I. beading, & special ceramic tape of 5 x 20 mm size etc complete in all respect as per NBC 2016, IS 16231 (Part 3):2016 and as per direction of Engineer-in-charge with glass of required thickness having 120 minutes of fire resistance both integrity & radiation control (EW120) and minimum 20 minutes of insulation (EI20). The manufacturer have to give test report/certification of fire glass and the glass should have the stamp showing the value of E, EW & EI. The glass shall be tested in approved NABL accredited lab or by any other accreditation body which operates in accordance with ISO/IEC 17011 and accredits labs as per ISO/IEC 17025 for testing and calibration scopes shall be eligible. The maximum glazing size shall not be more than 1100x2200 mm (w x h) or 2.42 sqm	sqm	28929.0
9.223		GI Metal Doors	GI Metal Doors having wooden finish through Sublimation Printing and Powder coating - Providing and fixing of Metal door with outer frame. door must have fire resistant levels from 30 minutes up to 2 hours all tested to BS 476 Part 20 & 22, IS3614 (Part 2), doorsets have	sqm	12719.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			with options for glazing if needed , fire resistant self closing louvers, single or double doorsets, configurations. Size -99x59 mm suitable section for Door made out from pressed formed G. Sheet of Thickness 1.6 (zinc coated). With necessary cut-outs of Locks(Mortise Lock )and Handle etc. 42mm Thick Sandwich Panel Door made from 1.2 mm thick G.I Sheet duly filed with honeycomb paper core 40/12 for sound absorbing and provide more strength to door shutters and fixing with necessary stainless steel ball bearing hinges. The complete shutter & frame (inside & outside) shall be wooden finish through sublimation printing or finished with powder coating of minimum 50 micron thickness. Outer Frame will be grouted on wall with Anchor fastener of Suitable Size and quantity as per Direction of Engineer Incharge .		
9.224		50 mm thick door shutter with both side 4 mm thick burma teak veneer	50 mm thick door shutter :- Providing and fixing hand made special design 50 mm thick door shutter with both side 4 mm thick burma teak veneer (ISI marked IS : 14842) with PU polish Ply and veneer Fixed by adhesive SH with complete Butt hinges and necessary screws etc .as per Architectural drawing all complete as per directions of Engineer- in-charge :	sqm	12087.00
9.225		Cement bonded particle board in wall panel	Supply and installation of termite proof, moisture/fire resistant 8mm thick cement bonded particle board conforming to IS: 14276: 1995 in wall panel on structure to form wall/partition wall on external face of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 125 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts,other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre fixed the self-drilling/tapping screws/fasteners of approved make. as per the directions of Engineer-in-Charge.	sqm	1429.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
9.226		Acoustic Sound Proof Door	Providing and fixing 85mm thick puff Sound Proof Door consisting teak wood door frame section of size 100mm x 50mm and middle section size is 125mm x 50mm. Teak Wood Frame to be coated with FR Paint. 9mm thick FR grade ply to be fixed on both size at teak wooden frame with 50mm thick resin bonded rockwool pad conforming to IS8193 Fire class A-1 as per EN 13201 of 100kg density to be fill in gap at wooden frame. For sound absorption 2mm thick sound damping layer (mass load vinyl) to be fix on inside 6mm calcium silicate board to be fixed inside the door to reduce sound transmission for acoustic insulation. 4mm thick teak veneer to be fixed as a skin on both sides finished. all edges of the panel door to be cover with 85mm wide x 10mm thick teak wood battens - D type rubber gasket Sound seal to be fixed teak wood battern for stop noise leakage complete door as performace as a Hight STC sound proof acoustic door. The door to be fixed on existing door frame with heavy duty SS hinger with ss screws. All hardware i.e door handles, door stopper and door closer etc have to be taken separately, not to be included in this item.	sqm	18036.00
9.227		Non-Woven Polyester Fibre Acoustic wall Panels	Supplying & Installation of Non-Woven 100% Polyester Fibre Acoustic wall Panels made from polyester short fibre. It is prepared by needle punching on multi folded polyester fabric sheets is lightweight and flexible along with excellent tension/compression stiffness. The panel can be easily cut into any desired shape pattern and V-Grove pattern (arranged by carding process). The final material consists of a three-dimensional network structure with breathable open cells. fixed with Rubber adhesive. Physical Properties 1. Eco-friendly 2. 100% recyclable 3. Moisture proof, Humidity Resistance 4. Flammability tested as per IS 11871 A 5. Thickness 10 mm 6. NRC: High Performance 0.60 to 0.90 7. Density 180-200kg/m <sup>3</sup>	sqm	3364.00
9.228		PVC wall panelling system	Providing & Fixing PVC ceiling system profile panel with click system interlock panel size 4000mmx340mmx1mm resistance to weather perfect finish in wood grain & solid colour maintenance free Resistance to weather truly anti bacterial. with edge profile J-trim on periphery & center profile T-trim in panel joint Complete System to be fixed on G.I. framework of ceiling section at 450 mm	sqm	3178.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			<p>distance with enter section suspended by roof by G.I. angle hanger in proper line &amp; level etc complete</p> <p><b>PRODUCT SPECIFICATIONS:</b>  Meets or exceeds the standard specification of (ASTM D-4477) and its referenced documents.  Impact resistance: No deformation observed. (Tested at 50 LBS)  Tensile strength, MPa: &gt;37.0  Tensile modulus, MPa: &gt;2000  Surface distortion: None at 120F  Squareness: &lt;1/8" of square  Length: Within 1/4" of specification  Lock control: Complies  Color Change: &lt;2 grayscales (16 hrs under 1200W/m2 UV radiation at 50 degrees)</p>		



**CHAPTER – 10.0**  
**STEEL WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	IS 63	Whiting for paints and putty
2	IS 198	Varnish gold size
3	IS 228	Structural steel (Standard quality)
4	IS 277	Specification for galvanized steel sheets (Plain and corrugated)
5	IS 800	Code of practice for use of structural steel in general in steel construction
6	IS 806	Code of practice for use of steel Tubes in general building construction
7.	IS 808	Dimensions for Hot rolled steel beams, columns, channel and angle sections
8.	IS 812	Glossary of terms relating to welding and cutting metals
9.	IS 813	Scheme of symbols for welding
10	IS 814	Covered electrodes for manual metal arc welding of carbon and carbon manganese steel
11	IS 816	Code of practice for use of metal arc welding for general construction in mild steel
12	IS 817	Code of practice for training and testing of metal arc welders
13	IS 818	Code of practice for safety and healthy requirements in electric and gas welding and cutting operations
14	IS 822	Code of procedure for inspection of welds
15	IS 823	Manual for metal arc welding in mild steel
16	IS 1038	Steel doors, windows and ventilators
17	IS 1081	Code of practice for fixing and glazing of metal (Steel and aluminium) doors, windows and ventilators
18	IS 1148	Hot rolled steel rivet bars (upto 40 mm diameters) for structural purposes
19	IS 1161	Steel tubes for structural purposes
20	IS 1182	Recommended practice for radiographic examination of fusion welded butt joints in steel plates
21	IS 1200 (Part-VIII)	Method of measurements of steel work and iron works
22	IS 1363 Part I	Hexagon head bolts, screws, and nuts of product grade C (Hexagon Head bolt)

23	IS 1363 (Part-II)	Hexagon Head Bolts, screws and nuts of product Grade 'C'
24	IS 1363 (Part-III)	Hexagon Head Bolts, screws and Nuts of product grade 'C'
25	IS 1367	Technical supply conditions for threaded steel fasteners
26	IS 1599	Method for bend test
27	IS 1608	Metallic materials - Tensile Testing at Ambient Temperature.
28	IS 1821	Dimensions for clearance holes for bolts and screws
29	IS 1852	Rolling and cutting tolerance for hot rolled steel products
30	IS 1894	Method for tensile testing of steel tubes
31	IS 1977	Structural steel (ordinary quality)
32	IS 2062	Hot Rolled low, medium and high tensile structural steel
33	IS 2074	Ready mixed paint, air drying red oxide zinc chrome priming
34	IS 4351	Specification for steel door frames
35	IS 4454 (Part-I)	Steel wires for mechanical springs. Cold drawn unalloyed steel wire.
36	IS 4711	Methods for sampling of steel pipes, tube and fittings.
37	IS 4736	Hot - dip zinc coating on mild steel tubes
38	IS 4923	Hollow Steel Sections for Structural use - Specification
39	IS 6248	Metal rolling shutters and rolling grills
40	IS 7452	Specification for hot rolled steel sections for doors, windows and ventilators.

**PREAMBLE  
STEEL WORK  
(CHAPTER: 10.0)**

**10.1 STEEL**

General requirements relating to supply of structural steel shall conform to IS 8910.

**10.2 FREE FROM DEFECTS**

All finished materials shall be well and cleanly rolled to the dimensions, sections and masses specified. The finished material shall be reasonably free from surface flaws; laminations; rough/ jagged and imperfect edges and all other harmful defects.

Minor surface defects may be removed by the manufacturer/supplier by grinding provided the thickness is not reduced locally by more than 4 percent below the minimum specified thickness. Reduction in thickness by grinding greater than 4 percent but not exceeding 7 percent may be made subject to mutual agreement between the purchaser and manufacturer/supplier

**10.3 MICRO-ALLOYING ELEMENTS**

Elements such as niobium, boron, vanadium and titanium added singly or in combination to obtain higher strength to weight ratio and better toughness, formability and weldability as compared to unalloyed steel of similar strength level.

**10.4 WELDING:**

Welding shall generally be done by electric arc process as per IS 816 and IS 823. The electric arc method is usually adopted and is economical. Where electricity for public is not available generators shall be arranged by the contractor at his own cost unless otherwise specified. Gas welding shall only be resorted to using oxyacetylene flame with specific approval of the Engineer-in-charge. Gas welding shall not be permitted for structural steel work gas welding requires heating of the members to be welded along with the welding rod and is likely to create temperature stresses in the welded members. Precautions shall therefore be taken to avoid distortion of the members due to these temperature stresses. The work shall be done as shown in the shop drawings which should clearly indicate various details of the joint to be welded, type of welds, shop and site welds as well as the types of electrodes to be used. Symbol for welding on plans and shops drawings shall be according to IS 813. As far as possible every efforts shall be made to limit the welding that must be done after the structure is erected so as to avoid the improper welding that is likely to be done due to heights and difficult positions on scaffolding etc. apart from the aspect of economy. The maximum dia of electrodes for welding work shall be as per IS 814. Joint surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter, which adversely affect the quality of weld and workmanship.

**10.5 COLLAPSIBLE STEEL GATES**

These shall be of approved manufacture and shall be fabricated from the mild steel sections.

The gates shall consist of double or single collapsible gate depending on the size of the opening. These shall consist of vertical double channels each 20 x 10 x 2 mm at 10 cm centre to centre braced with flat iron diagonals 20 x 5 mm and top and bottom rails of T- iron 40 x 40 x 6 mm @ 3.5 kg/m with 40 mm dia. ball bearings in every fourth double channel, unless otherwise specified. Wherever collapsible gate is not provided within the opening and fixed along the outer wall surface, T- iron at the top may be replaced by flat

iron 40 x 10 mm. The collapsible gate shall be provided with necessary bolts and nuts, locking arrangement, stoppers and handles. Any special fittings like spring, latches and locks, shall be so specified in the description of item where so required. The gate shall open and close smoothly and easily.

#### **10.6 M.S. SHEET SLIDING SHUTTER**

These shall be manufactured as per drawings and specification. These shall be fabricated from mild steel sheets.

The shutters shall be double or single leaf shutter as specified. The shutters shall be fabricated of specified size of M.S. angle iron frame diagonally braced with the same size of M.S. angle riveted / welded together with 3mm gusset plate at junction to form a rigid frame. M.S. sheet of 1 mm thickness or as specified shall be fixed to the frame with rivets/welds as approved by the Engineer-in-charge. These shall also be provided with top and bottom guide rails of specified size angles or T- irons and 25 mm diameter pulley or with 25 mm diameter ball bearing at the bottom and guide block with steel pulleys at the top. The shutters shall also be provided with locking arrangement, handles, stoppers, and holdfasts, other fittings as specified in the description of the item. The guide rails shall be sufficiently long and continued along the wall on both ends so that the sliding shutters can rest against the walls, giving full opening when so required.

#### **10.7 M.S. SHEET SHUTTERS**

These shall be manufactured as per drawing and specification. These shall be fabricated from mild steel sheets and angle iron.

The doors shall be provided as double leaf shutters unless otherwise specified. The shutters shall be fabricated with frame of M.S. angle 40 x40 x6 mm @ 3.5 kg/ metre and two diagonal braces of the same section unless otherwise specified. The frame shall be riveted and/ or welded at the junctions. Wherever riveting shall be done 3.15 mm (10 G) thick gusset plate shall be provided at the junction. M.S. sheet of 1 mm thickness or as specified, shall be fixed to the frame with rivets or welds as approved by the Engineer-in-charge. Alternatively the diagonal bracing may be replaced by one horizontal and two cross flats 30x6 mm unless otherwise specified. The outer frame shall be provided with cleats made of section 40 x 10 mm and bent in the shape of angle cleats with one arm 150 mm long and the other arm 50 mm long and fixed to the angle iron frame of the door with two 12 mm dia bolts and nuts. For doors upto 2.40 m height, two angles cleats per door shall be provided. The cleat shall have a vertical leg of 150 mm which shall be fixed with frame and horizontal leg of about 50 mm which shall be provided with a hole of 24 mm dia and fixed in the projected pin of the pin clamp.

#### **10.8 ROLLING SHUTTERS**

Rolling shutters shall conform to IS 6248. These shall include necessary locking arrangement and handles etc. These shall be suitable for fixing in the position as specified i.e. outside or inside on or below lintel or between jambs of the opening. The door shall be either push and pull type or operated with mechanical device supplied by the firm. Shutters upto 10 sqm. shall be of push and pull type and shutters with an area of over 10 sqm shall generally be provided with reduction gear operated by mechanical device with chain or handle, if bearings are specified for each of operation, these shall be paid for separately.

## 10.9 GLAZING

### 10.9.1 Glass Panes:-

The glass panes shall have square corners and straight edges. The glass panes shall be so cut that it fits slightly loose in the frames. In doors, windows and clerestory windows of bath, WC and lavatories frosted glass panes shall be used which shall weight not less than 10.00 kg/m<sup>2</sup>. Glazing shall be provided on the outside of the frame unless otherwise specified. Putty of approved make conforming to IS 419 shall be used for fixing glass panes.

### 10.9.2 Putty

Putty shall be applied between glass panes and glazing bars. Putty shall then be applied over the glass pane, which shall stop 2 to 3 mm from the sight line of the back rebate to enable the painting to be done upto the sight line to seal the edge of the putty to the glass. The oozed out putty shall be cleaned and from putty cut to straight line. Quantity of putty shall not be less than 185 gm/metre of glass perimetre. Putty shall be painted within 2 to 3 weeks, after glazing is fixed to avoid its cracking.

### 10.9.3 Glazing clips

Four glazing clips may be provided per glass pane for a size larger than 30x60 cm for all types, where the glass panes size exceed 80x200 cm, 6 glazing clips shall be used. In case of doors, windows and ventilators without horizontal glazing bars, the glazing clips may be spaced according to the slots, in the vertical members provided the spacing does not exceed 30 cm otherwise the spacing shall be 30 cm. Where large size glass panes are required to be used or where the door or window is located in heavily exposed situation, holes for glazing clips have to be drilled prior to fabrication and cannot be done at any later stages. Use of glazing clips shall be specified while placing the order.

### 10.9.4 Beading

Where specially stipulated, fixing of glass panes may be done with metal or wooden beading instead of mere putty. Where beading are proposed to be used, the manufacturers shall be intimated in advance to drill holes for hard screws. Usually beads shall be fixed with screws spaced not more than 10 cm from each corner and the intermediate not more than 20 cm apart. When glass panes are fixed with wooden or metal beading having mitred joints, a thin layer of putty shall be applied between glass panes and sash bars and also between glass panes and the beading. Size of M.S. beading shall be 10 x 10 mm box section manufactured from 1.6 mm thick sheet unless otherwise specified in the item. Where metal beading is specified, extra payment shall be made on this account.

## 10.10 PRESSED STEEL DOOR FRAMES

### 10.10.1 Material

Steel door frames profile shall be manufactured from commercial mild steel sheet of specified thickness, (1.6 mm or 1.25mm) conforming to IS 2062 and 4351. Steel door frames with or without fan light shall be made in the profiles which may be manufactured to suit doors of either type opening inwards or outwards as directed by the Engineer-in- Charge.

### 10.10.2 Construction

Each door frame shall consist of hinge jamb, lock jamb, head and if required angle threshold. These shall be welded or rigidly fixed together by mechanical means. Where no angle threshold is required, temporary base tie shall be screwed to the feet of frames in order to form a rigid unit. Where so specified base ties shall be of pressed mild steel 1.25 mm thick adjustable to suit floor thickness of 35 or 40 mm and removable, or alternatively, threshold of mild steel angle of section 50x25 mm, minimum shall be provided for external doors frames.

**Fixing Lugs:** There shall be three adjustable lugs with split end tail to each jamb without fan light, and four for jamb with fan light. The head of the fixing lug shall be of one of the following lengths:

- (i) 98 mm long for use with profile A
- (ii) 120 mm long for use with profile B
- (iii) 160 mm long for use with profile C

The head shall be made from flat steel strip 25 mm wide and not less than 1.60 mm thick the tail of the lugs shall be 200mm long and shall be made of steel strip not less than 40 mm wide and not less than 1 mm thick.

### 10.10.3 Hinges:

100 mm mild steel butt hinges shall be used. For door frames 80 cm wide and under, three hinges shall be rigidly fixed to one jamb and for door frames above 80 cm wide, four hinges shall rigidly fixed to one jamb, if it is single shutter, where the height of door shutter exceeds 2.15 metres, one additional hinge shall be provided for every 0.5 m or part thereof the additional height. In all cases the hinges shall be so fixed that the distance from the inside of the head rebate to the top of the upper hinge is 20 cm and the distance from the bottom of the door frame to the bottom of the bottom hinge is also kept about 200 mm. The middle hinges shall be at equal distances from lower and upper hinges or as agreed to between the purchaser and the supplier. Hinges shall be made of steel 2.5 mm thick with zinc coated removable pin of 6 mm diameter. The space between the two leaves of the hinge when closed shall be 3 mm and the leaf that is not welded to the frame shall have four counter sunk holes to take No. 10 cross recessed head wood screws.

**Mortar Guards:** Mortar guards of thickness of main frame sheet shall be provided in accordance to provisions of IS 4351 and as instructed by Engineer-in-charge shall be provided. These shall be welded to the frame at the head of the frame for double shutter doors to make provision for bolts. These shall also be provided to the frame behind the hinges, mortice locks and latches, slots, aldop and sliding /tower bolts.

**Lock – Strike Plate:** There shall be an adjustable lock- strike plate of steel complete with mortar guard to make provision for locks or latches complying with the relevant Indian Standards. (IS 4351) Lock-strike plates shall be of galvanized mild steel and fixed at 95 cm from the head of the frame.

**Shock Absorbers:** For side hung door there shall not be less than three buffers or rubber or other suitable material inserted in holes in the rebate. One shall be located at the centre of the lock jamb and the other two shall be at 30 cm. from top and bottom of the frame. For double leaf shutter door, two buffers shall be provided.

### 10.10.4 Finishing

The surface of door frame shall be thoroughly cleaned, free of rust, mill-scale dirt oil etc. either by mechanical means, for example sand or shot blasting or by chemical means such as pickling. After pretreatment of the surface one coat of approved primer i.e. red oxide zinc chrome primer conforming to IS 2074. Two coats of paints as directed by the Engineer-in-charge shall be applied to the exposed surface.

### 10.10.5 Fixing

Frames shall be fixed up right in plumb and plane. To avoid sag or bow in width during fixing or during construction phase, temporary struts across the width preventing sides bulging inwards may be provided. Wall shall be built solid on each side and grouted at each course to ensure solid contact with frame leaving no voids behind the frame. Three lugs shall be provided on each jamb with spacing not more than 75 cm. The temporary struts should not be removed till the masonry behind the frame is set. In case screwed base tie is provided, this should be left in position till the flooring is laid when it can be removed. After pretreatment of the surface, one coat of steel primer and two coats, of paint, as directed by Engineer-in-charge shall be applied to the exposed surface.

## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
Steel if arranged by the contractor	10.1.1	(a) Tensile strength (b) Bend test	Laboratory	IS 1599	20 tonne	Every 20 tonne or part thereof
Steel tubular pipes	10.13	(a) Tensile Test (b) Bend Test (c) Flattening Test	Laboratory	IS 1608 IS 2329 IS 2328	Every 8 tonne or part thereof	Every 8 tonne or part thereof

### GALVANISED STEEL SHEETS

#### Dimensions

- 1) Sizes of plain Sheet: The plain sheets shall be supplied in any combination of the following lengths, widths and thickness.
  - (a) Length: 2500 and 3000 mm
  - (b) Width: 900 and 1000 mm
  - (c) Thickness: 0.50, 0.63, 0.80, 1.00 mm
- 2) In case of sheets supplied in coil, the internal diameter of coil shall be 450, 510 and 610 mm  
And the mass of each coil shall not exceed 12 tonne.
- 3) Coils weighing more than 12 tonnes may be supplied subject to mutual agreement between the contracting parties.
- 4) Corrugated sheets.
- 5) Length- The length of the corrugated sheets shall be as follows: 2500, 3000 mm

#### Zinc Coating

The weight of coating referred to in this specification shall represent the total weight of zinc both side inclusive. On any sample selected at random from the delivery, one set of three samples each 50 x 50 mm or 50 mm diameter shall be selected at random from one sheet for every 500 G.S. sheets, the coating for the different classes shall be within the limit specified in table below:



**TABLE 10.1**  
**Mass of Coating (Total Both Sides)**

Grade of coating	Minimum average coating Triple spot test g/sqm	Minimum coating single spot test g/sqm*
600	600	510
450	450	380
350	350	300
275	275	235

\* Minimum individual value obtained in triple spot test.

### Mass

The mass of sheets and coils shall be calculated as given in Table II on the basis of nominal dimensions and mass of zinc coating.

**TABLE 10.2**  
**Calculation of Mass of Sheets or Coils**

Type of materials	Order of calculation	Method of calculation	Number of Numerals in
Sheet	Mass of single sheet	Nominal mass of single sheet plus mass of zinc coating	Rounded off to 4 effective Figures
	Total mass	Mass of single sheet (kg) x number of sheets	Rounded off to integral value of kg
Coil	Unit mass of coil	Unit mass of sheet (kg/m <sup>2</sup> )x width (mm) x10 <sup>-3</sup>	Rounded off to 3 effective Figures
	Mass of single coil	Unit mass of coil (kg/m)x length (m)	
	Total mass (kg)	Total mass of each coil	Integral number of kg

### Note:

(i) Nominal mass of single sheet shall be calculated by calculating the volume of the sheet and multiplying the same with density of sheet (density 7.85 g/ cubic cm) and rounding the same to 4 effective figures.

(i) Mass of the coating shall be calculated by multiplying the surface area of single sheet with indicated nominal coating mass (gm/square metre) as shown for triple spot test (Table I).

(i) For calculation of corrugated sheet mass, the width before corrugation shall be considered while calculating the area.

### Corrugations

The depth and pitch of corrugation shall be as follows:

**TABLE 10.3**  
**Dimensions of Corrugations**

<b>Grade</b>	<b>Depth of Corrugation (mm)</b>	<b>Pitch of Corrugation (mm)</b>
A	17.5	75
B	12.5	75

The number of corrugations shall be 8, 10, 11 or 13 per sheet. The overall width of the sheets before and after corrugation shall be as given in Table below.

**TABLE 10.4**  
**Details of Corrugations**

<b>Number of Corrugations</b>	<b>Grade</b>	<b>Nominal overall width of sheet measured between crowns of outside corrugations</b>	
		<b>Before corrugation mm</b>	<b>After corrugation mm</b>
8	A	750	660
10	A	900	810
11	A	1000	910
13	A	1200	1110
8	B	750	680
10	B	900	830
11	B	1000	930
13	B	1200	1130

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.1		Structural steel work single section	Structural steel work in single section fixed with or without connecting plate including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	kg	71.00
10.2		Structural steel work built up sections	Structural steel work using M.S. flats, angles, channels I-section, H-section etc. riveted, bolted or welded in built up sections, trusses and framed work, including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer all complete.	kg	69.00
10.3		Collapsible steel shutters	Providing and fixing in position collapsible steel shutters with vertical channels 20x10x2mm and braced with flat iron diagonals 20x5mm size with top and bottom rail of T-iron 40x40x6mm with 40mm dia steel pulleys complete with bolts, nuts, locking arrangement, stoppers, handles, including applying a priming coat of approved steel primer. Rate includes recess cutting in floor and making good the same wherever required.	sqm	4132.00
10.4		M.S. sheet sliding-shutters	Providing and fixing 1mm thick M.S. sheet sliding-shutters with frame and diagonal braces of 40x40x6mm angle iron, 3mm M.S.gusset plates at the junction and corners 25mm dia pulley,40x40x6mm angle and T-iron guide at the top and bottom respectively including applying a priming coat of approved steel primer.	sqm	3155.00
10.5		M.S. sheet door and angle iron frame	Providing and fixing 1mm thick M.S. sheet door with frame of 40x40x5mm angle iron and 3mm M.S. gusset plates at the junctions and corners, all necessary fittings complete, including applying a priming coat of approved steel primer.		
	10.5.1	With angles braces	Using M.S. angels 40x40x6mm for diagonal braces	sqm	2604.00
	10.5.2	With flats braces	Using flats 30x6mm for diagonal braces and central cross piece.	sqm	2474.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.6		M.S.rolling shutters	Supplying and fixing rolling shutters of approved make, made of required size M.S. laths interlocked together through their entire length and jointed together at the end by end locks mounted on specially designed pipe shaft with brackets, side guides and arrangements for inside and outside locking with push and pull operation complete including the cost of providing and fixing necessary 27.5cm long wire springs manufactured from high tensile steel wire of adequate strength conforming to I.S. 4454- part-1 and M.S. top cover of required thickness for rolling shutters.		
	10.6.1	1.25 mm thick top cover	80x1.25mm M.S. laths with 1.25 mm thick top cover.	sqm	2200.00
	10.6.2	1.2 mm thick top cover	80x1.20 mm M.S. laths with 1.20 mm thick top cover.	sqm	1850.00
	10.6.3	0.9 mm thick top cover	80x0.90 mm M.S. laths with 0.90 mm thick top cover.	sqm	1716.00
10.7		Extra for chain and crank operation	Extra for providing suitable mechanical device chain and crank operation for operating rolling shutters.		
	10.7.1	Exceeding 10.00 sqm and upto 16.80 sqm in the area	Exceeding 10.00 sqm and upto 16.80 sqm in the area.	sqm	747.00
	10.7.2	Exceeding 16.80 sqm in area.	Exceeding 16.80 sqm in area.	sqm	782.00
10.8		Extra for grilled rolling shutters	Extra for providing grilled rolling shutters manufactured out of 8 mm dia. M.S. bar instead of laths as per design approved by Engineer-in-Charge. (Area of grill to be measured).	sqm	308.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.9		Ball bearing for rolling shutters	Providing and fixing ball bearing for rolling shutters.	each	366.00
10.10		Glazed steel doors, windows and ventilators z-section	Providing and fixing factory made ISI marked glazed steel doors, windows and ventilators side /top /centre hung with beading and Z-section all members such as F7D, F4B, K11 B and K12 B and other tubular section member etc. complete of standard rolled steel sections, joints mitred and flash butt welded and sash bars tenoned and riveted, including providing and fixing of hinges, pivots, including priming coat of approved steel primer, but excluding the cost of other fittings, complete all as per approved design (sectional weight of only steel members shall be measured for payment).		
	10.10.1	Fixed with lugs	Fixing with 15x3 mm lugs 10 cm. long embedded in cement concrete block 15x10x10 cm of Cement Concrete 1:3:6 (1 Cement : 3 sand : 6 graded stone aggregate 20 mm nominal size).	kg	107.00
	10.10.2	Fixed with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	kg	93.00
	10.10.3	Extra for steel beading	Extra for providing and fixing steel beading of size 10x10x1.6mm (box type) approved shape and section with screws instead of glazing clips and metal sash putty in steel doors, windows, ventilators and composite units.	meter	36.00
10.11		T-iron frames for doors, windows and ventilators	Providing and fixing L-iron or T-iron frames for doors, windows and ventilators of mild steel L-section or T-sections, joints mitred and welded, including fixing of necessary butt hinges and screws and applying a priming coat of approved steel primer.		
	10.11.1	Fixed with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	kg	77.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.12		Pressed steel door frames	Providing and fixing pressed steel door frames made of 1.6 mm thick steel profile conforming to IS: 4351 manufactured from commercial mild steel sheet including hinges, jamb, lock jamb, bead and if required angle threshold of mildsteel angle of section 50x25mm, or base ties of 1.60 mm pressed mild steel welded or rigidly fixed together by mechanical means, including 2.5mm thick M.S. pressed butt hinges, with mortar guards, lock strike-plate and shock absorbers as specified filling the frame with Cement Concrete 1:3:6 at site before fixing (cost of concrete to be paid separately) fixing with adjustable lugs (200 mm long & 1.0 mm thick) and applying a coat of approved steel primer after pre-treatment of the surface as directed by Engineer-in-charge:		
	10.12.1	Profile B size 80mmx50mm single rebate	Profile B of 1.60mm thick single rebate of size 80mmx50mm		
	10.12.1.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	402.00
	10.12.1.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	394.00
	10.12.2	Profile C size 100mmx50mm single rebate	Profile C of 1.60mm thick single rebate of size 100mmx50mm		
	10.12.2.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	431.00
	10.12.2.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	424.00
	10.12.3	Profile E size 115mmx50mm double rebate	Profile E of 1.60mm thick double rebate of size 115mmx50mm		
	10.12.3.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	472.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	10.12.3.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	464.00
	10.12.4	Profile B size 80mmx50mm single rebate	Profile B of 1.25mm thick single rebate of size 80mmx50mm		
	10.12.4.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	356.00
	10.12.4.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	348.00
	10.12.5	Profile C size 100mmx50mm single rebate	Profile C of 1.25mm thick single rebate of size 100mmx50mm		
	10.12.5.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	385.00
	10.12.5.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	377.00
	10.12.6	Profile E size 115mmx50mm double rebate	Profile E of 1.25mm thick double rebate of size 115mmx50mm		
	10.12.6.1	Fixing with adjustable lugs	Fixing with adjustable lugs with split end tail to each jamb.	meter	414.00
	10.12.6.2	Fixing with dash fastener	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	meter	406.00
10.13		M.S. tubular frames for doors, windows and ventilators	Providing and fixing M.S. Tubular frames and shutters or frames only or shutteronly for doors, windows, ventilators and cupboard with any sections, made of 1.60 mm or 1.25 mm thick M.S. Sheet, joints mitred, welded and grinded finish, with profiles of required size as per drawing, including fixing of necessary butt hinges, stays and screws and applying a priming coat of approved steel primer excluding cost of all fittings such as handles, tower bolts, sliding door bolts, latches etc. and panels.		
	10.13.1	Fixing with cement concrete block	Fixing with 15x3 mm lugs 10 cm. long embedded in cement concrete block 15x10x10 cm of Cement Concrete 1:3:6 (1 Cement : 3 sand : 6 graded stone aggregate 20 mm nominal size).	kg	116.20

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	10.13.2	Fixing with carbon steel galvanised dash	Fixing with carbon steel galvanised dash fastener of required dia and size (to be paid for separately).	kg	114.80
10.14		Steel work in built up tubular trusses/frame	Steel work in built up M.S. tubular section (round, square or rectangular hollow tubes etc.) trusses/frame work etc. including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer, including welding and bolted with special shaped washers etc. complete.		
	10.14.1	Hot finished welded tubes	Hot finished welded type tubes	kg	117.00
	10.14.2	Hot finished seamless tubes	Hot finished seamless type tubes	kg	123.00
	10.14.3	Electric resistance tubes	Electric resistance or induction butt welded tubes.	kg	98.00
10.15		M.S.structural steel	Design, supply, fabrication, transportation and erection of structural steel/mild steel built-up sections for steel building in column, rafter, truss, floor joist, wind bracings, tie beam, foundation bolts, fasteners etc. Including two coats of Epoxy paint and one coat of primer. These structural steel/built-up sections shall be manufactured using advanced CNC Plasma/Oxy Acetylene cutter and H Beam Welding line. Welding shall be in full depth on both sides of the plate adopting relevant I.S Code.	kg	132.00
10.16		M.S. fan clamp	Providing and fixing M.S. fan clamp type I or II of 16 mm dia M.S. bar bent to shape with hooked ends in R.C.C. slabs, beams during laying including painting the exposed portion of loop, all as per standard design complete.	each	112.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.17		M.S. box for ceiling fan	Providing and fixing circular/ Hexagonal cast iron or M.S. sheet box for ceiling fan clamp of internal dia 140mm, 73mm height, top lid of 1.5mm thick M.S. sheet with its top surface hacked for proper bonding, top lid shall be screwed into the cast iron/ M.S. sheet box by means of 3.3mm dia. round headed screws, one lock at the corners. Clamp shall be made of 16mm dia M.S. bar bent to shape as per standard drawing.	each	148.00
10.18		M.S. holding down bolts with nut	Providing and fixing mild steel round holding down bolts with nuts and washer plates complete.	kg	84.00
10.19		Bolts nuts and washers	Providing and fixing bolts including nuts and washers complete.	kg	101.00
10.20		M.S. rivets	Providing and fixing M.S. rivets of sizes in position.	kg	106.00
10.21		Welding	Welding by gas or electric plant including transportation of plant at site etc.complete.	cm	5.00
10.22		Welded built up steel sections	Steel work welded in built up sections/ framed work including cutting, hoisting, fixing in position and applying a priming coat of approved steel primer using structural steel etc. as required.		
	10.22.1	Stair cases	In stringers, treads, landings etc. of stair cases including use of chequered plate wherever required, all complete.	kg	86.00
	10.22.2	Frame, ladder, railing	In gratings, frames, guard bar, ladder, railings, brackets, gates and similar works.	kg	85.00
10.23		Hand rail	Providing and fixing hand rail of approved size by welding etc. to steel ladder railing, balcony railing, staircase railing and similar works, including applying a priming coat of approved steel primer.		
	10.23.1	M.S. tube.	M.S. tube.	kg	110.00
	10.23.2	E.R.W. tubes.	E.R.W. tubes.	kg	132.00
	10.23.3	G.I. pipes.	G.I. pipes.	kg	129.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.24		Dash fastener fixing	Providing and fixing carbon steel galvanised (minimum coating 5 micron) dash fastener of 10 mm dia doublethreaded 6.8 grade (yield strength 480 N/mm <sup>2</sup> ), counter sunk head, comprising of 10 mm dia polyamide PA 6 grade sleeve, including drilling of hole in frame, concrete/ masonry, etc. as per direction of Engineer-in-charge.		
	10.24.1	60 mm	10x60 mm	each	57.00
	10.24.2	80 mm	10x80 mm	each	63.00
	10.24.3	120 mm	10x120 mm	each	78.00
	10.24.4	140 mm	10x140 mm	each	84.00
	10.24.5	160mm	10x160mm	each	110.00
10.25		Stainless steel railing	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, 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 and stainless steel dash fasteners, stainless steel bolts etc., of required size, on the top of the floor or the side of waist 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.)	kg	582.00
10.26		Fly proof wire gauze to windows, doors	Providing and fixing fly proof wire gauze to windows, clerestory windows and doors with M.S. Flat 15x3mm and nuts and bolts complete.		
	10.26.1	M.S.	Galvanised M.S. Wire gauze with 0.63mm dia wire and 1.4 mm aperture on both sides	sqm	646.00
	10.26.2	S.S.	Stainless steel (grade 304) wire gauze of 0.5 mm dia wire and 1.4 mm aperture on both sides.	sqm	1334.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.27		Glass panes/ steel sheet/ fibre sheet	Providing and fixing glass panes/ steel sheet/ fibre sheet with putty and glazing clips in steel doors, windows, clerestory windows all complete.		
	10.27.1	4.0 mm glass	With 4.0 mm thick glass panes	sqm	792.00
	10.27.2	5.50 mm glass	With 5.50 mm thick glass panes	sqm	873.00
	10.27.3	1mm M.S.	With 1mm thick mild steel sheet i/c 10x10x1.6mm box beading.	sqm	916.00
	10.27.4	2.00 mm FRP sheet	With 2mm thick fibre reinforced polymer (FRP) sheet i/c 10x10x1.6mm boxbeading.	sqm	611.00
	10.27.5	1.0mm galvanised steel	With 1mm thick Galvanised steel sheet i/c 10x10x1.6mm box beading.	sqm	936.00
	10.27.6	4mm fibre board	With 4mm thick cement fibre board conforming to IS 14862:2000 of category type A grade i/c 10x10x1.6mm box beading.	sqm	750.00
	10.27.7	6mm cement fibre board	With 6mm thick cement fibre board conforming to IS 14862:2000 of category type A grade i/c 10x10x1.6mm box beading.	sqm	800.00
	10.27.8	8mm cement fibre board	With 8mm thick cement fibre board conforming to IS 14862:2000 of category type A grade i/c 10x10x1.6mm box beading.	sqm	872.00
10.28		Extra for fixing froasted glass instead of float glass	Add extra for providing and fixing froasted glass instead of float glass.		
	10.28.1	4.0 mm glass	With 4.0 mm thick glass panes.	sqm	259.00
	10.28.2	5.0 mm glass	With 5.5 mm thick glass panes.	sqm	262.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
10.29		Supplying at site	Supplying at site:		
	10.29.1	R.C.C. Standards post/ struts/rails/ poles	R.C.C. Standards post/ struts/rails/ poles of mix 1:1.5:3 (1 cement : 1.5 sand : 3 graded stone aggregate 12.5 mm nominal size) with wooden plugs or 6mm bar nibs wherever required as per direction of Engineer-in-charge including fixing (cost of earth works in excavation, concrete works in foundation to be paid separately).	cum	16510.00
	10.29.2	Angle iron post	Angle iron post and strut of required size including bottom to be split and bent at right angle in opposite direction for 10 cm length and drilling holes upto 10 mm dia. etc. complete. (cost of earth work in excavation and concrete work in foundation to be paid separately)	kg	67.00
	10.29.3	Welded steel wire fabric	Supplying at site -Welded steel wirefabric of required width having rectangular mesh painted with two or more coats of enamel paint of approved shade over a coat of primer (Priming painting to be paid for separately).	kg	81.00
10.30		Turn buckles	Supplying and fixing turn buckles and straining bolts for barbed wire fencing. (Labour rate only).	each set	153.00
10.31		Fencing with R.C.C. post with GI barbed wire	Fencing with R.C.C. post placed at required distance, embedded in cement concrete blocks, every 15th post, last but one end post and corner post shall be strutted on both sides and end post one side only, provided with horizontal lines and two diagonals of barbed wire weighing 9.38 kg per 100 metres(minimum) between the two posts fitted and fixed with G.I. staples on wooden plugs or G.I. binding wire tied to 6 mm bar nibs fixed while casting the post (cost of R.C.C. posts, struts, earth work andconcrete to be paid for separately) with GIbarbed wire.	metre	10.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.32		Fencing with barbed G.I.wire	Fencing with barbed G.I. wire angle iron post placed fitted to at required distance embedded in cement concrete blocks, every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and provided with horizontal lines and two diagonals interwoven with horizontal wires, of barbed wire weighing 9.38 kg per 100 m (minimum) between the two posts fitted and fixed with G.I. staples, turn buckles etc. complete. (Cost of posts, struts, earth work and concrete work to be paid for separately):- Payment to be made per metre cost of total length of barbed wire used.	metre	17.00
10.33		Fencing with welded steel wire fabric	Fixing Welded steel wire fabric fencing with posts of specified material and of standard design placed and embedded in cement concrete blocks 45x45x60cm of mix 1:5:10 (1cement :5 sand :10 graded stone aggregate 40mm nominal size) every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and struts embedded in cement concrete blocks 70x45x50cm of the same mix, provided with welded steel wire fabric fixed between the posts fitted and fixed with G.I. staples on wooden plugs or tied to 6 mm bar nibs with G.I. binding wire (cost of posts, painting, earth work in excavation and cement concrete to be paid for separately). (Labour rate only).	sqm	18.00
10.34		Fencing with chain link fabric 2mm dia	Providing and fixing G.I. or PVC coated G.I.wire chain link fabric fencing of required width and mesh size including strengthening with 2mm dia wire or nuts, bolts and washers as required complete with posts of specified material and of standard design placed and embedded in cement concrete blocks 45x45x60cm of mix 1:5:10 (1cement :5 sand :10 graded stone aggregate 40mm nominal size) every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and struts embedded in cement concrete blocks 70x45x50cm of the same mix, as per the		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			direction of Engineer- in-charge. (Cost of post, painting earthwork & c.c. to be paid separately)		
	10.34.1	G.I. wire	Made of G.I. wire.	kg	133.00
	10.34.2	PVC coated G.I. wire	Made of G.I. wire, PVC coated to achieve outer dia. not less than 5mm in required colour and shade.	kg	138.00
10.35		Fencing with G.I. chain link fabric 3mm dia	Providing and fixing G.I. chain link fabric fencing of required width in mesh size 25x25 mm made of G.I. wire of dia. 3mm including strengthening with 2mm dia. wire or nuts, bolts and washers as required complete, with posts of specified material and of standard design placed and embedded in cement concrete blocks 45x45x60cm of mix 1:5:10 (1cement :5 sand : 10 graded stone aggregate 40mm nominal size) every 15th post, last but one end post and corner post shall be strutted on both sides and end post on one side only and struts embedded in cement concrete blocks 70x45x50cm of the same mix, as per the direction of Engineer-in- Charge. (cost of post painting earth work & C.C. to be paid separately)	sqm	574.00
10.36		Concertina coil fencing	Providing and fixing concertina coil fencing with punched tape concertina coil 600 mm dia 10 metre openable length (total length 90 m), having 50 nos rounds per 6 metre length, upto 3 m height of wall with existing angle iron 'Y' shaped placed 2.4m or 3.00m apart and with 9 horizontal R.B.T. reinforced barbed wire, stud tied with G.I. staples and G.I. clips to retain horizontal, including necessary bolts or G.I. barbed wire tied to angle iron, all complete as per direction of Engineer-in charge, with reinforced barbed tape(R.B.T.) / Spring core (2.5 mm thick) wire of high tensile strength of 165 kg/ sq mm with tape (0.52 mm thick) and weight 43.478 gm/ metre (cost of M.S. angle, C.C. blocks shall be paid separately).	metre	275.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
10.37		Fire resistance steel sheet door shutter and frame	Providing & fixing of Fire Resistant Flush Door Shutter made out of 0.8 mm thick sheet steel (Steel as per IS 513) duly powder coated by pre treatment (seven tank process) with coating of powder, minimum thickness of 60 microns as per IS 13871 and approved shade, the construction of door shutter consists of outer skins (front & back)of steel sheet with lock seam joint on vertical, top and bottom shall be welded with the doorskin, door skins are assembled together at lock seam joint. The door shutter depth shall be 40 mm, infill material in the hollow portion of door shutter shall be PUF/ mineral wool /glass wool/rock wool of density 48 Kg/M3, vertical pressed 'Z' section of size 20x40x20x1000 mm shall be tag welded at the middle of door shutter vertically and a pressed 'L' channel of size 90x216x1.2 mm 3 numbers shall be welded on inner side of door shutter for fixing SS hinges, a steel strip of size 90x262x1.2 mm 3 numbers shall be welded on inner side of door shutter for hinge cover, a steel strip of size 90x195x1.2 mm shall also be welded on inner side of door shutter for supporting door lock. The door shall be fixed with stainless less butt hinges of size 100x58x2 mm 3 numbers, the hinges shall be screwed to the door shutter by CSK machine screw of size M5x20 mm 12 numbers, the door shutters shall be manufactured as per IS 16074-2013 and door locking system shall be of Mortise type cylindrical lock complete as per the direction of Engineer-in-Charge Fireresistant door shutter frame assembly shall be provided with Fire Resistant Door Frame made out of 1.2 mm thick sheet steel conforming to IS: 513 duly powder coated by pretreatment (seven tank process) with coating of powder, minimum thickness of 60 microns as per IS 13871 and of approved shade, the door frame profile shall be of 50x100x65 mm, the construction of door frame consists of L angle of size 90x216x1.2 mm 3	sqm	3410.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			numbers shall welded on inner side of door frame for fixing SS hinges, bottom tile angle of size 20x20x1120x1.6 mm shall be bolted the bottom of door frame by hex head bolt M6x20 mm-2 numbers, the frame shall be of welded construction, steel strip of size 90x262x1.2 mm 3 no's shall be welded on inner side of door shutter for hinge support, steel strips of size 50x10x1.2mm 6numbers shall be welded on inner side of door frame for the support of anchor fasteners fastener. Infill material in the hollow portion of door frame shall be PUF/ mineral wool /glass wool/rock wool of density 48 Kg/M3, the door frame shall be manufactured as per IS 4351-2003, the door frame fixing shall be done by dry fixing method with anchor fasteners of size M10x60 mm 6 numbers, complete as per the direction of Engineer-in-Charge.		
10.38		Roll formed steel window air tight	Providing and fixing of factory make air tight casement windows made of roll formed galvanized pre-painted steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/ powder coated (base steel as per IS 513 of "D" quality, galvanized as per IS 277 with zinc of 120 grams/sqm) outer frame section 46x52x0.58 mm, shutter section 46x46x0.58mm, mullion section 46x70x0.58mm, beading section 18x25x0.58 mm, windows panelled without glazing (glazing shall be paid separately as per SOR rate) with EPDM (Ethyl Propylene Diamine Monomer) gasket and the sections cut to length mitre joined with corner bracket centre mullions fixed using mullion cap and with handle made of powder coating high grade aluminum with nylon receiver, corner brackets made of CRCA (Cold Rolled Close Annealed) with Zinc Phosphate, Mullion caps made of glass filled nylon, frames fixed to the concrete /masonry		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			wall by means of self-expanding screws. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.		
	10.38.1	Openable window	Openable window	sqm	5228.00
	10.38.2	Fixed windows	Fixed windows	sqm	4190.00
10.39		Roll formed steel window single rebate with glass shutter and grill	Providing and fixing of factory make single rebate openable/fixed windows made of roll formed galvanized pre-painted steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/powder coated (base steel as per IS 513 of "D" quality, galvanized as per IS 277 with zinc of 120 grams/sqm) outer frame section 48 x 50 x0.58mm, centre mullion section 48 x 50 x0.58mm, shutter section 47 x 20 x0.58mm and the fixed glass beading section 12 x 12 x0.58mm, outer frame and mullions shall consists rebate for glazed shutter with a 20 mm provision for guard bars/grills and the sections cut to length mitre joined with corner bracket, centre mullion fixed with mullion cap, handle, stay, 2 nos. SS (stainless steel) heavy duty pivot hinges per shutter and window fitted without glazing (glazing shall be paid separately as per SOR rate) with EPDM (Ethyl Propylene Diamine Monomer) gaskets including fixing frames in concrete/masonry wall by means of self- expanding screws, including 10mm square bars welded to 6x12mm flat at a distance 150mm c/c (pitch) etc. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			drawings and direction of Engineer-in-charge complete.		
	10.39.1	Openable single rebate window	Openable single rebate window	sqm	4511.00
	10.39.2	Fixed single rebate window	Fixed single rebate window	sqm	3894.00
10.40		Roll formed steel window – Double rebate with glass shutter, grill and mosquito mesh shutter	Providing and fixing of factory make double rebate windows made of rollformed galvanized pre-painted steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/ powder coated (base steel as per IS 513 of "D" quality, galvanized as per IS 277 with zinc of 120 grams/sqm) outer frame section 72 x 55 x 0.58mm, centre mullion section 72 x 50 x 0.58mm, shutter section 47 x 20 x 0.58mm, fly mesh section 40 x 20 x 0.58mm and the fixed glass beading section 12 x 12 x 0.58mm, outer frame and mullions shall consists rebate for glazed shutter, fly mesh and 20 mm provision for guard bars/grills, the sections cut to length miter joined with corner bracket, centre mullions fixed with mullion cap, stay, handles, latch, 2 Nos of heavy duty stainless steel pivot hinges per shutter and panelled without glazing (glazing shall be paid separately as per SOR rate) with and S.S. Mesh for fly mesh shutter (32 gauge, 304 grade), fitted using EPDM (Ethyl Propylene Diamine Monomer) gaskets including fixing windows in the concrete/masonry wall by means of self-expanding screws, including 10mm Square bars welded to 6x12mm flat at a distance 150mm c/c (pitch) etc. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete..		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	10.40.1	Fixed single rebate window	Openable double rebate window	sqm	5820.00
	10.40.2	Fixed double rebate window	Fixed double rebate window	sqm	4449.00
10.41		Roll formed steel window- – fixed ventilator	Providing and fixing of factory make fixed louvers fabricated from roll formed sections made of galvanized pre-painted steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/powder coated (base steel as per IS 513 'D' quality, galvanized as per IS 277 with zinc of 120 grams/Sqm) section for external frame 33 x 58 x0.58mm, glass holding flanges made of polypropylene, sections are to be cut to length, miter joined with corner bracket. The above frames should be fixed to the concrete/masonry walls by means of self-expanding screws. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in- charge complete. (glazing shall be paid separately as per SOR rate)	sqm	3404.00
10.42		Roll formed steel window sliding (2 track) 2 glass shutter	Providing and fixing of factory make pre painted steel sliding window 2 track-2 panel sliding window fabricated from roll formed sections made of galvanized steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/powder coated (Base Steel as per IS 513 'D' quality, galvanized as per IS 277 with zinc of 120 GM/Sq.mtr) Section for external frame should be of 59x44 x0.58mm, Section for shutter should be of 35x50 x0.58mm. Without glazing (glazing shall be paid separately as per	sqm	3479.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			SOR rate) Corner bracket for internal and external frame made of glass filled nylon. Gaskets are to be made of Ethyl Propylene Diamine Monomer (EPDM). The sections are to be cut to length, joined and assembled by means of corner bracket. The above frames should be fixed to the concrete/masonry walls by means of self-expanding screws. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.		
10.43		Roll formed steel window sliding (3 track) 2glass shutter + 1mosquito mesh shutter	Providing and fixing pre painted steel sliding window 3 fabricated from Roll formed sections made of galvanized Steel with epoxy primer of 5-7 microns thick, finish painted with a polyester paint of 12-16 microns thick and back coated with alkyd backer 5-7 microns thick or powder coated with pure polyester powder up to 50-60 microns thick, colour coated/ powder coated (Base Steel as per IS 513 'D' quality, galvanized as per IS 277 with zinc of 120 gm/sqm). Section for external frame should be of 107x44 x0.58mm, section for shutter should be of 35x49 x0.58mm. Section of mesh should be of 35 x 49 x0.58mm. Without glazing (glazing shall be paid separately as per SOR rate) corner bracket for internal and external frame made of glass filled nylon. Gaskets are to be made of Ethyl Propylene Diamine Monomer (EPDM). The sections are to be cut to length, joined and assembled by means of corner bracket. The above frames should be fixed to the concrete/masonry walls by means of self-expanding screws. Including filling the gap upto 5 mm depth and 5 mm width in between steel frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete.	sqm	5430.00

**CHAPTER – 11.0**  
**FLOORING**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No. 1	I.S. No. 2	Subject 3
1	IS 269	Specification for 33 grade ordinary portland Cement
2	IS 401	Code of practice for preservation of timber
3	IS 451	Technical supply conditions for wood screws
4	IS 455	Specification for portland slag cement
5	IS 661	Code of practice for thermal insulation of cold storages
6	IS 702	Specification for industrial bitumen
7	IS 1124	Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones
8	IS 1130	Specification for marble (blocks, slabs and tiles)
9	IS 1141	Code of practice for Seasoning of timber
10	IS 1200 (Part-XI)	Method of measurement of Building and Civil Engineering work (Part 11) paving, floor finishes, dado and skirting
11	IS 1237 Edition 2.3	Specification for cement concrete flooring tiles
12	IS 1322	Specification for bitumen felts for water proofing and damp-proofing
13	IS 1443	Code of practice for laying and finishing of cement concrete flooring tiles
14	IS 1489 (Part-I)	Specification for portlandpozzolana cement (Part-I) flyashbased
15	IS 1489 (Part-II)	Specification for Portland pozzolana cement (Part II) calcined clay based
16	IS 1580	Specification for bituminous compounds for water proofing and caulking purpose
17	IS 2114	Code of practice for laying in-situ terrazzo floor finish
18	IS 2571	Code of practice for laying in-situ cement concrete flooring
19	IS 3622	Specification for sand stone (Slab and Tiles)
20	IS 3670	Code of practice for construction of timber floors
21	IS 4457	Acid and/or alkali Resistant tiles.
22	IS 5318	Code of practice for laying of hard wood parquet and wood block floors
23	IS 5766	Code of practice for laying of burnt clay brick floor
24	IS 8041	Specification for rapid hardening portland cement

25	IS 8042	Specification for white portland cement
26	IS 8043	Specification for hydrophobic portland cement
27	IS 8112	Specification for 43 grade ordinary portland cement
28	IS 12330	Specification for sulphate resisting portland cement.
29	IS 13630 (Part-1 to 15)	Methods of Testing of ceramic tiles
30	IS 13712	Specification for ceramic tiles; definition, classification characteristic and marking
31	IS 15622	Specification for pressed ceramic tile
32	IS 1122	Method of test for determination of true specific gravity of natural building stones
33	IS 1124	Method of test for determination of water absorption, apparent specific gravity and porosity of natural building stones
34	IS 1130	Marble (blocks, slabs and tiles).
35	IS 4101 (Part-1)	Code of practice for external facing and veneers: Stone facing.
36	IS 3316	Specifications for structural granite
37	IS 14223 (Paart-1)	Polished Building Stones (Part-1) Granite

## LIST OF MANDATORY TESTS

Material	Clause	Test	Field/ laboratory test	Test Procedure	Min. quantity of material for carrying out the test	Frequency of testing
Terrazzo Tiles	11.10. 1 and 11.11. 1	1. Transverse strength 2. Water absorption 3. Abrasion A test	Laboratory	IS: 1237	5000 Nos. (no testing need be done if total number of tiles of all types of all sizes from all manufactur ers used in a work is less than 5000 Nos)	One test for every 10,000 Nos. or part thereof for each type and size from a single manufacturer (One test to be done even if the number of terrazzo tiles of any type and size from a single manufacturers is less than 5000 Nos. provided the total number of terrazzo tiles of all types and sizes from all manufacturers used in a work exceed 5000 Nos.
Pressed ceramic tiles (for floor and wall)	11.4,1 1.5 and 11.16	1. Dimensions and surface quality 2. Physical properties 3. Chemical properties	Laboratory	IS: 13630	3000 Nos.	3000 Nos. or part thereof
Marble	8.3 (Table 8.2)	(i) Moisture Absorption	Laboratory	IS 1124	50 Sq.m.	100 sqm. Or part thereof.
		(ii) Hardness Test	-do-	Mho's Scale	-do-	-do-
		(iii) Specific Gravity	-do-	IS 1122	-do-	-do-
Granite		(i) Moisture	-do-	IS 1124	-do-	-do-
		(ii) Specific Gravity	-do-	IS 1122	-do-	-do-



**PREAMBLE**  
**FLOORING**  
**(CHAPTER: 11.0)**

**11.1 Cement Concrete**

Cement concrete of specified mix grade shall be used and it shall generally conform to the specifications described under sub head 4.0

**11.2 Base Concrete**

Flooring shall be laid on base concrete where so provided. The base concrete shall be provided with the slopes required for the flooring. Flooring in verandah, Courtyard, kitchens and baths shall have slope ranging from 1 : 48 to 1 : 60 depending upon location and as decided by the Engineer-in-Charge. Floors in water closet portion shall have slope of 1:30 or as decided by the Engineer-in-Charge to drain off washing water. Further, necessary drop in flooring in bath, WC, kitchen near floor traps ranging from 6 mm to 10 mm will also be provided to avoid spread of water. Necessary margin to accommodate this drop shall be made in base concrete. Plinth masonry off set shall be depressed so as to allow the base concrete to rest on it.

The flooring shall be commenced preferably within 48 hours of the laying of base concrete. The surface of the base shall be roughened with steel wire brushes without disturbing the concrete. Immediately before laying the flooring, the base shall be wetted and a coat of cement slurry @ 2 kg of cement spread over an area of one sqm so as to get a good bond between the base and concrete floor.

If the cement concrete flooring is to be laid directly on the RCC slab, the top surface of RCC slab shall be cleaned and the laitance shall be removed and a coat of cement slurry @ 2 kg of cement spread over an area of one sqm so as to get a good bond between the base and concrete floor.

**11.3 Finishing**

The finishing of the surface shall follow immediately after the cessation of beating. The surface shall be left for some time, till moisture disappears from it or surplus water can be mopped up. Use of dry cement or cement and sand mixture stiffening the concrete to absorb excessive moisture shall not be permitted. Excessive trowelling shall be avoided.

**11.4 Tile Work**

**Preparation of Surface and Laying**

Base concrete or the RCC slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding for the tile shall be with cement mortar 1:4 (1 cement: 4 coarse sand) or as specified. The average thickness of the bedding shall be 20 mm or as specified while the thickness under any portion of the tiles shall not be less than 10 mm.

Mortar shall be spread, tamped and corrected to proper levels and allowed to harden sufficiently to offer a fairly rigid cushion for the tiles to be set and to enable the mason to place wooden plank across and squat on it.

Over this mortar bedding neat grey cement slurry of honey like consistency shall be spread at the rate of 3.3 kg of cement per square metre over an area upto one square metre. Tiles

shall be soaked in water washed clean and shall be fixed in this grout one after another, each tile gently being tapped with a wooden mallet till it is properly bedded and in level with the adjoining tiles. The joints shall be kept as thin as possible and in straight lines or to suit the required pattern.

The surface of the flooring during laying shall be frequently checked with a straight edge about 2 m long, so as to obtain a true surface with the required slope. In bath, toilet W.C. kitchen and balcony/verandah flooring, suitable tile drop or as shown in drawing will be given in addition to required slope to avoid spread of water. Further tile drop will also be provided near floor trap.

Where full size tiles cannot be fixed these shall be cut (sawn) to the required size, and their edge rubbed smooth to ensure straight and true joints. Tiles which are fixed in the floor adjoining the wall shall enter not less than 10 mm under the plaster, skirting or dado.

After tiles have been laid surplus cement slurry shall be cleaned off.

### **11.5 Pointing and Finishing**

The joints shall be cleaned off the grey cement slurry with wire/coir brush or trowel to a depth of 2 mm to 3 mm and all dust and loose mortar removed. Joints shall then be flush pointed with white cement added with pigment if required to match the colour of tiles. Where spacer lug tiles are provided, the half the depth of joint shall be filled with polysulphide or as specified on top with under filling with cement grout without the lugs remaining exposed. The floor shall then be kept wet for 7 days. After curing, the surface shall be washed and finished clean. The finished floor shall not sound hollow when tapped with a wooden mallet.

### **11.6 Marble and Granite Stone Flooring**

#### **General**

Marble shall be hard, sound, dense and homogeneous in texture with crystalline texture as far as possible. It shall generally be uniform in colour and free from stains, cracks, decay and weathering

### **11.7 Coloured Marble**

**Plain Black Marble :** Black marble sawn along veins locally known as 'Peta Pasu sawing' available at Bhainslana.

### **11.8 Black Zebra Marble**

- (i) Bhainslana Black Zebra Marble: Black marble having grey or white veins available at Bhainslana.
- (ii) Kishangarh Black Zebra Marble: Black marble with grey and/or white veins available at Kishangarh.
- (iii) Abu Black Zebra Marble: Black marble having white patches and streaks available at Abu.
- (iv) Narnaul Black Zebra Marbles: Black marble with thin white veins available at Narnaul.
- (v) Makrana Dhobi Doongri Zebra Marble: Greyish black marble with white flowery pattern available at Dhobi Doongri.

### 11.9 Green Marble

- (i) Baroda Green Marble: Dark green marble with flowery pattern available at Baroda.
- (ii) Abu Green Marble: Light green marble with green and/or brown streaks on white ground available at Ambaji.
- (iii) Falna Green Marble: Green marble with prominent yellowish pattern available at Falna.
- (iv) Bundi Green Marble: Green marble with pinkish shades available at Umar, (Bundi).

### 11.10 Grey Marble

- (i) Kumari Grey Marble: Grey marble having light blue shades available at Makrana.
- (ii) Bundi Grey Marble: Grey Marble with pink or green or black streaks available at Umar (Bundi).

### 11.11 Brown Marble

- (i) Bar Brown Marble/Brown Marble with light and dark brown shades available at bar.
- (ii) Narnaul Brown Marble Brown marble having teak wood shades available at Narnaul

### 11.12 Granite

It shall be of any colour and size as directed by Engineer-in-Charge. Granite shall be plain machine cut and mirror polished. The stone shall be smooth and of even surface without holes or pits.

**TABLE -11.1**  
**Physical Properties of Marble and Granite**

Characteristic	Marble		Granite	
	Marble Requirements	Method of test	Granite Requirement	Method of test
(1) Moisture absorption after 24 hrs immersion in cold water	Max. 0.4%	IS 1124	Max. 0.50% by weight	IS 1124
(2) Hardness	Min. 3	Mhos scale	-	-
(3) Specific Gravity	Min. 2.5	IS 1122	Min. 2.6	IS 1122

### 11.13 Approval of Sample

Before starting the work, the contractor shall get samples of marble/Granite approved by the Engineer-in- Charge. Approved samples shall be kept in the custody of the Engineer-in-Charge and the marble supplied and used on the work shall conform to samples with regard to soundness, colour, veining and general texture.

### 11.14 Stone Work - Table Rubbed and Polished (Plain Work)

For all stone work in steps, jambs, columns and other plain work: Joints in staircase treads, kitchen platforms shall be permitted only at curvature or when width/length is more than 0.6/2 mtrs. Respectively. Number of joints in each direction shall not be more than one number for every 2 m length beyond the initial 2.00 m length. Additional joints due to curvature or for providing fixture shall be provided judiciously.

### 11.15 Dressing, Cutting and Rubbing

Every stone shall be gang saw/machine cut to the required size and shape, chisel dressed machine finished on all beds and joints, so as to be free from any waviness and to give truly vertical, horizontal, radial or circular joints as required. The exposed faces and sides of stones forming joints upto 6mm from the face shall be fine tooled machine cut such that a

straight edge laid along the face of the stone is in contact with every point on it. All window sills, tread of steps, counters vanities moulding edges etc. shall be machine cut and polished to give high gloss mirror finish as per direction of Engineer-in-Charge. These surfaces shall then be rubbed smooth. All visible angles and edges shall be true, square and free from chipping. Beyond the depth of 6 mm from face, the joints shall be dressed with a slight splay so that the thickness of joint increases, in an inverted V shape. The surfaces of the stones coming in contact with backing need not be chisel dressed.

Every stone shall be cut to the required size and shape, fine chisel dressed on all sides to the full depth so that a straight edge laid along the side of the stone shall be fully in contact with it. The top surface shall also be fine chisel dressed to remove all waviness. In case machine cut slabs are used, fine chisel dressing of machine cut surface need not be done provided a straight edge laid any where along the machine cut surfaces is in contact with every point on it. The sides and top surface of slabs shall be machine rubbed or table rubbed with coarse sand before paving. All angles and edges of the marble slabs shall be true, square and free from chippings and the surface shall be true and plane. The thickness of the slabs shall be 18, 30 or 40 mm as specified in the description of the item. Tolerance of + 3% shall be allowed for the thickness. In respect of length and breadth of slabs a tolerance of + 2% shall be allowed.

#### **11.16 Laying**

Base concrete or the RCC slab on which the slabs are to be laid shall be cleaned, wetted and mopped. The bedding for the slabs shall be with cement mortar 1:4 (1 cement: 4 sand) or as given in the description of the item.

The average thickness of the bedding mortar under the slab shall be 20 mm and the thickness at any place under the slab shall be not less than 12 mm.

The slabs shall be laid in the following manner: Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar is allowed to harden a bit and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already paved shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the marble slabs as given in the description of the item. The slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slabs with as fine a joint as possible. Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the surface of the slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days. The surface of the flooring as laid shall be true to levels, and, slopes as instructed by the Engineer-in-Charge. Joint thickness shall not be more than 1mm. Due care shall be taken to match the grains of slabs which shall be selected judiciously having uniform pattern of Veins/streaks or as directed by the Engineer-in-Charge.

The slabs shall be matched as shown in drawings or as instructed by the Engineer-in-Charge. Slabs which are fixed in the floor adjoining the wall shall enter not less than 12 mm under the plaster skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness. Marble slabs flooring shall also be laid in combination with other stones and/or in simple regular pattern/design as described in item of work and/or drawing.

### **11.17 Polishing and Finishing**

Slight unevenness at the meeting edges of slabs shall then be removed by fine chiselling and finished in the same manner as specified except that cement slurry with or without pigments shall not be applied on the surface before each polishing.

### **11.18 Measurements**

Marble stone flooring with different kind of marble/Granite/Kota shall be measured separately and in square metre correct to two places of decimal. Length and breadth shall be measured correct to a cm before laying skirting, dado or wall plaster. No deduction shall be made nor extra paid for voids not exceeding 0.20 square metre. Deductions for ends of dissimilar materials or other articles embedded shall not be made for areas not exceeding 0.10 square metre. Nothing extra shall be paid for laying the floor at different levels in the same room. Steps and treads of stairs paved with stone slabs shall also be measured under the item of flooring. Extra shall, however, be paid for such areas where the width of treads does not exceed 30 cm. nosing for treads shall be measured in running metre and paid for extra. The width of treads shall be measured from the outer edge of the nosing, as laid, before providing the riser.

### **11.19 Protection**

Green work shall be protected from rain by suitable coverings. The work shall also be suitably protected from damage during construction.

### **11.20 Rate**

The rate shall include the cost of all materials and labour involved in all the operations described above. However, extra shall be paid for making special type of pattern/design/flowers as per drawings. No deductions shall be made in rate even if flooring is done without any pattern/design.

### **11.21 Wall Lining/Veneer Work**

Unless and otherwise specified in the nomenclature of the item, the marble slabs used for wall lining/veneer work shall be gang saw cut (polished and machine cut). Back shall not be polished/ cut in order to ensure a good grip with the hearting of backing. The cut slabs shall be of the thickness as specified with a tolerance permissible. The tolerance in wall lining when straight edge of 3 m length is placed should not be more than 2 mm.

### **11.22 Laying**

The stone shall be wetted before laying. They shall then be fixed with mortar in position without the use of chips or under pinning of any sort. Care shall be taken to match the grains of veneer work as directed by the Engineer-in-Charge. For purpose of matching the grains, the marble slabs shall be selected judiciously having uniform pattern of veins/streaks. Preferably the slabs shall be those got out of the same block from the quarry. The area to be veneered shall be reproduced on the ground and the marble slabs laid in position and arranged in the manner to give the desired matching of grains. Any adjustment needed for achieving the best results shall be then carried out by replacing or interchanging the particular slabs. Special care shall be taken to achieve the continuity of grains between the two slabs one above the other along the horizontal joints. This shall then be got approved by the Engineer-in-Charge and each marble slabs numbered properly and the same number shall be marked on a separate drawing as well as on the surface to be actually veneered, so as to ensure the fixing of the particular slabs in the correct location. For the facing of the columns also the same procedure as mentioned above shall be followed.

Where so desired, the adjoining stones shall be secured to each other by means of copper pins 75 mm long and 6 mm diameter or as specified.

The stones shall be secured to the backing by means of cramps. The material for cramps shall have high resistance to corrosion under conditions of dampness and against the chemical action of mortar or concrete in which cramps are usually embedded. Cramps shall be of 25 × 6 mm and 30 cm long in case of backing of stone masonry walls and brick masonry walls thicker than 230 mm. In case of backing with brick masonry walls 230 mm or less thick or RCC member's cramps shall be of 25 × 6 mm and length as per requirement made out of gun metal or any other metal. Generally the outer length of cramp in half brick work backing shall be 115 mm and in one brick work backing it shall be 150 mm. Cramps shall be spaced not more than 60 cm apart horizontally. Alternatively the stone may be secured to the backing by means of stone dowels 10 x 5 x 2.5 cm.

The adjoining stones shall be secured to each other by means of gun metal cramps or copper pins of the specified size. Cramps may be attached to its sides or top and bottom or sides, top and bottom. The actual number of cramps and their sections, however, shall be as per requirements of design to carry the loads.

Where cramps are used to hold the unit in position only, the facings shall be provided with a continuous support on which the stones rest at the ground level and other storey levels, the support being in the form of projection from or recess into the concrete floor slab, or a beam between the columns or a metal angle attached to the floor slab or beams. These supports shall preferably be at vertical intervals not more than 3.5 m apart and also over the heads of all openings. Such supports shall also be provided where there is transition from thin facing below to thick facings above.

Alternatively cramps may be used to hold the units in position and in addition to support the units thus transferring the weight of the units to the backing. Such cramps should be properly designed as per IS 4101 (Part 1).

The cramps may be of copper alloyed with zinc, tin, nickel, lead or stainless steel. The pins, cramps and dowels shall be laid in cement mortar 1:2 (1 cement: 2 sand) and their samples got approved by the Engineer-in-Charge and kept at site.

### **11.23 Joints**

All joints shall be full of mortar. Special care shall be taken to see that groundings for veneer work are full of mortar. If any hollow groundings are detected by tapping the face stones, these shall be taken out and relaid. The thickness of the face joints shall be uniform, straight and as fine as possible, not more than 1.5 mm and in the face joint, the top 6 mm depth shall be filled with mortar specified for the pointing.

### **11.24 Acid or Alkali Resistant Tiles**

The tiles shall be of vitreous ware and free from deleterious substances. The iron oxide content allowable in the raw material shall not exceed two percent. The tiles shall be vitrified at the temperature of 1100°C and above and shall be kept unglazed. The finished, tile, when fractured shall appear fine grained in texture, dense and homogenous. The tiles shall be sound, true to shape, flat and free from flaws and manufacturing defects affecting their utility. The tiles shall be conforming to IS 4457. The tiles to be tested for water absorption, compressive strength, acid resistance as per IS 4457. Sampling procedure for acceptance tests and criteria for conformity to be as per IS 4457. The tiles shall be of required colour.



### **11.25 Dimensions and Tolerances**

Ceramic unglazed vitreous acid-resistant tiles shall be made in three sizes namely 98.5 X 98.5 mm, 148.5 x148.5 mm and 198.5 x198.5 mm. They shall be available in the following thickness: 35, 30, 25,20 and 15 mm. The depth of the grooves on the under side of the tile shall not exceed 3 mm. Tolerance on length, breadth and thickness of tiles shall be + 2 percent.

### **11.26 Shape**

The tiles shall be square shaped. Half tiles rectangular in shape shall also be available. Half tiles for use with full tiles shall have dimensions which shall be such as to make two half tiles, when joined together, match with the dimension of full tile. The shape of tiles otherthan square shall be as agreed to between the purchaser and the manufacturer. Tiles shall be checked for squareness and warp as per IS 4457.

### **Performance Requirements**

The tiles when tested in accordance with method given in IS 4457, shall conform to be requirement specified in the code (IS 4457).

### **Loss in Abrasion**

The maximum percentage of loss in abrasion of the ceramic unglazed vitreous acid resistant tiles determined in accordance with the procedure laid down in IS 1237, shall be as mentioned in IS 4457.

### **11.27 Marking**

Tiles shall be legibly marked on the back with the name of the manufacturer or his trade mark. Manufacturer's batch number and year of manufacture. Each tile may also be markedwith the ISI certification mark.

### **11.28 Preparation of Surface and Laying**

Preparation of surface and laying as prescribed, except the cement used to be acid and or alkali resistant cement and cement mortar to be used to be acid and or Alkali resistant mortar. Thickness of bedding of mortar for flooring to be 10 mm or specified on the item and for dado/skirting to be 12 mm or specified on item.

### **11.29 Pointing and Finishing**

As specified, except that cement used for pointing to be acid and or alkali resistant cement.

### **11.30 Fixing of Tile Flooring with Cement Based High Polymer Modified Quick Set Adhesive (Water Based)**

When tile flooring is to be laid over the existing flooring without dismantling old flooring it can be laid with adhesive. The old flooring shall be thoroughly cleaned and checked for undulations, if any shall be rectified with cement mortar 1:3 (1 cement: 3 sand). Old cement concrete surface shall be hacked and cleaned off to have proper bond with the old surface.

High polymer modified quick set tile adhesive (conforming to IS 15477) shall be thoroughly mixed with water and a paste of zero slump shall be prepared so that it can be used with in 1.5 to 2 hours. It shall be spread over an area not more than one sqm at one

time. Average thickness of adhesive shall be 3 mm The adhesive so spreaded shall be combed using suitable trowel. Tiles shall be pressed firmly in to the position with slight twisting action checking it simultaneously to ensure good contact gently being tapped with wooden mallet till it is properly backed with adjoining tiles. The tiles shall be fixed within 20 minutes of application of adhesive. The surplus adhesive from the joints, surface of the tiles shall be immediately cleaned.

The surface of the flooring shall be frequently checked during laying with straight edge of above 2m long so as to attain a true surface with required slope. Where spacer lugs tiles are provided these shall be filled with grout with lugs remaining exposed. Where full size tile can not be fixed these shall be cut (sawn) to the required size and edges rubbed smooth to ensure straight and true joints. Tiles which are fixed in floor adjoining to wall shall enter not less than 10 mm under plaster, skirting or dado.



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.1		Cement concrete flooring 40mm thick	40 mm thick Cement concrete flooring 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate) 20mm nominal size stone aggregate in panels finished with a floating coat of neat cement including cement slurry, but excluding the cost of nosing of steps etc. complete.(Area of panel not to exceed 2.0 sqm)	sqm	270.00
11.2		52 mm thick cement concrete flooring with hardener topping 52 mm thick	52 mm thick cement concrete flooring with concrete hardener topping, under layer 40 mm thick cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 20 mm nominal size) and top layer 12 mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix: 2 graded stone aggregate 6 mm nominal size) by volume, hardening compound mixed @ 2 litre per 50kg of cement or as per manufacturers specifications. This includes cost of cement slurry, but excluding the cost of nosing of steps etc. complete.	sqm	399.00
11.3		Cement concrete flooring with hardener topping 62 mm thick	62 mm thick cement concrete flooring with concrete hardener topping, under layer 50 mm thick cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 20mm nominal size) and top layer 12mm thick cement hardener consisting of mix 1:2 (1 cement hardener mix: 2 graded stone aggregate, 6mm nominal size) by volume, hardening compound mixed @ 2 litre per 50kg of cement or as per manufactures specifications. This includes cost of cement slurry, but excluding the cost of nosing of steps etc. complete.	sqm	431.00
11.4		Cement plaster skirting	Cement plaster skirting 18 mm thick (upto 30 cm height) with cement mortar 1:3 (1 cement: 3 sand) finished with a floating coat of neat cement.	sqm	246.00
11.5		Cement concrete 1:2:4 pavement with	Cement concrete pavement with Cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 20 mm nominal size) including finishing complete.	cum	4654.00
11.6		Making chequers pattern	Making chequers of approved pattern on cement concrete floors, steps, landing, pavements etc.	sqm	21.00
11.7		Mosaic flooring (top layer 6mm thick)	40 mm thick marble chips flooring rubbed and polished to granolithic finish, under layer 34 mm thick cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 12.5mm nominal size) and top layer 6mm thick with white, black, chocolate, grey, yellow or green marble chips of sizes from		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			1mm to 4mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix : 7 marble chips) by volume including cement slurry etc. complete : (Area of panel not to exceed 2.0 sqm)		
	11.7.1	Dark shade pigment (grey cement)	Dark shade pigment with ordinary cement.	sqm	493.00
	11.7.2	Light shade pigment (white cement)	Light shade pigment with white cement.	sqm	550.00
	11.7.3	Medium shade pigment (white & grey cement)	Medium shade pigment with 50% white cement and 50% ordinary cement.	sqm	521.00
	11.7.4	Without pigment (white cement)	White cement without any pigment.	sqm	511.00
	11.7.5	Light shade pigment (grey cement)	Light shade pigment with ordinary cement.	sqm	499.00
	11.7.6	Without pigment (grey cement)	Ordinary cement without any pigment.	sqm	468.00
11.8		Mosaic flooring (Top layer 9mm thick)	40 mm thick marble chips flooring, rubbed and polished to granolithic finish, under layer 31mm thick cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 12.5mm nominal size) and top layer 9mm thick with white, black, chocolate, grey, yellow or green marble chips of sizes from 4mm to 7mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder : 7 marble chips) by volume including cement slurry etc. complete. (Area of panel not to exceed 2.0 sqm)		
	11.8.1	Dark shade pigment (grey cement)	Dark shade pigment with Ordinary cement.	sqm	526.00
	11.8.2	Light shade pigment (white cement)	Light shade pigment with white cement.	sqm	607.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	11.8.3	Medium shade pigment (white & grey cement)	Medium shade pigment with 50% white cement and 50% ordinary cement.	sqm	566.00
	11.8.4	Without pigment (white cement)	White cement without any pigment.	sqm	570.00
	11.8.5	Light shade pigment (grey cement)	Light shade pigment with ordinary cement.	sqm	532.00
	11.8.6	Without pigment(grey cement)	Ordinary cement without any pigment.	sqm	493.00
11.9		Mosaic flooring (top layer 12 mm thick)	40 mm thick marble chips flooring, rubbed and polished to granolithic finish, under layer 28 mm thick cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 12.5mm nominal size) and top layer 12mm thick with white, black, chocolate, grey yellow or green marble chips of sizes from 7mm to 10mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 2:3 (2 cement marble powder mix : 3 marble chips) by volume including cement slurry etc. complete :(Area of panel not to exceed 2.0 sqm)		
	11.9.1	Dark shade pigment (grey cement)	Dark shade pigment with ordinary cement.	sqm	563.00
	11.9.2	Light shade pigment (white cement)	Light shade pigment with white cement.	sqm	677.00
	11.9.3	Medium shade pigment (white & grey cement)	Medium shade pigment with 50% white cement and 50% ordinary cement.	sqm	620.00
	11.9.4	Without pigment (white cement)	White cement without any pigment.	sqm	620.00
	11.9.5	Light shade pigment (grey cement)	Light shade pigment with ordinary cement.	sqm	576.00
	11.9.6	Without pigment(grey cement )	Ordinary cement without any pigment.	sqm	519.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.10		Mosaic skirting	Marble chips skirting (upto 30 cm height) 18 mm thick with under layer 12 mm thick in cement plaster 1:3 (1 cement : 3 sand) : rubbed and polished to granolithic finish, top layer 6 mm thick with white, black, chocolate, grey, yellow or green marble chips of sizes from smallest to 4 mm nominal size laid in cement marble powder mix 3:1 (3 cement : 1 marble powder) by weight in proportion of 4:7 (4 cement marble powder mix : 7 marble chips) by volume :		
	11.10.1	Dark shade pigment (grey cement)	Dark shade pigment with ordinary cement.	sqm	572.00
	11.10.2	Light shade pigment (white cement)	Light shade pigment with white cement.	sqm	629.00
	11.10.3	Medium shade pigment (white & grey cement)	Medium shade pigment with 50% white cement and 50% ordinary cement.	sqm	601.00
	11.10.4	Without pigment (white cement)	White cement without any pigment.	sqm	602.00
	11.10.5	Light shade pigment (grey cement)	Light shade pigment with ordinary cement.	sqm	579.00
	11.10.6	Without pigment (grey cement)	Ordinary cement without any pigment.	sqm	549.00
11.11		Extra for laying terrazo flooring in staircase	Extra for laying terrazo flooring on staircase treads not exceeding 30 cm in width including cost of forming, nosing etc.	sqm	22.00
11.12		Glass strips in floors	Providing and fixing glass strips 40 mm wide and 4 mm thick in joints of terrazo/ cement concrete floors.	metre	34.00
11.13		Crazy marble stone flooring	18 mm thick crazy marble stone white, black or as specified marble stone flooring, including filling the gaps with light shade 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 white, black or white and black marble chips of sizes from 1mm to 4mm nominal size by volume), with under layer 25mm thick cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 12.5 mm nominal size), including rubbing, polishing and cement slurry etc. complete .	sqm	844.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.14		Mosaic tile flooring	Precast terrazo tiles 22mm thick with graded marble chips of size upto 12mm, laid in floors, and landings, jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete, on 20 mm thick bed of cement mortar 1:4 (1 cement : 4 sand) :		
	11.14.1	Light shade pigment (white cement)	Light shade using white cement.	sqm	813.00
	11.14.2	Medium shade pigment (white & grey cement)	Medium shade using 50% white cement and 50% ordinary cement.	sqm	756.00
	11.14.3	Dark shade (grey cement)	Dark shade using ordinary cement.	sqm	700.00
	11.14.4	Without pigment (grey cement)	Ordinary cement without any pigment.	sqm	700.00
11.15		Extra for mosaic tiles in staircase	Extra if terrazo tiles are laid in treads of steps not exceeding 30 cm in width.	sqm	28.00
11.16		Mosaic tiles in skirting	Precast terrazo tiles 22 mm thick with graded marble chips of sizes upto 12 mm in skirting and risers of steps not exceeding 30 cm in height on 12 mm thick cement plaster 1:3 (1 cement : 3sand) jointed with neat cement slurry mixed with pigment to match the shade of the tiles, including rubbing and polishing complete with tiles of :		
	11.16.1	Light shade pigment (white cement)	Light shade pigment using white cement.	sqm	954.00
	11.16.2	Medium shades pigment (white & grey cement)	Medium shades pigment using 50% white cement and 50% ordinary cement.	sqm	883.00
	11.16.3	Dark shade pigment (grey cement)	Dark shade pigment using ordinary cement.	sqm	811.00
	11.16.4	Without any pigment (grey cement)	Ordinary cement without any pigment.	sqm	750.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.17		Chequered mosaic tiles	Chequered terrazzo tiles 22 mm thick with graded marble chips of size up to 6 mm in floors jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete on 20 mm thick bed of cement mortar 1:4 (1 cement :4 sand) :		
	11.17.1	Light shade pigment (white cement)	Light shade pigment using white cement.	sqm	889.00
	11.17.2	Medium shades pigment (white & grey cement)	Medium shade pigment using 50% white cement, 50% ordinary cement.	sqm	807.00
	11.17.3	Dark shade pigment (grey cement)	Dark shade pigment using ordinary cement.	sqm	732.00
	11.17.4	Without any pigment (grey cement)	Ordinary cement without any pigment.	sqm	686.00
11.18		Chequered cement concrete tiles	Chequered precast cement concrete tiles any finish, any size 22 mm thick IS:13810-1993 ISI mark in footpath and courtyard jointed with neat cement slurry mixed with pigment to match the shade of tiles, 15mm thick screed bed in cement mortar 1:6 complete all as specified and directed by Engineer-in-Charge.		
	11.18.1	Light shade pigment (white cement)	Light shade pigment using white cement.	sqm	754.00
	11.18.2	Medium shades pigment (white & grey cement)	Medium shade pigment using 50% white cement 50% Grey cement.	sqm	669.00
	11.18.3	Dark shade pigment (grey cement)	Dark shade pigment using ordinary cement.	sqm	591.00
	11.18.4	without any pigment (grey cement)	Ordinary cement without any pigment.	sqm	535.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.19		Marble stone flooring	Marble stone flooring with 18 mm thick marble stone (sample of marble shall be approved by Engineer-in-charge) laid over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 sand and grey cement slurry, joints treated with white cement mixed with pigment to match colour of stone including rubbing and polishing complete with : (area of slabs over 0.5 sqm)		
	11.19.1	Makrana white	Makrana white second quality.	sqm	3051.00
	11.19.2	Raj Nagar plain	Raj Nagar plain.	sqm	1381.00
	11.19.3	Agaria	Agaria White/Morgarh	sqm	1882.00
	11.19.4	Katni marble	Katni marble	sqm	1555.00
	11.19.5	Black zebra	Black Zebra.	sqm	1315.00
	11.19.6	Udaipur green	Udaipur / Baroda green marble	sqm	1649.00
	11.19.7	Pink plain	Pink plain marble.	sqm	1448.00
	11.19.8	Jaisalmer yellow	Jaisalmer Yellow	sqm	1582.00
11.20		Marble stone in steps, riser, skirting and dado	Marble stone 18 mm thick in riser of step, skirting, dado and pillar laid on 12 mm average thick cement mortar 1:3 (1 cement: 3 sand and laid with white cement slurry) joints treated with white cement mixed with pigment to match the shade of the slab i/c rubbing and polishing complete. (area of slab over 0.50sqm.)		
	11.20.1	Makrana white	Makrana white second quality.	sqm	3675.00
	11.20.2	Raj Nagar plain	Raj Nagar plain.	sqm	1932.00
	11.20.3	Agaria	Agaria White/Morgarh	sqm	2455.00
	11.20.4	Katni marble	Katni marble	sqm	2113.00
	11.20.5	Black Zebra	Black Zebra.	sqm	1863.00
	11.20.6	Udaipur green	Udaipur / Baroda green marble	sqm	2211.00
	11.20.7	Pink plain	Pink plain marble.	sqm	2002.00
	11.20.8	Jaisalmer yellow	Jaisalmer Yellow	sqm	2141.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.21		Marble wall lining (vener work)	Marble work gang saw cut (polished and machine cut) of thickness 18 mm for wall lining (vener work), backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement: 3 sand), including pointing with white cementmortar 1:2 (1 white cement: 2 marble dust) withan admixture of pigment to match the marble shade (To be secured to the backing by means of cramps, which shall be paid for separately). (Area of slabs over 0.50 sqm.)		
	11.21.1	Makrana white	Makrana white second quality.	sqm	3773.00
	11.21.2	Raj Nagar plain	Raj Nagar plain.	sqm	2737.00
	11.21.3	Agaria	Agaria White/Morgarh	sqm	2553.00
	11.21.4	Katni marble	Katni marble	sqm	2219.00
	11.21.5	Black zebra	Black Zebra.	sqm	1961.00
	11.21.6	Udaipur green	Udaipur / Baroda green marble	sqm	2309.00
	11.21.7	Pink plain	Pink plain marble.	sqm	2100.00
	11.21.8	Jaisalmer yellow	Jaisalmer Yellow	sqm	2240.00
11.22		Marble& granite work for kitchen platforms, vanity counters, window sills , facias	Providing and fixing 18mm thick gang saw cut mirror polished (premoulded and prepolished) machine cut for kitchen platforms, vanitycounters, window sills , facias and similar locations of required size of approved shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 sand) with joints treated with white cement, mixed with matching pigment, epoxy touch ups, including rubbing, curing moulding and polishing to edge to givehigh gloss finish wherever required etc. complete at all levels. Samples approved by Engineer-in- Charge.		
	11.22.1	Marble granite	Raj Nagar plain/White Marble/Udaipur Green Marble /Zebra black	sqm	1797.00
	11.22.2	Granite fine grained	Granite fine grained dark crystal of other colours and various patterns	sqm	2356.00
	11.22.3	Granite coarse grained	Granite coarse grained light black/ light red/white with crystal of other colours and various patterns	Sqm	2113.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	11.22.4	Granite with various	Granite grey/pink/brown with various patterns	Sqm	1808.00
	11.22.5	Cuddpah	Cuddpah stone	sqm	1279.00
11.23		Extra for nosing marble	Extra for prefinished nosing to treads of steps of marble stone.	meter	164.00
11.24		Extra for marble flooring insteps	Extra for marble stone flooring in treads of steps and risers using single length upto 2.00 metre.	sqm	191.00
11.25		Extra for prefinished grooves	Extra for prefinished grooves to treads of steps of granite stone	metre	61.00
11.26		Italian marble mirror polished flooring	Providing and laying machine cut, mirror polished, Italian Marble stone (18 mm thick Italian Marble stone slab, Perlato, Rosso erona, Fire Red or Dark Emperadore etc.)work in flooring laid in required pattern in linear portion of the building all complete as per architectural drawings, with 18 mm thick stone slab laid over 20 mm (average) thick base of cement mortar 1:4 (1 cement: 4 sand) laid and jointed with white cement slurry @ 4.4 kg/sqm including pointing with white cement slurry mixed with pigment to match the marble shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge.	sqm	6558.00
11.27		Italian marble wall lining mirror polished	Providing and fixing machine cut, mirror / eggshell polished, Marble stone work 18 mm thick Italian Marble stone slab, Perlato, Rosso verona, Fire Red or Dark Emperadore etc. for wall lining (vener work) including dado, skirting, risers of steps etc., in required design and pattern wherever required, stones of different finished surface texture, on 12 mm (average) thick cement mortar 1:3 (1 cement : 3 sand) laid and jointed with white cement slurry @ 3.3 kg/sqm including pointing with white cement slurry admixed with pigment of matching shade, including rubbing, curing, polishing etc. all complete as per Architectural drawings, and as directed by the Engineer-in-Charge.	sqm	6957.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.28		Italian marble flooring in required design and patterns	Italian marble flooring in required design and patterns		
	11.28.1	Without epoxy coating	Providing and laying machine cut, mirror polished Italian Marble stone 18 mm thick Italian Marble stone slab,Perlato, Rosso verona, Fire Red or Dark Emperadore etc flooring, in required design (Simple geometrical, abstract etc.) and in patterns in combination with Italian marble stones of different colors, shades and finished surface texture etc., in linear portions of the building, all complete as per the architectural drawings, with 18 mm thick stone slab laid over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 sand) laid and jointed with white cement slurry @ 4.4 kg/sqm including pointing with white cement slurry admixed with pigment to match the marble shade including rubbing, curing and polishing etc all complete as specified and as directed by the Engineer-in-Charge.	sqm	7748.00
	11.28.2	With epoxy coating with fiber net	Premium high Quality machine, cut, mirror polished, italian marble (minimum compressive strength 1800 psi is compulsory) in required special design and in required special pattern in combination with different varieties italian marble and finished surface texture linear portion of the building all complete as per architectural drawings, with 18 mm thick stone slab with stone slab base side epoxy coating with fibre net and top side epoxy coating for increase strength and laid over 20mm (average) thick base of cement mortar 1:3 (1 cement : 3 sand ) laid and jointed with white cement slurry @ 4.4 Kg/sqm including pointing with white cement slurry admixed with pigment to match the marble shade resin and epoxy after every rubbing coat used epoxy and resin including rubbing, curing and polishing etc.(Italian marble has to be treated with epoxy resins and matching pigments to increase its strength)all complete as specified as directed by the Engineer-in-Charge.	sqm	9067.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.29		Granite wall lining (Polished)	Granite work gang saw cut (polished and machine cut) of thickness <b>18mm</b> for wall lining (vener work), backing filled with a grout of average 12 mm thick in cement mortar 1:3 (1 cement: 3 sand) including pointing with white cement mortar 1:2 (1 white cement: 2 marble dust) with an admixture of pigment to match the marble shade: (To be secured to the backing by means of cramps, which shall be paid for separately).		
	11.29.1	Stone slab over 0.50 sqm	Area of slab over 0.50 sqm		
	11.29.1.1	Granite (fine grained)	Fine grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2919.00
	11.29.1.2	Granite(coarse grained)	Coarse grained granite light Black/light Red/ off White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2675.00
	11.29.1.3	Granite of various patterns	Gray/Pink/Brown or equivalent with various patterns	sqm	2370.00
	11.29.2	Stone slab upto 0.50 sqm	Area of slab upto 0.50 sqm		
	11.29.2.1	Granite (fine grained)	Fine grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2705.00
	11.29.2.2	Granite(coarse grained)	Coarse grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2486.00
	11.29.2.3	Granite (with pattern)	Gray/Pink/Brown or equivalent with various patterns	sqm	2212.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.30		Mirror polished pre moulded granite flooring 18 mm thick	Providing and laying gang saw cut <b>18 mm thick</b> , mirror polished premoulded (wherever required) and pre polished machine cut granite stonework in flooring of required size shape of approved shade, color and texture in flooring laid over 20 mm thick base of cement mortar 1:4 (1 Cement: 4 sand) including grouting the joints with white cement mixed with matching pigments epoxy touch ups etc. complete as per direction of Engineer-in-Charge.		
	11.30.1	Stone slab over 0.50sqm	Area of slab over 0.50 sqm		
	11.30.1.1	Granite (fine grained)	Fine grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2642.00
	11.30.1.2	Granite(coarse grained)	Coarse grained granite light Black/light Red/ off White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2422.00
	11.30.1.3	Granite ( with pattern)	Gray/Pink/Brown or equivalent with various patterns	sqm	2153.00
	11.30.2	Stone slab upto 0.50sqm	Area of slab upto 0.50 sqm		
	11.30.2.1	Granite (fine grained)	Fine grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2455.00
	11.30.2.2	Granite(coarse grained)	Coarsegrained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	2258.00
	11.30.2.3	Granite (with pattern)	Gray/Pink/Brown or equivalent with various patterns	sqm	2011.00
11.31		Granite flooring 30mm thick mirror polished pre moulded	Providing and laying gang saw cut <b>30 mm thick</b> , mirror polished pre moulded and pre polished machine cut granite stone of required size and shape of approved shade, colour and texture in footpath, flooring in road side plazas and similar locations, laid over 20mm thick base of cement mortar 1:4 (1 cement: 4 sand) including grouting the joints with white cement mixed with matching pigment, epoxy touch ups etc. complete as per direction of Engineer-in-Charge. (area of slab more than 0.50 sqm)		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	11.31.1	Granite (fine grained)	Fine grained granite dark Black/dark Red/ White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	3616.00
	11.31.2	Granite(coarse grained)	Coarse grained granite light Black/light Red/ off White or equivalent with self design/ pattern/crystals of other colors of glitter	sqm	3250.00
	11.31.3	Granite (with pattern)	Gray/Pink/Brown or equivalent with various patterns	sqm	2793.00
11.32		Deduction	Deduct for not polishing granite flooring (item no 11.29 & 11.30)	sqm	130.00
11.33		Polished Granite Stone	Providing and laying Granite stone flooring in required design and patterns in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 18 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry admixed with pigment of matching shade including rubbing, curing and polishing and as directed by the Engineer-in-Charge Granite stone slab Dark Black, Dark Red, White or equivalent,		
	11.33.1	Flame finish	Flamed Finish Granite	sqm	2542.00
	11.33.2	Leather finish	Leather Finish Granite	sqm	2809.00
11.34		Granite work in riser steps, skirting, dado and pillars	Granite stone work 18mm thick of any colour in riser of steps, skirting, dado and pillars laid on 12 mm average thick cement mortar 1:3 (1 cement:3 sand) and jointed with white cement slurry mixed with pigment to match the shade of slab.	sqm	3413.00
11.35		Granite stone block paving	Providing and fixing 10x10x7.50 cm Granite stone block hand cut and chisel dressed on top, for paving in floors, drains etc. laid over 20mm thick base mortar 1:4 (1cement:4 sand) with joints 10mm wide filled with same mortar mixed with matching pigment including ruled pointing etc. complete as per direction of engineer-in charge.	sqm	2765.00
11.36		Kota stone flooring	Kota stone slab flooring over 20 mm (average) thick base laid over and jointed with grey cement slurry mixed with pigment to match the shade of the slab including rubbing and mirror polishing complete with base of cement mortar 1 : 4 (1 cement : 4 sand) 25 mm thick.(Area of slab to be over 0.25 sqm) Note: - Deduction shall be made for not mirror polishing according to item no 11.43	sqm	1029.00
11.37		Deduction for not using 25 mm thick stone	Deduction for using 20 mm thick slab instead of 25 mm thick slab of kota stone in item no 11.35	sqm	70.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.38		Kota stone in risers, skirting, dado and pillars	Kota stone slabs in risers of steps, skirting, dado and pillars laid on 12 mm (average) thick cement mortar 1:3 (1 cement 3 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete.		
	11.38.1	10-12 mm thick	10-12 mm thick	sqm	1001.00
	11.38.2	20 mm thick	20 mm thick	sqm	1054.00
11.39		Kota stone 40 mm chiseled dressed	Kota stone slab (area less than 0.5 sqm) rough chiseled dressed average 40 mm thick flooring for parking and open area of thickness over 20 mm (average) thick base laid over and jointed with grey cement slurry complete with base of cement mortar 1:4 (1 Cement : 4 Sand)	sqm	723.00
11.40		Edge moulding of stone work	Providing edge moulding to 18mm thick marble stone counters, Vanities, window sills etc. including machine polishing to edge to give high gloss finish etc. complete as per design approved by Engineer-in-Charge.		
	11.40.1	Marble work	Marble work	meter	160.00
	11.40.2	Granite work.	Granite work.	meter	269.00
11.41		Extra for marble /granite stone in facia and drops	Extra for fixing marble /granite stone over and above corresponding basic item, in facia and drops of width upto 150 mm with epoxy resin based adhesive including cleaning etc. complete.	meter	167.00
11.42		Extra for providing opening in marble/granite/stone work	Extra for providing opening of required size and shape for wash basins/ kitchen sink in kitchen platform, vanity counters and similar location in marble/Granite/stone work including necessary holes for pillar taps etc. including moulding, rubbing and polishing of cut edges etc. complete.	each	232.00
11.43		Mirror (glass) polishing	Mirror polishing on marble work/Granite work/stone work wherever required to give high gloss finish complete.	sqm	164.00
11.44		Fine dressed stone flooring flush joints	Fine dressed stone flooring over 20 mm (average) thick base of cement mortar 1:5 (1cement : 5 sand) with joints finished flush.		
	11.44.1	40 mm Red stone	Red sand stone	sqm	578.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	11.44.2	40 mm White stone	White sand stone	sqm	578.00
	11.44.3	40mm Lime stone	Grey lime stone	sqm	578.00
	11.44.4	25 mm Kota stone	Kota stone	sqm	678.00
11.45		Fine dressed sand stone flooring with joint pointing	40 mm thick fine dressed stone flooring over 20 mm (average) thick base of cement mortar 1:5 (1 cement : 5 sand) including pointing with cement mortar 1:2 (1 cement : 2 sand) with an admixture of pigment to match the shade of stone.		
	11.45.1	Red stone	Red sand stone	sqm	642.00
	11.45.2	White stone	White sand stone	sqm	642.00
11.46		Machine rubbed sand stone flooring	40 mm thick machine rubbed stone flooring over 20 mm (average) thick base of cement mortar 1:5 (1 cement :5 sand) with joints 3mm thick, side buttered with cement mortar 1:2 (1 cement : 2sand) mixed with pigment to match the shade of stone and pointing with same mortar		
	11.46.1	Red stone	Red sand stone	sqm	709.00
	11.46.2	White stone	White sand stone	sqm	709.00
11.47		Extra for nosing	Extra for pre finished nosing in treads of steps of Kota stone/ sand stone slab.	meter	39.00
11.48		Extra for stone work in stairs	Extra for Kota stone/ sand stone in treads of steps and risers using single length upto 1.05 metre.	sqm	10.00
11.49		Ceramic glazed floor tiles	Providing and laying Ceramic glazed floor tiles 300x300 mm or more (having thickness 6 to 7mm) of 1st quality conforming to IS : 15622 of approved make in any colours and shade laid on 20 mm thick Cement Mortar 1:4 (1 Cement : 4 sand) including pointing the joints with white cement and matching pigment etc., complete.	sqm	670.00
11.50		Ceramic glazed wall tiles	Providing and fixing Ceramic glazed wall tiles 300x450 mm or more (having thickness 6 to 7 mm) of 1st quality conforming to IS: 15622 of approved make in all Colours & shades, except burgundy, bottle green, black laid on 12mm thick bed of Cement Mortar 1:3 (1 Cement: 3 sand)preprad same day when mortar is still green jointed with grey cement slurry @3.3 kg per sqm including pointing the joints with white cement and matching pigments etc., complete.	sqm	776.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.51		Rectified ceramic floor tiles	Providing and laying rectified Glazed Ceramic floor tiles 300x300 mm or more (having thickness 9 to 10mm) of 1st quality conforming to IS : 15622 of approved make in all colours white, ivory, grey, fume red brown laid on 20mm thick cement mortar 1:4 (1 Cement : 4 sand) including grouting the joints with white cement and matching pigments etc., complete.	sqm	644.00
11.52		Rectified ceramic wall tiles	Providing and laying rectified Glazed Ceramic wall tiles 300x450 mm or more (thickness to be specified by the manufacturer) of 1st quality conforming to IS : 15622 of approved make in all colours white, ivory, grey, fume red brown laid on 12 mm thick cement mortar 1:3 (1 Cement : 3 sand) including grouting the joints with white cement and matching pigments etc., complete.	sqm	698.00
11.53		Antiskid floor tiles (heavy duty)	Providing and laying Antiskid floor tiles of any sizes, 12 mm thickness 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 sand) including grouting the joints with white cement with matching pigments etc., complete.	sqm	880.00
11.54		Deduct for not grouting the joints	Deduct for not grouting the joints with white cement and matching pigment in the items of fixing of vitrified tiles.	sqm	8.00
11.55		Deduct for not using cement mortar 1:4 bedding for flooring	Deduct for not using 20mm thick cement mortar 1:4 (1 cement: 4 sand) bedding in laying of floor tiles.	sqm	359.00
11.56		Fixing tiles/ marble or granite stone in flooring, skirkingdedo, pillars	Fixing glazed/ Ceramic/Rectified/ Vitrified floor tiles with cement based high polymer modified quick-set tile adhesive (Water based) conforming to IS: 15477, in average 3mm thickness.	sqm	350.00
11.57		Tactile tile	Providing and laying tactile tile (for vision impaired persons as per standards) of size 300x300x9.8mm having water absorption less than 0.05% and conforming to IS: 15622 of approved make in all colours and shades for outdoor floors such as footpath, court yard, multi modals location etc., laid on 20mm thick base of cement mortar 1:4 (1cement : 4 sand) in all shapes and patterns including grouting the joints with white cement mixed with matching pigments etc. complete as per direction of Engineer-in-Charge.	sqm	1307.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.58		Glass mosaic tiles	Providing and fixing Glass mosaic tiles at finished plain wall surface of size 20 mm x 20 mm x 4 mm in all colour, design, fixing in customize design as per direction of Engineer-in- Charge. The glass mosaic tiles to be fixed on the wall surface with the help of approved adhesive applied at the rate of 2.5 kg per sqm and grouting of the same. The rate is inclusive of all operation, material and required pattern approved by Engineer-in-Charge:	sqm	1556.00
11.59		Turf paver	Providing and laying 500x500x40mm thick Turf paver on 150mm thick sub grade of compacted bed of 20mm nominal size stone aggregate and base course with 50mm thick sand and filling joints with sand including spreading, well ramming, consolidating and finishing smooth etc. all complete as per direction of Engineer- in- charge.	sqm	1457.00
11.60		Acid and/ or alkali resistant tiles	Providing and fixing 10mm thick acid and/ or alkali resistant tiles of approved make and colour using acid and/ or alkali resisting mortar bedding and joints filled with acid and/ or alkali resisting cement as per IS : 4457 complete as per the direction of Engineer-in- Charge.		
	11.60.1	Flooring	In flooring on a bed of 10 mm thick mortar 1:4 (1 acid proof cement: 4 sand) Acid and alkali resistant tile.	sqm	1262.00
	11.60.2	Dado/skirting	In dado/skirting on 12 mm thick mortar 1:4 (1 acid proof cement: 4 sand). Acid and alkali resistant tile.	sqm	1368.00
11.61		Tile work in skirting, risers of steps and dado	8 mm thick.stones Tile work in skirting, risers of steps and dado (upto 2 m height) over 12 mm thick bed of cement mortar 1:3 (1 cement :3 sand) and jointed with grey cement slurry @ 3.3 kg/sqm including pointing in white cement mixed with pigment of matching shade complete.		
	11.61.1	Marble	Marble tiles (polished) Raj Nagar.	sqm	1119.00
	11.61.2	Granite	Granite tile of any colour /shade	sqm	1524.00
11.62		Cramps in RCC/CC/Brick masonry	Providing and fixing cramps of required size and shape in RCC/ CC /Stone/ Brick masonry backing with cement mortar 1:2 ( 1 cement :2 sand) including drilling necessary hole in stones and embedding the cramp in the hole (fastener to be paid separately).		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	11.62.1	Gunmetal	Gunmetal cramps.	kg	589.00
	11.62.2	S.S.	Stainless steel cramps.	kg	631.00
11.63		Expansion hold fasteners on C.C. / R.C.C./ Brick masonry	Providing and fixing expansion hold fasteners of wedge expansion type on C.C. / R.C.C./ Brick masonry surface backing including drilling necessary holes and the cost of bolt etc complete.		
	11.63.1	6 mm.	Fastener with threaded dia 6 mm.	each	25.00
	11.63.2	10 mm.	Fastener with threaded dia 10 mm.	each	29.00
	11.63.3	12 mm.	Fastener with threaded dia 12 mm.	each	46.00
11.64		Stone slab in urinal partitions	Providing and fixing stone slab table rubbed on both faces edges rounded and polished of size as required and 1.8 cm thick fixed in urinal partitions by cutting a chase of appropriate width with chase cutter and embedding the stone in the chase with epoxy grout or with cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 6 mm nominal size) as per direction of Engineer-in-charge and finished smooth.		
	11.64.1	White Agaria	White Agaria Marble Stone.	sqm	3046.00
	11.64.2	Granite Stone	Granite Stone of approved shade.	sqm	3422.00
11.65		Removable raised/false access flooring	Providing and fixing removable raised/false access flooring with system and its components of approved make for different plenum height with possible height adjustment upto 50 mm, comprising of modular load bearing floor panels supported on G.I. rectangular stinger frame work and G.I. Pedestal etc. all complete, as per the architectural drawings, as specified and as directed by Engineer-in-charge consisting of :  a) Providing at required spacing to form modular framework, pedestals made out of GI tube of thickness minimum 2 mm and 25 mm outer diameter, fully welded on to the G.I. Base plate of size 100mmx100mmx3mm at the bottom of the pedestal tube, G.I. pedestal head of size 75mmx75mmx3.5 mm welded with GI fully threaded stud 16mm outer diameter with two GI Check nuts screwed on the stud for level adjustment upto50mm, locking and stabilizing the		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>pedestal head in position at the required level. The pedestals shall be fixed to the subfloor (base) through base plate using epoxy based adhesive of approved make or the machine screw with rawl plug.</p> <p><b>b)</b> Stringers system in all steel construction hot dipped galvanized of rectangular size 570x20x30x0.80mm thick having holes at both ends for securing the stringers on to the pedestal head using fully threaded screws ensuring maximum lateral stability in all directions, the grid formed by the pedestal and stringer assembly shall receive the floor panel, this system shall provide adequate solid, rigid support for access floor panel, the system shall provide a minimum clear uninterrupted clearance between the bottom of the floor for electrical conduits and wiring etc. all complete as per the architectural drawings, as specified and as directed by the Engineer-in-charge.</p> <p><b>C)</b> Providing and fixing Access Floor panel of 600x600x32 mm medium grade Filled Steel anti static high pressure Lamination of 800H grade (FS800H). Access Floor panel shall be steel welded construction with an enclosed bottom pan with uniform pattern of 64 hemispherical cones. The top and bottom plates of Steel Gauges: top 0.6 mm and bottom 0.7 mm fused spot welded together (minimum 64 welds in each dome and 20 welds along each flange). The panel should be Corroresist epoxy coated for lifetime rust protection and cavity formed by the top and bottom plate is filled with Pyrogrip noncombustible Portland cementitious core mixed with lightweight foaming compound. The access floor shall be factory finished with Anti-static High Pressure laminate with Non Warp technology upto 1mm thickness for superior adhesion and Surface flatness within 0.75mm. The panel is to withstand a Concentrated Load of 363 kgs applied on area 25mm x 25mm without collapse in the centre of the panel which is placed on four steel blocks. The panel will withstand and Uniformly Distributed Load (UDL) minimum 1250 kg/sqm and an impact load of 50kg all complete as per the approved manufacturer's specification and as per the direction of Engineer-in-charge. All specification must be printed on the</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			side of the panel to ensure the quality of the product.		
	11.65.1		300 mm Finished Floor Height (FFH)	sqm	4002.00
	11.65.2		450 mm Finished Floor Height (FFH).	sqm	4044.00
11.66		Concrete interlocking paver block	Providing and laying factory made machine pressed precast cement concrete interlocking paver block of any shape and size conforming to IS:15658- 2006 and ISI marked of 60 mm thickness, M-30 grade with grey cement and pigment all as specified. Made by block making machine with strong vibratory compaction, laid in required colour and pattern over and including 50mm thick compacted bed of stone dust, filling the joints with sand etc. all complete as per the direction of Engineer-in-Charge.	sqm	586.00
11.67		Epoxy flooring self leveling	Providing Epoxy flooring self leveling type on strong base in desired colour/design as approved by Engineer-in-Charge. Resin for epoxy is to be of floor grade type i/c appropriate hardner and filler material. with 5 year defect liability period (This item is to be used only for operation theaters in hospitals)		
	11.67.1	1 mm	1 mm thick	sqm	1198.00
	11.67.2	2 mm	2 mm thick	sqm	1825.00
	11.67.3	3 mm	3 mm thick	sqm	2452.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.68		Heterogeneous 3.25mm thick acoustic PVC vinyl flooring	Providing and fixing acoustic PVC (Poly Vinyl Flooring) EN (European Standard) over fiberglass mat PVC foam backing (EN 14904), total thickness is 3.25mm (EN 428/EN 427), wear layer is 0.85 mm thick (EN 429), anti-bacterial and anti-fungus surface treatment (sanitized), reinforced, total weight is 3240g/m <sup>2</sup> approx. (EN 430), abrasion group T (EN660-1,660-2), dimensional stability <0.10% (EN-434), reaction to fire (EN 13501-1) Bfls1 on fibre cement substrate, static indentation (EN 433: 0.12mm), castor chair test qualified –no damage (EN-425), furniture leg test qualified (EN 424)-no damage, underfoot comfort (EN 433) ≥ 0.40mm, impact sound reduction(EN ISO 140-8,EN ISO 717-2) Δlw19Db, acoustical improvement (NF S31-074)-class A, certificate NF UPEC.A+(NF 189) - registered, no formaldehyde emission (EN 717-1), no pentachlorophenol (EN 12673), 100% recyclable (eco-friendly), includes 26% of recycled content, includes 52% natural product, low VOC emissions after 28 days of installation (lower than ≤100µg/m <sup>3</sup> ), static effect(EN ISO 846) -sanitized, chemical resistance test qualified (EN-423)-high resistance, thermal and underfloor heating test qualified (EN12524) - all vinyl sheets must be linked crosswise with a continuous copper strip and finally connected to earth for grounding electrostatic electrical charges. Suitable and slip resistant. Recommended to use in area like Lecturer room, Conference room, Kids area, School, colleges, Residential and all commercial official scope etc.	sqm	4221.00
11.69		Heterogeneous 2 mm thick Pvc vinyl flooring	Providing and fixing 2 mm thick heterogeneous PVC (poly vinyl flooring) EN (European Standard) with wear layer is 0.55mm thick of PVC, total weight is 2300 g/m <sup>2</sup> approx. PUR (polyurethane reinforced), residual indentation approx.0.05 mm, castor wheel test qualified, dimensional stability ≤0.10%, static electrical charge <2kv, all vinyl sheets must be linked crosswise with a continuous copper strip and finally connected to earth for grounding electrostatic electrical charges. good resistance to	sqm	2218.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			scratch, slip, chemical and fire, doesn't favour in growth of fungi & bacteria. 100% recyclable (eco-friendly). Low VOC emissions after 28days of installation (lower than $\leq 10\mu\text{g}/\text{m}^3$ ). phthalate free technology. directional in design. The floor finish should termite free at the room perimeter passing over a concealed cove forming and continuing up on the wall upto 100mm. Recommended to use in area like Patient rooms, Doctor room Lecturer room, Kids area, School, Colleges, Residential and all commercial official scope etc.		
11.70		Laminated wooden flooring	Providing and fixing 8mm and above thick laminated (wooden flooring) of AC4 and above grade product of approved made out of core high density fibre board (HDF), surface layer shall be high pressure laminated treated for abrasion, scratch, moisture protection, flame protection U.V resistant, layer of acrylic resin, aluminium oxide or similar layer having above properties, backing under layer on min 2 mm thickness shall provide as sound absorbent and moisture protection layer, The seamless impregnated decorative layer of specified size, design, colour and pattern, all bonded together under high temperature and pressure with eco-friendly. The material shall be applicable warranty formaldehyde free, eco-friendly and fully recyclable (eco-friendly) and matching shed and excluding quantity of skirting and profile.	sqm	1758.00
11.71		Brick on edge flooring	Brick on edge flooring with bricks of class designation 7.5 on a bed of 12 mm cement mortar, 1:6 (1 cement : 6 sand) including filling the joints with same mortar, with common burntclay non modular bricks		
	11.71.1	100 mm	100 mm thick	sqm	480.00
	11.71.2	200 mm	200mm thick	sqm	960.00
11.72		Chamfered edge cement concrete paver blocks over	Providing and laying factory made chamfered edge Cement Concrete paver blocks in footpath, parks, lawns, drive ways or light traffic parking etc. of required colour strength, thickness pattern, surface texture (smooth/rough) and size/shape, conforming to 15658-2006 made by table vibratory method using PU mould, laid in required colour and pattern over 50mm thick compacted bed of sand, compacting and	sqm	840.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			proper embedding/ laying of inter locking paver blocks into the bedding layer through vibratory compaction by using plate vibrator, filling the joints with sand and cutting of paver blocks as per required size and pattern, finishing and sweeping extra sand including locking with M15 cement concrete in footpath, parks, lawns, drive ways or light traffic parking etc. complete as per manufacturer's specifications and direction of Engineer-in-Charge.		
	11.72.1	80mm thick	80 mm thick C.C. paver block of M-35 grade	sqm	656.00
	11.72.2	60mm thick	60 mm thick C.C. paver block of M-35 grade	sqm	556.00
	11.72.3	60mm thick	60 mm thick C.C. paver block of M-30 grade	sqm	518.00
11.73		Kerb stone M-25	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-Charge).	cum	6097.00
11.74		Precast RCC pavement slab	Providing and fixing at or near ground level factory made RCC pavement slab of M-30 grade of size 450x450x50 mm, including reinforcement with 6 mm dia M.S. bars 4 nos on each side (top & bottom), including setting in position in footpath to the required level and line over a bed of 20 mm average thick cement mortar 1:5 (1 cement : 5 sand), having joint thickness not more than 5mm except on curve, including filling of joints with same cement mortar and making grooves etc. complete as per direction of Engineer-in-Charge.	sqm	718.00
11.75		Granite door frame	Providing and fixing 16mm thick gang saw cut mirror polished premoulded and prepolished machine cut Granite of approved shade, colour and texture of Granite Door frame. in cement mortar 1:3 (1 cement :3 sand) including pointing with an admixture of pigment to match the shade		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			including fixing of granite stone door frame with epoxy resin based adhesive including secured to the backing by means of cramps, drilling of hole with rawl plugs and screws 75mm long cleaning etc. complete. Including rubbing, curing, moulding and polishing edges to give high glossy finish and drilling of hole for fixing stainless steel hinges, aldrops, towerbolts etc complete at all levels as per instruction of Engineer-in-Charge.		
	11.75.1	100 mm wall	Granite Door frame for 100mm thick wall Thickness.	metre	1010.00
	11.75.2	200 mm wall	Granite Door frame for 200mm thick wall Thickness.	metre	1512.00
11.76		Vitrified floor tiles nano polished	Providing and laying vitrified floor tiles (without soluble salt) or printed (with soluble salt) Nano polished (Glossy finish) in different sizes with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours & shades, 1 <sup>st</sup> quality/ premium quality in flooring laid on 20mm thick cement mortar 1:4 (1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11.76.1	Light shade	Plain ivory light shade Size 600X600mm thickness 9-10mm	sqm	950.00
	11.76.2	Dark shade	Dark shade (terracotta) Size 600X600mm thickness 9-10mm	sqm	1033.00
11.77		Vitrified floor tiles nano polished skirting	Providing and laying vitrified floor tiles (without soluble salt) or printed (with soluble salt) Nano polished (Glossy finish) in different sizes with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours & shades, 1 <sup>st</sup> quality/ premium quality in skirting laid on 12mm thick cement mortar 1:4 (1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11.77.1	Plain ivory	Plain ivory light shade Size 600X600mm thickness 9-10mm	sqm	940.00
	11.77.2	Dark shade	Dark shade (terracotta) Size 600X600mm thickness 9-10mm	sqm	1022.00
11.78		Vitrified floor tiles multi charged	Providing and laying vitrified floor tiles Multi/Double charged (Minimum top layer thickness 2.0mm) Nano Polished self design, in different size with water absorption less than 0.05% and conforming to IS:15622 of approved		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			make in all colours& shades, quality/ premium quality in flooring laid on 12mm thick cement mortar 1:4(1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11.78.1	Light shade	In light shade glossy/ rustic /stain finished		
	11.78.1.1	600X600	Size 600X600 mm thickness 9-10 mm	sqm	1104.00
	11.78.1.2	800X800	Size 800X800mm thickness 11-12mm	sqm	1223.00
	11.78.1.3	800X1200	Size 800X1200 mm thickness 11-12mm	sqm	1413.00
	11.78.2	Dark shade	In dark shade glossy/ rustic /stain finished		
	11.78.2.1	600X600	(a) Size 600X600 mm thickness 9-10 mm	sqm	1169.00
	11.78.2.2	800X800	(b) Size 800X800mm thickness 11-12mm	sqm	1295.00
	11.78.2.3	800X1200	(c) Size 800X1200 mm thickness 11-12mm	sqm	1521.00
11.79		Vitrified floor tiles multi charged tiles in skirting	Providing and laying vitrified floor tiles Multi/Double charged (Minimum top layer thickness 2.0mm) Neno Polished self design, in different size with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours& shades, 1 <sup>st</sup> quality/ premium quality in skirting laid on 12mm thick cement mortar 1:4(1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11.79.1	Light shade	In light shade glossy/ rustic /stain finished		
	11.79.1.1	600X600	(a) Size 600X600 mm thickness 9-10 mm	sqm	1093.00
	11.79.1.2	800X800	(b) Size 800X800mm thickness 11-12mm	sqm	1212.00
	11.79.1.3	800X1200	(c) Size 800X1200 mm thickness 11-12mm	sqm	1403.00
	11.79.2	Dark shade	In dark shade glossy/rustic/stain finished		
	11.79.2.1	600X600	(a) Size 600X600 mm thickness 9-10 mm	sqm	1159.00
	11.79.2.2	800X800	(b) Size 800X800mm thickness 11-12mm	sqm	1284.00
	11.79.2.3	800X1200	(c) Size 800X1200 mm thickness 11-12mm	sqm	1510.00
11.80		Vitrified floor-tiles full body	Providing and laying vitrified floor-tiles Full Body Design Homogenous Body matt/rustic finish in different size with water absorption less than		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			0.05% and conforming to IS:15622 of approved make in all colours& shades, 1 <sup>st</sup> quality/ premium quality in flooring laid on 20mm thick cement mortar 1:4(1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11.80.1	Light colour	In light colour and shades as ivory, beige blanco, grey etc.		
	11.80.1.1	300X300	(a) Size 300X300 mm thickness 9-10 mm	sqm	934.00
	11.80.1.2	600X600	(b) Size 600X600mm thickness 9-10mm	sqm	1206.00
	11.80.1.3	600X600	(c) Size 600X600 mm thickness 11-12mm (to be used heavy duty indoor areas of non residencial buildings only such as schools, hostels, libraries hospitals, institutions, offices etc.)	sqm	1349.00
	11.80.2	Dark colour	In dark colour and shade etc.		
	11.80.2.1	300X300	(a) Size 300X300 mm thickness 9-10 mm	sqm	946.00
	11.80.2.2	600X600	(b) Size 600X600mm thickness 9-10mm	sqm	1340.00
	11.80.2.3	600X600	(c) Size 600X600 mm thickness 11-12mm (to be used in heavy duty indoor areas of non residencial buildings only such as schools, hostels, libraries hospitals, institutions, offices etc.)	sqm	1546.00
11.81		Vitrified floor-tiles full body skirting, riser	Providing and laying vitrified floor-tiles Full Body Design Homogenous Body matt/rustic finish in different size with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours& shades, 1 <sup>st</sup> quality/ premium quality in skirting, riser laid on 12mm thick cement mortar 1:4(1cement :4sand) including grouting the joints with white cement and matching pigments etc. complete		
	11. 81.1	Light colour	In light colour and shades as ivory, beige blanco, grey etc.		
	11. 81.1.1	300X300	(a) Size 300X300 mm thickness 9-10 mm	sqm	923.00
	11. 81.1.2	600X600	(b) Size 600X600mm thickness 9-10mm	sqm	1196.00
	11. 81.2	Dark colour	In dark colour and shades etc.		
	11. 81.2.1	300X300	(a) Size 300X300 mm thickness 9-10 mm	sqm	935.00
	11. 81.2.2	600X600	(b) Size 600X600mm thickness 9-10mm	sqm	1329.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.82		Vitrified tiles (PGVT)/(GVT)	Providing and laying digital print random design(PGVT)/(GVT) vitrified tiles in different sizes with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours& shades, 1 <sup>st</sup> quality/ premium quality including grouting the joints with white cement and matching pigments etc. complete		
	11. 82.1	For floor	For floor glossy/ rustic /stain/matt finished laid on 20mm thick cement mortar 1:4 (1 cement:4sand)		
	11. 82.1.1	600X600	Size 600X600 mm thickness 9-10 mm	sqm	1140.00
	11. 82.1.2	800X800	Size 800X800mm thickness 9-10 mm	sqm	1261.00
	11. 82.1.3	800X1600	Size 800X1600mm thickness 9-10 mm	sqm	1489.00
	11. 82.1.4	1000X1000	Size 1000X1000mm thickness 9-10 mm	sqm	1388.00
	11. 82.1.5	600X1200	Size 600X1200 mm thickness 9-10 mm	sqm	1235.00
	11. 82.1.6	800X1200	Size 800X1200 mm thickness 9-10 mm	sqm	1450.00
	11. 82.1.7	1200X1200	Size 1200X1200 mm thickness 9-10 mm	sqm	1596.00
	11. 82.1.8	1200X1800	Size 1200X1800mm thickness 9-10 mm	sqm	1715.00
	11. 82.1.9	1200X2400	Size 1200X2400 mm thickness 9-10 mm	sqm	2403.00
	11. 82.2	For wall (stain / rustic )	For wall stain / rustic finished laid on 12mm thick cement mortar 1:3 (1 cement:3sand) prepared same day when mortar is still green i.e. within 6 hours,		
			Size 300X600 mm thickness 9-10 mm	sqm	968.00
	11. 82.3	For wall (polished / Glossy)	For wall polished / Glossy finished laid on 12mm thick cement mortar 1:3 (1 cement:3sand) prepared same day when mortar is still green i.e. within 6 hours,		
			Size 300X600 mm thickness 9-10 mm	sqm	1048.00
11.83		Vitrified tiles (PGVT)/(GVT) in skirting, riser	Providing and laying digital print random design(PGVT)/(GVT) vitrified tiles in different sizes with water absorption less than 0.05% and conforming to IS:15622 of approved make in all colours& shades, 1 <sup>st</sup> quality / premium in skirting, riser laid our 12mm thick cement mortar 1:3 including grouting the joints with white cement and matching pigments etc. complete		
	11. 83.1	For skirting	For skirting, risers etc. glossy/ rustic /stain/matt finished in all colours and shades		
	11. 83.1.1	600X600	Size 600X600 mm thickness 9-10 mm	sqm	1129.00
	11. 83.1.2	800X800	Size 800X800mm thickness 9-10 mm	sqm	1250.00
	11. 83.1.3	600X1200	Size 600X1200 mm thickness 9-10 mm	sqm	1224.00
	11. 83.1.4	800X1200	Size 800X1200 mm thickness 9-10 mm	sqm	1440.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.84		Granite work in wall lining, skirting etc	Granite work gang saw cut (polished machine cut) of thickness 12 mm for wall lining, skirting, risers of steps and dado (veneer work), back filling with a grout of average 12 mm thick in cement mortar 1:3 (1 Cement: 3 sand) including pointing with white cement mortar 1:2 (1 white cement: 2 marble dust) with an admixture of pigment to match the marble shade: (To be secured to the beaching by means of cramps, which shall be paid for separately).		
	11. 84.1	Area more than 0.18 sqm	Area of tiles not less 0.18 sqm		
	11. 84.1.1	Fine granite pattern	Fine granite dark Black/dark Red/ White with self design/ pattern/crystals of other colors of glitter	sqm	2296.00
	11. 84.1.2	Course granite patterns	Course granite light Black/light Red/ off White with crystals of other colors and various patterns	sqm	2113.00
	11. 84.1.3	Various patterns	Gray/Pink/Brown with various patterns	sqm	1879.00
11.85		Granite work in flooring	Providing and laying gang saw cut <b>12mm</b> thick, mirror polished pre moulded (wherever required) and pre polished machine cut granite stone of required size and shape of approved shade, colour and texture in flooring laid over 20mm thick base of cement mortar 1:4(1cement:4sand) including grouting the joints with white cement mixed with matching pigments, epoxy touch ups etc. complete as per direction of Engineer-in-Charge.		
	11. 85.1	Area more than 0.18 sqm	Area of tiles not less 0.18 sqm		
	11. 85.1.1	Fine grained granite pattern	Fine grained granite dark Black/dark Red/ White with self design/ pattern/crystals of other colors of glitter	sqm	1775.00
	11. 85.1.2	Coarse granite patterns	Coarse grained granite light Black/light Red/ off White with crystals of other colors and various patterns	sqm	1610.00
	11. 85.1.3	Various patterns	Gray/Pink/Brown with various patterns	sqm	1404.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.86		Artificial synthetic green grass	Providing and fixing artificial synthetic green long and fine yarns grass, UV/water resistant with SBR latex backing eco-friendly durable high density 100 % PP ( Poly Poplin ) anti UV fiber.denier 12000 dtex, stich rate 18 stiches per 10cm, stich density 16800 stiches/m2, tuftedweight 1830g/sqm approx.		
	11.86.1	Artificial synthetic green grass – 25mm thick	Roll size will be 25.00m X 2.00m (25mm thick)- weight 150kg- per roll.	sqm	2265.00
	11.86.2	Artificial synthetic green grass – 40mm thick	Roll size will be 25.00m X 2.00m (40mm thick)- weight 180kg- per roll.	sqm	2656.00
11.87		Laminated (engineered wooden flooring) 10-14mm thick	Providing and fixing laminated (engineered wooden flooring) of suitable thickness 10-14 mm of suitable grade category product of approved made out of core high density fibre board (HDF) & other component it treated for abrasion ,scratch ,moisture protection, flame protection,U.V resistant. backing under layer on min 2 mm thickness shall provide as sound absorbent and moisture protection layer .The Seamless impregnated decorative layer of specified size. design, colour and pettern, all bonded together under high temperature and pressure with eco-friendly resins specified by the manufacturer .The material shall be applicable warranty formaldehyde free, eco friendly, highly recommended for high traffic area and fully recyclable and matching shed and excluding quantity of skirting and profile.	sqm	7459.00
11.88		Homogeneous (solid wooden flooring)- 14-18mm thick	Providing and fixing single layer homogeneous (solid wooden flooring) of suitable thickness 14 - 18 mm of suitable grade category product of scratch protection, moisture protection, flame protection U.V. resistant, backing under layer on min 2 mm thickness shall provide as sound absorbent and moisture protection layer of specified design,colour and pattern, all bonded together under high temperature and pressure with eco-friendly resins specified by the manufacturer .The material shall be applicable warranty formaldehyde free, eco friendly ,highly recommended for high traffic area and fully	sqm	9801.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			recyclable and matching shade and excluding quantity of skirting and profile.		
11.89		Carpet tile / carpet	Providing and fixing tufted 1/10" loop pile (carpet tile / Carpet). EN (European Standard) size 50cm x 50cm /roll Size of total thickness 5.5 mm and above with total mass of 4100g/m2 approx and with polyester fleece primary backing with standard dimensional stability with impact sound / noise reduction and recommended for high traffic acoustical area.	sqm	3233.00
11.90		Stone plastic composite (pvc vinyl flooring)	Providing and fixing spc (stone plastic composite) virgin pvc water resistant proof vinyl flooring with a thickness between 4 to 8mm uv coated layer with a wear layer of 0.3 to 0.80mm with a SPC core layer of 2.00 to 5.00 mm with a SOP of heat resistant, voc free, easy to cut, anti microbial protection in the form of tiles, planks helpful in environmental of protection health.	sqm	4230.00
11.91		Fine grain sand stone tile flooring 20 mm thick	Providing and laying pre mirror polished/ pre polished fine grain machine cut sand stone tile flooring 20mm thick (hardness should not be less than 7 and water absorption should not be more than 0.3%) of required size and shape of approved shade, flooring in plazas open staircase and similar locations, laid over 20 mm thick base of cement mortar 1:4 (1 cement : 4 coarse sand) including grouting the joint with white cement mix with matching pigment etc. complete as per direction of Engineer-in-Charge.		
	11. 91.1	300x300mm	300x300mm	sqm	1182.00
	11. 91.2	400x400mm	400x400mm	sqm	1207.00
	11. 91.3	600x600mm	600x600mm	sqm	1328.00
11.92		Fine grain sand stone slab flooring 20 mm thick	Providing and laying pre mirror polished/ pre polished fine grain machine cut sand stone slab flooring 20mm thick (hardness should not be less than 7 and water absorption should not be more than 0.3%) of required size of area more than .50 sqm and shape of approved shade, flooring in plazas open staircase and similar locations, laid over 20mm thick base of cement mortar 1:4(1 cement : 4 coarse sand) including grouting the joint with cement mix matching pigment etc. complete as per direction of Engineer -in-Charge.	sqm	1686.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
11.93		Vinyl flooring of 4.5 mm thick	Supply and application of vinyl flooring of 4.5 mm thick with 1.5 mm wear layer comes in all size of (1.8mx15m) available in different color options. PVC vinyl cushion indoor flooring comes with indentation of less than 0.5 and also have good abrasion and impact resistance. It also have better shock absorption property of more than 35 and good ball rebound property of about 98%.	sqm	2086.00
11.94		Adhesive PU-Tactile tiles	Providing and fixing coloured self adhesive PU-Tactile tiles, ground surface indicators made of Polyurethane of size 300x300mm conforming to AST MD 1204,ASTMD 638,ASTMD 4060 ASTMD 2240 for guiding/warning to the visually impaired visitors in the center/side of the pedestrian/ approach path way as per the specification and Harmonised guideline complete in all respect to the entire satisfaction of Engineer-in-charge.	sqm	3260.00
11.95		Woven vinyl Acoustical floorings	Providing and fixing Woven vinyl Acoustical floorings with roll dimensions of 1.8/2mtr meters width and length of 20 meters or Tiles size as per company standard should be approved by architect. 2.50-2.80 mm thickness to laid on hard, levelled, smooth and moisture free sub floor. Woven Vinyl flooring should have traffic classification 33 and weight of 2.7-3.5 kg/m <sup>2</sup> . Flooring should have caster chair EN-985 tested with color fastness of more than 6. It should be ASTM E662 qualified on Smoke density test. Product must be fire rating of the product should be Bfl-S1. Any Joints in flooring rolls should be sealed with cold welding. This work will be inclusive of all Labour, Raw Material, Hardware, adhesive etc. complete. Flooring will be provided as per approved shade and colour in ,as per the satisfaction of the Architect and Engg. Incharge.	sqm	2889.00
11.96		Teak wood flooring system for Auditorium Stage / Sports flooring	Supply and Installation of Teak wood flooring system for Auditorium Stage / Sports flooring SURFACE BOARD: - Teak Wood Sports Flooring - Grade 1"LABO SPORTS Test Certify finished with 21 mm thick, 55 to 85mm wide and in random length in tongue and groove shape. The edges of the boards will have a finger lock groove and the bottom side with air pass groove and treated with special anti-termite and water-resistant lacquer. THE UNDER FRAME: - Resilient SPF Pine Wood sleeper subfloor of 70 mm x 45 mm, treated with anti-termite solution and fixed on the bottom side with 10 mm thick EPDM rubber pads, stapled through the two wings at 350	Sqm	9480.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>mm x 350 mm.</p> <p>INSTALLATION: - IPS subfloor treated with a vapour barrier to be placed on the levelled IPS sub-floor before laying the under frame. The runners having air cushion pads to be placed on the vapour barrier in perfect level at 350 mm in 1 direction. The surface board to be screwed to the runner through the tongue only and will lock the screwed tongue by the groove of adjoining board. Ends of the boards will be locked by inserting the wooden fingers through the edge grooves and fixed with suitable adhesive. The expansion of 12-15 mm will be left open between the wooden flooring and the surrounding.</p> <p><b>Note:-</b> The item shall be executed only after the permission of Chief Engineer/ Additional Project Director.</p>		



**CHAPTER – 12.0**  
**ROOFING AND CEILING**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1.	IS 73	Specification for paving Bitumen
2.	IS 277	Galvanised steel sheets (plain and corrugated)
3.	IS 651	Glazed stoneware pipes and fittings
4.	IS 702	Specification for industrial bitumen
5.	IS 1199	Methods of sampling and analysis of concrete
6.	IS 1200 (Part-IX)	Method of measurements of building and civil engineering works: Part - 9 Roof covering ( including cladding)
7.	IS 1200 (Part-X)	Method of measurements of building and civil engineering works: Part -10 ceiling and lining
8.	IS 1230	Cast iron rain water pipes and fitting
9.	IS 1367 (Part-13)	Technical supply conditions for threaded steel fasteners pt.13 hot dip galvanized coating on threaded fasteners
10.	IS 2095 (Part-1)	Gypsum plaster boards (Pt.1) plain Gypsum plaster boards
11.	IS 2115	Code of practice for flat roof finish: mud phuska
12.	IS 2633	Method of testing uniformity of coating on zinc coated articles
13.	IS 2645	Specification for integral water proofing compounds for cement mortar and concrete
14.	IS 3007 (Part-1)	Code of practice for laying of asbestos cement sheets: part- 1 corrugated sheets
15.	IS 3007 (Part-2)	Code of practice for laying of asbestos cement sheets part- 2 semi-corrugated sheets
16.	IS 3087	Particle boards of wood and other lignocellulogic materials (medium density) for general purposes - specifications
17.	IS 3144	Methods of test for mineral wool thermal insulation materials
18.	IS 3346	Method of the determination of thermal conductivity of thermal insulation materials
19.	IS 3348	Specification for fibre insulation boards
20.	IS 3384	Specification for bitumen primer for water proofing and damp proofing
21.	IS 4671	Expanded polystyrene for thermal insulation purposes
22.	IS 5382	Specification for rubber sealing rings for gas mains, water mains and sewers
23.	IS 5688	Methods of test of performed block type and pipe covering type thermal insulations
24.	IS 6598	Cellular concrete for thermal insulation
25.	IS 7193	Specification for glass fibre base coal tar pitch and bitumen felts (Amendment I)
26.	IS 8183	Bonded mineral wool
27.	IS 10192	Specifications for synthetic resin bonded glass fibre (SRBGF) for electrical purposes.
28.	IS 13592	Unplasticised polyvinyl chloride (UPVC) pipes for soil and Waste discharge system for inside and outside building.
29.	IS 14753	Specifications for polymethyl Methacrylate (PMMA) (Acrylic) sheets
30.	IS 14862	Fibre cement flat sheets – specifications
31.	IS 14871	Specifications for products in fibre reinforced cement - Long corrugated or Asymmetrical section sheets and fittings for roofing and cladding.

**PREAMBLE**  
**ROOFING AND CEILING**  
**(CHAPTER: 12.0)**

**CORRUGATED GALVANISED STEEL SHEET ROOFING**

**12.1 C.G.S. Sheets**

These shall be of the thickness specified in the description of the item and shall conform to IS 277. The sheets shall be of 275 grade of coating unless otherwise specified in the description of item. The sheets shall be free from cracks, split edges, twists, surface flaws etc. They shall be clean, bright and smooth. The galvanising shall be non-injured and in perfect condition. The sheets shall not show signs of rust or white powder deposits on the surface. The corrugations shall be uniform in depth and pitch and parallel with the side.

**12.2 Slope**

Roof shall not be pitched at a flatter slope than 1 vertical to 5 horizontal. The normal pitch adopted shall usually be 1 vertical to 3 horizontal

**12.3 Laying and Fixing**

The sheets shall be laid and fixed in the manner described below, unless otherwise shown in the working drawings or directed by the Engineer-in-Charge.

The sheets shall be laid on the purlins to a true plane, with the lines of corrugations parallel or normal to the sides of the area to be covered unless otherwise required as in special shaped roofs.

The sheets shall be laid with a minimum lap of 15 cm at the ends and 2 ridges of corrugations at each side. The above minimum end lap of 15 cm shall apply to slopes of 1 vertical to 2 horizontal and steeper slopes. For flatter slopes the minimum permissible end lap shall be 20 cm. The minimum lap of sheets with ridge, hip and valley shall be 20 cm measured at right angles to the line of the ridge, hip and valley respectively. These sheets shall be cut to suit the dimensions or shapes of the roof, either along their length or their width or in a slant across their lines of corrugations at hips and valleys. They shall be cut carefully with a straight edge chisel to give a smooth and straight finish.

Lapping in C.G.S. sheets shall be painted with a coat of approved steel primer and two coats of painting with approved paint suitable for G.S. sheet, before the sheets are fixed in place. Sheets shall not generally be fixed into 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 a projecting drip course, the later to cover the junction by at least 7.5 cm.

The laying operation shall include all scaffolding work involved.

Sheets shall be fixed to the purlins or other roof members such as hip or valley rafters etc. with galvanised J or L hook bolts and nuts, 8 mm diameter, with bitumen and G.I. limpet washers or with a limpet washer filled with white lead as directed by the Engineer-in-Charge. While J hooks are used for fixing sheets on angle iron purlins, and L hooks are used for fixing the sheet to R.S. joists, timber or precast concrete purlins. The length of the hook bolt shall be varied to suit the particular requirements. The bolts shall be sufficiently long so that after fixing they project above the top of the nuts by not less than 10 mm. The grip of J or L hook bolt on the side of the purlin shall not be less than 25 mm. There shall be a minimum of three hook bolts placed at the ridges of corrugations in each sheet on every purlin and their spacing shall not exceed 30 cm. Coach Screws shall not be used for fixing sheets to purlins.

The galvanised coating on J or L hooks, and bolts shall be continuous and free from defects such as blisters, flux stains, drops, excessive projections or other imperfections which would impair serviceability. Where slopes of roofs are less than 21.5 degrees (1 vertical to 2.5 horizontal) sheets shall be joined together at the side laps by galvanised iron bolts and nuts 25 × 6 mm size, each bolt provided with a bitumen and a G.I. limpet washer or a G.I. limpet washer filled with white lead. As the overlap at the sides extends to two corrugations, these bolts shall be placed zig-zag over the two overlapping corrugations, so that the ends of the overlapping sheets shall be drawn tightly to each other. The spacing of these seam bolts shall not exceed 60 cm along each of the staggered rows. Holes for all bolts shall be drilled and not punched in the ridges of the corrugations from the underside, while the sheets are on the ground.

### **NON-ASBESTOS HIGH IMPACT FIBER REINFORCED CEMENT CORRUGATED SHEET ROOFING**

#### **12.4 Non-Asbestos High Impact Fiber Reinforced Cement Corrugated Sheets**

The sheets shall be of the approved quality and shall conform to IS 14871. The sheets shall be free from cracks, chipped edges or corners and other damages.

**Classification** – Sheets may be classified according to thickness as under:

Type A - The thickness of the sheets shall be approximately constant throughout the width of profile.

Type B - The thickness of the sheets shall vary regularly between the valley and the crown for corrugated sheets or between the lower part and the upper part of ribs for asymmetrical section sheets, in the same cross-section. The sheets shall be categorized based on height of corrugations, 'h' and minimum thickness 'e' as under:

**TABLE 12.1  
Category and Class (Minimum Breaking Load N/m)**

<i>Category</i>	<i>Minimum Thickness e (mm)</i>	<i>Class</i>									
		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
A (15 mm < h < 55 mm)	3	600	800	1000	1400	-	-	-	-	-	-
B (25 mm < h < 55 mm)	4			1000	1400	2000	2500	3300	-	-	-
C (40 mm < h < 80 mm)	4.5				1400	2000	2500	3300	4250	-	-
D (60mm < h < 150 mm)	5.5							3300	4250	5600	7400

The free overhang of the sheets at the eaves shall not exceed 30 cm. Corrugated sheets shall be laid from left to right starting at the eaves. 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 intermediate rows except the first and the last sheets shall have both the top left hand corner and bottom right hand corner cut. The last or top row sheets shall all have the bottom right hand corner cut with the exception of the last sheet which shall be laid uncut. If for any reason such as on considerations of the direction of prevailing winds, laying is to be started from the bottom right hand corner, then the whole procedure should be reversed

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.1		Corrugated G.S. sheet roofing	Providing corrugated G.S. sheet roofing including vertical/ curved surface fixed with polymer coated J or L hooks, bolts and nuts 8 mm diameter with bitumen and G.I. limpet washers or with G.I. limpet washers filled with white lead and including a coat of approved steel primer and two coats of approved paint on overlapping of sheets complete upto 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.		
	12.1.1	1.00 mm thick	1.00mm thick with zinc coating not less than 275gm/m <sup>2</sup>	sqm	1025.00
	12.1.2	0.80 mm thick	0.80mm thick with zinc coating not less than 275gm/m <sup>2</sup>	sqm	863.00
	12.1.3	0.63 mm thick	0.63 mm thick with zinc coating not less than 275gm/m <sup>2</sup>	sqm	726.00
12.2		Straight cutting in G.S. sheet roofing	Straight cutting in G.S. sheet of any thickness roofing for making opening of area exceeding 40 sq. decimetre for chimney stacks, sky light etc.	meter	25.00
12.3		Circular cutting in G.S. sheet roofing	Extra for circular cutting in C.G.S. sheet of any thickness roofing for making opening of area exceeding 40 square decimetre :	meter	150.00
12.4		G.S.Sheet ridges or hips	Providing ridges or hips of width 60 cm over all width plain G.S. sheet fixed with polymer coated J or L hooks, bolts and nuts 8 mm dia. G.I. limpet and bitumen washers complete.		
	12.4.1	0.80mm thick	0.80mm thick with zinc coating not less than 275gm/m <sup>2</sup>	meter	500.00
	12.4.2	0.63mm thick	0.63mm thick with zinc coating not less than 275gm/m <sup>2</sup>	meter	431.00
12.5		G.S. valleys	Providing valleys of 90cm wide overall in plain G.S. sheet fixed with polymer coated J or L hooks, bolts and nuts 8mm dia. G.I. limpet and bitumen washers complete. 1.60 mm thick with zinc coating not less than 350gm/m <sup>2</sup>	meter	994.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.6		Plain G.S. sheet	Providing and Fixing of 40 cm over all width plain, G.S. sheet fixed with polymer coated J or L hooks, bolts and nuts, G.I. limpet and bitumen washer complete, bent to shape and fixed in wall with cement mortar 1:3 (1cement : 3 sand). 1.00mm thick with zinc coating not less than 275gm/m <sup>2</sup>	meter	355.00
12.7		Semicircular plain G.S. sheet gutter	Providing and fixing 15 cm wide 45 cm over all semicircular plain G.S. sheet gutter with iron brackets 40x3mm size, bolts, nuts and washers etc. including making necessary connections with rain water pipes complete.		
	12.7.1	0.80mm thick	0.80mm thick with zinc coating not less than 275gm/m <sup>2</sup>	meter	459.00
	12.7.2	0.63mm thick	0.63mm thick with zinc coating not less than 275gm/m <sup>2</sup>	meter	402.00
12.8		Corrugated sheets reinforced by organic and/or inorganic synthetic fibres	Providing reinforced by organic fibres and/or inorganic synthetic fibres cement 6 mm thick corrugated sheets (as per IS: 14871) roofing up to any pitch and fixing with polymer coated J, or L hooks, bolts and nuts 8 mm 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), including cutting sheets to size and shape wherever required.	sqm	389.00
12.9		Straight cutting in Corrugated sheets reinforced by organic and/or inorganic synthetic fibres	Extra for straight cutting in reinforced by organic fibres and/or inorganic synthetic fibres cement corrugated, semi corrugated 6 mm thick sheet roofing for making openings of area exceeding 40 square decimeter for chimney stacks, skylights etc..	meter	20.00
12.10		Circular cutting in Corrugated sheets reinforced by organic and/or inorganic synthetic fibres	Extra for circular cutting in reinforced by organic fibres and/or inorganic synthetic fibres cement corrugated/ semi corrugated 6 mm thick sheet roofing for making openings of area exceeding 40 square decimeter.	meter	56.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.11		Extra for wind ties	Extra for providing and fixing wind ties of 40x 6 mm flat iron section.	meter	121.00
12.12		Ridges and hips in Corrugated sheets reinforced by organic and/or inorganic synthetic fibres	Providing and fixing ridges and hips in fibre cement reinforced by organic fibres and/or inorganic synthetic fibres roofing with suitable fixing accessories or self drilling fastener and EPDM washer etc. complete.		
	12.12.1	Serrated adjustable ridge	Corrugated serrated adjustable ridges	meter	367.00
	12.12.2	Plain	Plain wing adjustable ridges	meter	311.00
	12.12.3	Close fitting	Close fitting adjustable ridges	meter	420.00
	12.12.4	Unserrated	Unserrated adjustable hips	meter	506.00
12.13		Corrugated sheets reinforced by organic and/or inorganic synthetic fibres cement roofing	Providing and fixing fibre cement reinforced by organic fibres and/or inorganic synthetic fibres roofing accessories in all colours with polymer coated J or L hooks, bolts and nuts and or G.I. seam bolts and nuts, G.I. plain and bitumen washers or with self drilling fastener and EPDM washer etc. complete:		
	12.13.1	Apron	Corrugated apron pieces	meter	340.00
	12.13.2	Eave filler	Eave's filler pieces	meter	232.00
	12.13.3	North light	North light curves	meter	500.00
	12.13.4	Ventilator	ventilator curves	meter	622.00
	12.13.5	Barge	Barge boards	meter	623.00
	12.13.6	Ridge	Ridge finials	pair	229.00
	12.13.7	Special north	Special north light curves	each	753.00
	12.13.8	S-type	S type louvers	meter	418.00
12.14		Flat iron brackets	Providing flat iron brackets 50x3mm size with necessary bolts, nuts and washers etc. for fixing G.S. sheets gutters with purlins.	meter	49.00
12.15		Precoated G.I. profile sheets	Providing and fixing precoated galvanised iron profile sheets (size, shape and pitch of corrugation as approved by Engineer-in-charge) 0.50 mm + 0.05 %, total coated thickness with zinc coating 120 gsm as per IS: 277 in 240 mpa steel grade, 5-7	sqm	652.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns. Sheet should have protective guard film of 25 microns minimum to avoid scratches while transportation and should be supplied in single length upto 12 metre or as desired by Engineer-in-charge. The sheet shall be fixed using self-drilling /self-tapping screws of size (5.5x 55mm) with EPDM seal, complete upto 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.		
12.16		Precoated G.S. sheet roofing	Providing and fixing precoated galvanised steel sheet roofing accessories 0.50 mm + 0.05 % total coated thickness, Zinc coating 120gsm as per IS: 277 in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self-drilling/ self-tapping screws complete :		
	12.16.1	Ridge	Ridges plain (500 - 600mm).	meter	320.00
	12.16.2	Flashing	Flashings/ Aprons.( Upto 600 mm)	meter	284.00
	12.16.3	North light	North light curves.	meter	341.00
	12.16.4	Barge board	Barge board (Upto 300 mm)	meter	274.00
	12.16.5	Crimp curve	Crimp curve	sqm	315.00
	12.16.6	Gutter	Gutter. (600 mm over all girth)	meter	781.00



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
12.17		UV stabilized fibreglass reinforced plastic sheet roofing	Providing & fixing UV stabilised fibreglass reinforced plastic sheet roofing up to any pitch, including fixing with polymer coated 'J' or 'L' hooks, bolts & nuts 8mm dia. G.I plain/bitumen washers complete but excluding the cost of purlins, rafters, trusses etc. The sheets shall be manufactured out of 2400 TEX panel rovigis incorporating minimum 0.3% ultra-violet stabiliser in resin system under approximately 2400 psi and hot cured. They shall be of uniform pigmentation and thickness without air pockets and shall conform to IS 10192 and IS 12866.The sheets shall be opaque or translucent, clear or pigmented, textured or smooth as specified.		
	12.17.1	Corrugated	2mm thick corrugated (2.5" or 4.2" or 6") or step-down (2" or 3" or 6") as specified.	sqm	1031.00
	12.17.2	Flat	2mm thick flat.	sqm	955.00
12.18		Sky lights in polycarbonate panel	Providing and Fixing of sky lights consisting of Multi cell/tight cell Polycarbonate Panel System of approved colour, 16 mm thick (minimum) having uniform in color with an integral Tight-Cell core constructed not to exceed 4mmx4mm in a cross section, Vertical Standing Seam manufactured at both sides of the panel. Snap-on connector to interlock the panels shall have a grip- lock double tooth locking mechanism to ensure maximum uplift capability and shall be of same color as that of panel. Panel shall be factory sealed/end welded panels with additional End-cap/Aluminium U- Profile (mill finish) for ends. Panel shall be co-extruded with special anti- glare compound and UV protected. The full system shall be fitted on MS purlins perpendicular to direction of sheeting with purlin spacing as		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			specified by Manufacturer. The rate includes cost of all the operations, labour and all materials and tests (as applicable) involved such as bolts nuts and screws etc. and labour for cutting bending to required profile, necessary scaffolding, hoisting in position etc. for proper completion of the work etc. complete as per specification drawings and direction of Engineer in charge. Finished surface area of roofing fixed over steeltubular structure shall be measured for payment. MS tabular frame work shall be measured separately for payment.		
	12.18.1	10mm thick	10mm thick	sqm	3105.00
	12.18.2	16mm thick	16mm thick	sqm	3546.00
12.19		Sand stone slab for roofing	Providing sand stone slab 40 to 50 mm thick for roofing and laying them in cement mortar 1 : 4 (1 cement : 4 sand) over wooden karries or R.C.C. battens or structural steel sections(Karries or battens or structural steel sections to be paid separately) including pointing the ceiling joints with cement mortar 1:3 (1 cement : 3 sand ) complete :		
	12.19.1	Red stone	Red sand stone slab	sqm	441.00
	12.19.2	White stone	White sand stone slab :	sqm	504.00
12.20		Painting top of roofs with bitumen Bitumen painting roofs	Painting top of roofs with residualtype petroleum bitumen of grade VG 10 of approved quality @ 17kg per 10 sqm impregnated with a coat of sandat 60 cum per 10sqm including cleaning the slab surface with brushes and finally with a piece of cloth lightlysoaked in kerosene oil complete :	sqm	132.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
12.21		Two coats high albedo paint	Providing and applying two coats of High Albedo paint having minimum Solar Reflective Index (SRI) 108 (with solar reflectance and thermal emittance tested as per ASTM) C 1549 and ASTM C 1371 respectively), VOC less than 10 cc/gm. The coating thickness and the methodology of application shall be strictly as per manufacturer's specifications and as approved by engineer In charge. Surface preparation includes cleaning with metal wire brush to remove all dust, fungus etc., and washing with water all complete. The contractor shall give guarantee for the performance of SRI and also the durability of coating, all complete as per direction of Engineer-in-charge.	sqm	239.00
12.22		Heat resistant terrace tiles	Providing and fixing Heat Resistant Terrace Tiles (300 mm x 300 mm x 20 mm) with SRI (solar refractive index) > 78, solar reflection >0.70 and initial emittance >0.75 on waterproof and sloped surface of terrace, laid on 20 mm thick cement sand mortar in the ratio of 1:4 (1 cement : 4 sand) and grouting the joints with mix of white cement and marble powder in ratio of 1:1, including rubbing and polishing of the surface upto 3 cuts complete, including providing skirting upto 150 mm height along the parapet walls in the same manner.	sqm	1218.00
12.23		Pressed clay tiles as pattern or roof (with mortar)	Providing and laying pressed clay tiles (as per approved pattern 20 mm nominal thickness and of approved size) on roofs jointed with cement mortar 1:4 (1 cement : 4 sand) mixed with 2% integral water proofing compound laid over a bed of 20 mm thick cement mortar 1:4 (1 cement : 4 sand) and finished neat complete.	sqm	473.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.24		Mangalore tile on roof (on steel frame)	Providing and fixing on roof pressed clay tile (Mangalore tile) 20 mm nominal thickness and of approved size and as per approved pattern on steel frame work complete (steel frame work to be paid separately)	sqm	275.00
12.25		Pressed clay tile Mangalore ridge (on steel frame)	Providing and laying on roof pressed clay tile ridge (Mangalore tile) of 20mm thickness of approved pattern on steel frame work complete (steel frame work to be paid separately)	sqm	155.00
12.26		Gola	Providing gola 75x75 mm in cement concrete 1:2:4 (1 cement : 2 sand : 4 stone aggregate 10mm and down grade) including finishing with cement mortar 1:3 (1 cement : 3 sand) as per standard design : In 75x75mm deep chase	meter	99.00
12.27		Khurras	Making khurras 45x45 cm (sunk area) with average minimum thickness of 5 cm cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate of 20 mm nominal size) over P.V.C. sheet 1mx1mx400micron, finished with 12mm cement plaster 1:3 (1 cement : 3 sand) and a coat of neat cement rounding the edge and making and finishing the outlet complete so as to receive rain water/ spillage water on roof in a sunk area and completely rain out in a near perfect strain meter motion into rain water pipe.	each	156.00
12.28		M.S. holder bat clamps	Providing and fixing M.S. holder bat clamps of approved design to C.I. or S.C.I. rain water pipes embedded in and including cement concrete blocks 10x10x10cm of Cement Concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) and cost of cutting holes and making good the walls etc.		
	12.28.1	100 mm	100 mm diameter	each	107.00
	12.28.2	150 mm	150 mm diameter	each	112.00
12.29		Sand cast iron pipes.	Providing and fixing ISI marked sand cast iron rain water pipes.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.29.1	100 mm	100 mm dia minimum wall thickness 5mm	meter	871.00
	12.29.2	150 mm	150 mm dia minimum wall thickness 5mm	meter	1081.00
12.30		Lead caulked joints	Providing lead caulked joints to sand cast iron rain water pipes and fittings :		
	12.30.1	100 mm	100 mm dia. Pipe	each	221.00
	12.30.2	150 mm	150 mm dia. Pipe	each	309.00
12.31		Sand cast iron rain water pipe accessories	Providing, fixing and embedding sand cast iron accessories for rain water pipes in the masonry surrounded with 12 mm thick cement mortar of the same mix, as that of masonry (leadcaulking will be paid for separately) :		
	12.31.1	Bend	Sand cast iron bend :		
	12.31.1.1	100 mm	100 mm diameter	each	470.00
	12.31.1.2	150 mm	150 mm diameter	each	383.00
	12.31.2	plain shoes	Sand cast iron plain shoes :		
	12.31.2.1	100 mm	100 mm diameter	each	488.00
	12.31.2.2	150 mm	150 mm diameter	each	412.00
12.32		Unplasticised rigid PVC pipes	Providing and fixing on wall face Rigid Unplasticised rigid PVC (upvc) Single socketed rain water pipes conforming to IS : 13592 Type A including jointing with seal ring conforming to IS : 5382 leaving 10 mm gap for thermal expansion.		
	12.32.1	75 mm	75 mm diameter (minimum wall thickness 1.8mm)	metre	136.00
	12.32.2	110 mm	110 mm diameter (minimum wall thickness 2.2mm)	metre	238.00
12.33		Unplasticised - UPVC fittings	Providing and fixing on wall face Unplasticised - UPVC moulded fittings/ accessories for Unplasticised Rigid PVC rain water pipes conforming to IS : 13592 Type A including jointing with seal ring conforming to IS : 5382 leaving 10 mm gap for thermal expansion.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.33.1	Coupler	Coupler		
	12.33.1.1	75 mm	75 mm (minimum wall thickness 1.8mm)	each	67.00
	12.33.1.2	110 mm	110 mm (minimum wall thickness 2.2mm)	each	102.00
	12.33.2	Push coupler	Single push fit Coupler :		
	12.33.2.1	75 mm	75 mm (minimum wall thickness 1.8mm)	each	121.00
	12.33.2.2	110 mm	110 mm (minimum wall thickness 2.2mm)	each	94.00
	12.33.3	With door	Single tee with door		
	12.33.3.1	75 mm	75x75x75 mm (minimum wall thickness 1.8mm)	each	106.00
	12.33.3.2	110 mm	110x110x110 mm (minimum wall thickness 2.2mm)	each	176.00
	12.33.4	Without door	Single tee without door		
	12.33.4.1	75 mm	75x75x75 mm (minimum wall thickness 1.8mm)	each	106.00
	12.33.4.2	110 mm	110x110x110 mm (minimum wall thickness 2.2mm)	each	163.00
	12.33.5	Bend	Bend 87.5°		
	12.33.5.1	75 mm	75 mm bend (minimum wall thickness 1.8mm)	each	78.00
	12.33.5.2	110 mm	110 mm bend (minimum wall thickness 2.2mm)	each	112.00
	12.33.6	Shoe	Shoe (Plain)		
	12.33.6.1	75 mm	75 mm Shoe (minimum wall thickness 1.8mm)	each	69.00
	12.33.6.2	110 mm	110 mm Shoe (minimum wall thickness 2.2mm)	each	99.00
12.34		UPVC pipe clips	Providing and fixing unplasticised - PVC pipe clips of approved design to unplasticised - PVC rain water pipes by means of 50x50x50 mm hard wood plugs, screwed with M.S. screws of		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			required length, including cutting brick work and fixing in cement mortar 1:4 (1 cement : 4 coarse sand) and making good the wall etc. complete.		
	12.34.1	75 mm	75 mm (minimum wall thickness 1.8mm)	each	97.00
	12.34.2	110 mm	110 mm (minimum wall thickness 2.2mm)	each	114.00
12.35		Cast iron grating to rain water pipes	Providing and fixing to the inlet mouth of rain water pipe fixing cast iron grating 15 cm diameter and weighing not less than 440 grams.	each	43.00
12.36		PTMT grating to rain water pipes	Providing and fixing to the inlet mouth of rain water pipe PTMT (an Engineering Thermoplastic) grating square (Slit) 150 mm square with a height of 8 mm and weighing not less than 100 gms.	each	95.00
12.37		Rain water spout	Providing and fixing 100 mm/110 mm diameter and 60 cm long rain water spout in cement mortar 1:4 (1 cement : 4 sand)		
	12.37.1	Stone ware	Stone ware spout	each	72.00
	12.37.2	UPVC	Upvc spout (Pipe dia.110 mm)	each	38.00
12.38		Self-supported mechanically seamed steel sheet roofing system	Providing and fixing of self-supported mechanically seamed roofing system, made of high quality steel, having 340 MPA yield strength, pre coated galvalume sheet as per ASTM A 792 M of base metal thickness from 0.8mm to 1.6mm (tolerance $\pm$ 0.02mm). High grade steel sheet should have 55% aluminum and 45% zinc coating by hot-dip process of minimum 25 micron on top side & 12 micron on back side with epoxy primer and polyester wash-coat as per AZM 150. Roofing should be designed as per ASCE 7-20 international building code 2002. The analysis should carried out for span and center arch – rise considering the required live load, wind load, dead load and the		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>seismic factor. The analysis should also determine the thickness of steel and the end reactions at the beam level. Shop drawing of roofing system shall be submitted by the contractor through the consultant, and the same shall be checked and approved by the department. The roof panel formation shall be done as per the required length and curvature using hydraulic profile machine to give it the trapezoidal shape in required curvature. In this process the width of the sheet reduces from 0.914 meter to 0.61 meter (tolerance <math>\pm 0.02m</math>). The roof panel shall be lifted using a suitable crane and using a spreader bar and a sling evenly placed to ensure no distortion of the panels during lifting and placing. The crane shall hold/support the panel till the alignment is done and completed using a plumb and a water tube and bolted into beam. These curved panels have interlocking formation and are crimped together using mechanical seaming machine which imposes a load of approximately five tones to ensure the seaming of required rigidity. After seaming a clear epoxy lacquer is applied on the inner side of panel end in 15cm width to form a protective layer between panel and concrete beam. These panels are installed over water proof concrete gutter –beams having beveled edge to receive (support) curved panels. Beam shall design for arch reaction and vertical loads. Plaster shall not be applied on the beam. Schmidt Hammer test of the concrete should be carried out before erection to ensure that the anchor bolt can be securely fixed on support. In case of steel structure a steel runner plate of 6mm thickness and G.I. sheet gutter of suitable size shall be provided for installation of panels, G.I. anchor bolt of required sizes and type with G.I. washer and neoprene washers shall be</p>		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			provided as per design. After installation of panels, trapezoidalvoids are created between gutter–beam and panels which should be covered by a flashing fabricated or brick masonry which is to be paid separately. Area of this roof shall be measured along the periphery on hem-top between end to end of panels. Ridge and valley shall not be taken in to consideration for measuring length transverse to periphery. The rate includes supplying, fixing, loadingunloading, hire charges of all plants machineries, anchors, fasteners, washers, bolts, epoxy, paint and all wastage etc. complete. Accessories and fixtures like hangers/clamps for installation of lighting /fixtures /utility/ duct as per requirement and ventilators, skylight can also be provided at crown/ridge by making cuts into the panels which is to be paid separately. This item shall be executed only by the agency which has all required manufacturing machineries and necessary expertise.		
	12.38.1	Span upto 15m	Base metal thickness 0.8mm up to span 15 meter	sqm	1698.00
	12.38.2	Span upto 18m	Base metal thickness 0.9mm , up to span 18 meter	sqm	1828.00
	12.38.3	Span upto 21m	Base metal thickness 1.0 mm, up to span 21 meter	sqm	1931.00
	12.38.4	Span upto 23m	Base metal thickness 1.1 mm, up to span 23 meter	sqm	2042.00
	12.38.5	Span upto 25m	Base metal thickness 1.2mm, up to span 25meter	sqm	2152.00
	12.38.6	Span upto 27m	Base metal thickness 1.3 mm, up to span 27 meter	sqm	2256.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	12.38.7	Span upto 29m	Base metal thickness 1.4mm, up to span 29meter	sqm	2378.00
	12.38.8	Span upto 31m	Base metal thickness 1.5 mm, up to span 31 meter	sqm	2475.00
	12.38.9	Span upto 32m	Base metal thickness 1.6 mm, up to span 33 meter	sqm	2585.00
	12.38.10	Hangers	Providing and fixing galvalume 1.0 mm thick clamps/hangers of size 75X140mm with saddle of 50mm dia, riveted at one side and nut and bolt at other side, to self-supported roofing system by mechanical seaming to suspend light fixture/cable stay/false ceiling/duct etc., at their location which should be planned earlier by engineer-in-charge. Clamps shall be fixed during seaming of panels.	each	55.00
	12.38.11	Ventilator	Providing and fixing advanced type hurricane turbo ventilator to self-supporting roof having neck dia 600mm made of aluminum having 24 nos vertical vanes made of aluminum sheet. Ventilator should be fixed on 1 to 2mm thick G.I. ring which shall be fixed on 2mm thick polycarbonate sheet. Polycarbonate sheet shall have foam tap or rubber gasket under and over it and fixed by 1 to 2 mm thick aluminum angle 25X25mm with self-tapping screw to panels. All joints shall be sealed by silicon. Rates i/c of all material, labour fittings screw, rings, foam tap, aluminum angles etc. complete. Deduction shall not be made for cutting area of self-supported roof.	each	9196.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.38.12	Sky-lights	Providing and fixing of 2mm thick polycarbonate sheet to self-supported roofing system. The sheet shall have tensile strength and elongation as per ASTM D 638, refractive index as per ASTM D 592, light transmission as per ASTM D 1003 and specific gravity as per STM D 792. Polycarbonate sheet shall have foam tap or rubber gasket under and over it and fixed by 1 to 2 mm thick aluminum angle 25X25mm with self-tapping screw to panels. All joints shall be sealed by silicon. Rates include of all material, labour, fittings, screw, foam tap, aluminum angles etc. complete. Deduction shall not be made for cutting area of self-supported roof.	sqm	3400.00
12.39		Three-dimensional space frame steel structure	Supply, fabrication and erection of three-dimensional space frame steel structure consisting of support node, primary space frame members, space nodes, bolts, sleeves (nut), purlin stool, purlin etc. to support roof sheet in plain or curved shape. The space frame steel structure shall be designed as per relevant IS codes for earthquake, wind and all applicable forces/load as per IS 875 and/or International standard ASCE-7, AISC 89, AISI 89 etc. and produced in compliance with ISO 9001-2008 quality system. The lowest point of space frame steel structure shall be the support node securely welded over a flange plate, made of steel conforming to ASTM A36, fixed securely on top of a well a designed support shaft made of solid or hollow circular steel pipe or concrete column erected/constructed over a secured and unyielding steel or RCC foundation. Space frame nodes, which connect two or more primary space frame members, are solid spherical balls with internally threaded holes and manufactured by hot forging process	kg	312.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>from medium carbon steel conforming to BS EN 10083 Part-2. Primary space frame member, which connects two nodes and consists of well-designed hollow steel pipe of suitable length, shall have steel cones coaxially welded at both ends in accordance with welding standards. Pipes of primary space frame member shall be type E (ERW/HFIW) and conforming to ASTM A53, Grade A/B or IS 1239 Part I or IS 1161. Last primary space frame member shall have no coaxial steel cone at the end but shall be provided with galvanized plate. Coaxial steel cones (conical tips) preassembled at ends of primary spaceframe member shall conform to ASTM A36/ BS EN 10083, C-30 or DIN St 37-2 standards as applicable. Primary space frame member shall be hot dip galvanized during manufacturing as per ASTM A53 /ASTM A 123 as applicable with powder coated finish. The space frame nodes (except support nodes), fasteners, cones and all threaded parts shall be electro- galvanized finish. Average zinc coating done (in factory) on space frame pipes shall be 550 g /sqm (Approximate zinc coating thickness 77 Microns) and shall not be less than 400 g/sqm (Approximate zinc coating thickness 56 microns). Bolts, sleeves and cones shall be electro-galvanized to ASTM B 633 Type 2, SC3. Shop drawings along with structural design analysis shall be provided by the manufacturer for approval of the engineer in charge. Rate shall include cost of design, all material, all lifts, labour, transport, storage, machines, tools and plants, wastages, erection and installation at site all necessary scaffolding etc. necessary to provide finished product but excluding cost of erection/ construction of support shaft and roof sheet.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.40		Deck sheet 0.8 mm thick	Providing and fixing roofing consist of 0.8 mm thick galvanized steel deck sheet conforming to IS 277:1992 used as permanent shuttering over which MS wire mesh 3mm laid at 100x100 mm grid including edge trim covered with concrete. This metal deck will be supported on structural steel beam with shear studs. (Structural steel like Beam, column, joists etc. & concrete of different grade as per design will be paid separately).	sqm	1183.00
12.41		Roof tile underlay	Providing and fixing in position roof tile under lay using 12mm thick(minimum) Moisture/fire Resistance heavy duty fibre cement board(High Pressure Steam Cured) Type A,Category 4 conforming to IS 14862:2000, fixed on Steel frame work of 610mmx610mm or 610mmx1220mm grid by counter sunk stainless screw @ 300mm C/C all complete as per the drawings. The boards are to be fixed on the frame work in staggered manner keeping a uniform gap of 2mm.Finally, the roof tile like Shingles/Mangalorian Tiles etc may be laid on the board substrate by sealing the joints properly with filler material or sealant to ensure no leakage through joints. All complete as per drawings, specification and as per direction of Engineer-in-Charge.  Note - MS Section structure and roof tile like Shingles/Mangalorian Tiles etc cost will be paid separately.	sqm	1503.00
12.42		Thermal insulation under deck (fibre glass wool)	Providing and fixing thermal insulation of ceiling (under deck insulation) with Resin Bonded Fibre glass wool conforming to IS: 8183 density 24kg/m <sup>3</sup> , 50mm thick, wrapped in 200 G Virgin Polythene bags fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5mm x 24 gauge wire mesh, for top most ceiling of building.	sqm	484.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.43		Thermal insulation over false ceiling (fibre glass wool)	Providing and fixing thermal insulation with Resin Bonded Fibre glass wool conforming to IS : 8183, density 16kg/m <sup>3</sup> , 50mm thick, wrapped in 200G Virgin Polythene bags placed over existing false ceiling and held in position by criss-crossing GI wire.	sqm	191.00
12.44		Thermal insulation over false ceiling (expanded polystyrene)	Thermal Insulation of roofing with Expanded polystyrene fixed with suitable adhesive to the false ceiling as per the directions of the Engineer-in-charge :		
	12.44.1	Type N	With Type N - Normal 50 mm thick	sqm	233.00
	12.44.2	Type SE	With Type SE - Self Extinguishing type 50 mm thick.	sqm	271.00
12.45		Thermal insulation over deck (p.u. foam)	Providing and laying thermalinsulation of roofing with 40 mm thick impervious sprayed, closed cell free Rigid Polyurethane foam over deck insulation conforming to IS - 12432 Pt. III (density of foam being 40-45 kg/cum), over a coat of polyurethane primer applied @ 6-8 sqm per litre, laying 400 G polythene sheet over PUF spray and providing a wearing course of 40 mm thick cement screed 1: 2 : 4 (1 cement : 2 sand : 4 stone aggregate 20 mm nominal size) in chequered rough finish, in panels of 2.5 mx2.5 m and embedding with 24 G wire netting and sealing the joints withpolymerized mastic, all complete as per direction of Engineer-in-Charge.	sqm	1136.00
12.46		Thermal insulation of wall (fibre glass wool)	Providing and fixing thermal insulation with Resin Bonded Fibre glass wool conforming to IS: 8183 having density 24 kg/m <sup>3</sup> , 50 mm thick, wrapped in 200G Virgin Polythene Bags fixed to wall with screw, rawl plug and washers and held in position by criss crossing GI wire etc. complete	sqm	359.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			as per directions of Engineer-in-Charge.		
12.47		Thermal insulation under deck (rock wool)	Providing and fixing thermal insulation of ceiling (under deck insulation) with Resin Bonded Rockwool conforming to IS: 8183, density 48 kg/ m <sup>3</sup> , 50 mm thick, wrapped in 200 G Virgin Polythene bags fixed to ceiling with metallic cleats (50x50x3 mm) @ 60 cm and wire mesh of 12.5mm x 24 gauge wiremesh, for top most ceiling of building.	sqm	574.00
12.48		Thermal insulation over false ceiling (rock wool)	Providing and fixing thermal insulation with Resin bonded rock wool conforming to IS: 8183, density 48 kg/m <sup>3</sup> , 50 mm thick, wrapped in 200 G virgin Polythene bags placed over existing false ceiling and held in position by criss- crossing GI wire.	sqm	444.00
12.49		Thermal insulation of wall (rock wool)	Providing and fixing thermal insulation with Resin Bonded rock wool conforming to IS: 8183, having density 48 kg/m <sup>3</sup> . 50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawl plug and washers and held and in position by criss crossing GI wire etc. complete as per directions of Engineer-in-Charge.	sqm	448.00
12.50		50 mm thick Rockwool insulation for slab unfaced	Supply and application of 48kg/m <sup>3</sup> density & 50 mm thick with a tolerance of -2 + 6mm of Rockwool RB slabs unfaced (Binder<3.5%); conforming to IS: 8183/ASTM C 612 latest edition with amendments. Non- combustible when tested as per BS 476 Part 4 or A1 when tested as per EN: 13501. The product should comply with BS476 Part 12. The thermal conductivity should be<0.043 W/m.K at 100°C mean temperature and the minimum density should be 70Kg/cu-m (+10%). chloride content should be < 10 ppm; water absorption (partial immersion) 0.5kg/sqm	sqm	299.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			maximum as per BS 2972 Part 12 as per manufacturers specification. The maximum service temperature shall be 700°C. Shot content should be less than 2% for 500 microns & less than 10% for 250 microns when tested as per standard IS 3144. Two random samples from each supplied batch will be test for shot content at the site. The melting point of the wool shall be more than 1000°C and wool shall be bio-soluble in accordance with EU directive 127/2008 or similar. All Above mentioned standard are as per latest edition with amendments.		
12.51		50 mm thick Rockwool under deck insulation wrapped in polythene bags	Supply & Application of Rockwool RB slab 48kg density, 50mm thick wrapped in 200G vergine polythene bags for partition, ceiling (Under Deck insulation) conforming to IS: 8183 with tolerance of -2 +6mm of rock wool RB slabs unfaced (Binder <3.5%) conforming to IS:8183/ASTM C 612 latest edition with amendments. Non-combustible whentested as per BS 476 Part 4 or A1 whentested per EN 13501. The product should comply with BS 476 Part 12. The thermal conductivity should be < 0.043 W/m.K at 100°C mean temperature and the minimum density should be 70 Kg/m3 + 10%. Chloride content should be < 10 ppm; Water absorption (partial immersion) 0.5kg/m2 max as per BS 2972 Part 12 as per manufacturer specification. The maximum service temperature shall be 700°C. Shot content should be less than 2% for 500 microns & less than 10% for 250 microns when tested as per standard IS 3144. Two random samples from each supplied batch will be test for shot content at the site. The	sqm	349.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			melting point of the wool shall be more than 1000°C and wool shall be bio-soluble in accordance with EU directive 127/2008 or similar. All Above mentioned standard are as per latest edition with amendments.		
12.52		50mm thick rock wool slab with GI wire	Supply & Application of Rockwool RB 2 slab 64kg /m <sup>3</sup> , 50mm thick, with GI wire netting 24 SWG; fixing for NRC Value 1.00 for Acoustics,thermal & fire purpose conforming to and IS: 8133, IS: 8183 with tolerance of -2 + 6mm of RB slabs unfaced (Binder < 3.5%); conforming to IS:8183/ASTM C 612 latest edition with amendments. Non-combustible whentested as per BS 476 Part 4 or Al whentested as per EN 13501. The product should comply with BS 476 Part 12.The thermal conductivity should bile 1 0.043 W/m.K at 100°C mean temperature and the minimum density should be 70 kg/cu-m (+ 10%). Chloride content should be < 10 ppm; Water absorption (partial immersion) 0.5kg/sqm max as per BS 2972 Part 12 as per manufacturer's specification. The maximum service temperatureshall be 700°C. Shot content should beless than 2% for 500 microns & less than 10% for 250 microns when tested as per standard IS: 314. Two random samples from each supplied batch will be tested for shot content at the site. The melting point of the wool shall be more than 1000°C and wool shall be bio-soluble in accordance with EU directive 127/2008 or similar. All Above mentioned standard are as per latest edition with amendments.	sqm	487.00
12.53		50 mm thick rock wool building roll	Supply & Application of Rockwool building roll (1.1mx10m) 48kg	sqm	493.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		with aluminium foil facing	density, 50mm thick with FSK (foil scrim Kraft) aluminium foil facing for HVAC duct & building underdeck purpose conforming to IS: 8183, IS: 8183 and IS:8183 a tolerance of -2 +6 mm of Rockwool RB slabs unfaced (Binder < 3.5%) ; conforming to IS: 8183; /ASTM C 612 latest edition with amendments. Non-combustible when tested as per BS: 476 Part 4 orAI when tested as per EN: 13501. The product should comply with BS: 476 Part 12. The thermal conductivity should be< 0.943 w/m.k at 100°C mean temperature and the minimum density should be 70 Kg/m3 (+ 10%). Chloride content should be < 10 ppm; water absorption (partial immersion) 0.5kg/sqm maximum as per BS: 2972 Part 12 as per manufacturer's specification. The maximum service temperature shall be 700°C. Shot content should be less than 2% for 500 microns & less than 10% for 250 microns when tested as per standard IS: 3144. Two random samples from each supplied batch will be test forshot content at the site. The melting point of the wool shall be more than 1000°C and it shall be bio-soluble in accordance with EU directive127/2008 or similar. All Abovementioned standard are as per latestedition with amendments.		
12.54		50 mm thick rockwool with aluminium & glass facing for under deck insulation	Supply & Application of Rockwool Building Roll (1.1mX10m) 48kg density, 50mm thick with ALG (Alu & glass) mixture of Aluminium & glass facing for building underdeck application below metal sheet also conforming IS: 8183, IS: 8183 and IS: 8183 a tolerance of -2+6mm of rockwool RB slabs unfaced (Binder <	sqm	670.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			3.5%); conforming to IS: 8183/ASTM C 612 latest edition with amendments. Non-combustible when tested as per BS 476 Part 4 or AI when tested as per EN 13501. The product should comply with BS 476 Part 12. The thermal conductivity should be < 0.943 W/m.K at 100°C mean temperature and the minimum density should be 70 Kg/m <sup>3</sup> (+ 10%). Chloride content should be < 10 ppm; water absorption (partial immersion) 0.5kg/m <sup>2</sup> maximum as per BS 2972 Part 12 as per manufacturer's specification. The maximum service temperature shall be 700°C. Shot content should be less than 2% for 500 microns & less than 10% for 250 microns when tested as per standard IS: 3144. Two random samples from each supplied batch will be tested for shot content at the site. The melting point of the wool shall be more than 1000°C and wool shall be bio-soluble in accordance with EU directive 127/2008 or similar. All Abovementioned standard are as per latest edition with amendments.		
12.55		12mm thick 5 layered bubble-reflective thermal insulation	Providing and fixing of minimum 12mm thick, 5 layered bubble Reflective thermal insulation made of 12 microns aluminum foil with minimum 97% Reflectivity on both outer sides, under both aluminum foil 4mm thick FR bubble insulation with Low Emissivity - 0.032 (ASTM1371), Fire Class A (ASTM E84) Surface Burning Characteristics- Flame Spread Index (5) & Smoke Developed Index (50) shall be provided to hold 4mm thick XLPE (Chemically Cross-		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>Linked Closed Cell Polyethylene Foam) with fire characteristics conforming to BS 476 Part 6 Class“0”, Fire Propagation having an index (I) of 5.06 and sub-indices i1(2.71); i2(1.65), i3(0.70) water vapour transmission rate conforming to ASTM E 96-15 – <math>7.3 \times 10^{-6}</math>ng.hr/m<sup>2</sup>, water vapour permeance conforming to ASTM E 96</p> <p>15 – 0.2974, water vapourpermeability conforming to ASTM E 96-15 – 0.2433, tensile strengthconforming to ASTM D 3575-14 – 0.33 MPa, Elongation at break % conforming to ASTM D 3575-14 – 171, Fungus resistance conforming to ASTM C 1338-14 – No Fungal Growth, Bursting strength conforming to ASTM D 774-97(2007) – 5.7 kg/cm<sup>2</sup>in the density of <math>30 \pm 3</math> Kg/mat middle part of insulating material. All five layers of insulation shall be stick with each other by registered manufacturer using hot processwithout using any kind of adhesive.Insulation shall be supplied in 1.10m wide roll width with 50mm wide factory-made cuts at both sides to jointanother roll by using general stapler in case of new shed and adhesive in case of existing or self-supported roof.</p>		
	12.55.1	Over purlin & Below new metal sheet	<p>Fixing of insulation on new work by laying horizontally on the purlins and perpendicular to the direction of purlins and fixing by using self- tapping screws at equal distance. Placeand align the second roll of insulation parallel to the first roll and overlaps the adjacent rolls. After Insulation is fixed over the purlins the metal sheet is placed over insulation and drilled</p>	sqm	335.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			with self-tapping screws with purlins etc. complete, including all material and scaffolding.		
	12.55.2	Below purlin as under deck insulation of existing roof using self-tapping screw	Installation of insulation in Old Sheds where the sheets have been already fixed over the purlins so insulation shall be fixed under the purlins covering the roof bottom. Insulation roll to be unfolded at the bottom of the purlin horizontally and parallel to the roof and fixed by using the self-tapping screw with a washer at equal distance etc. Complete, including all material and scaffolding.	sqm	467.00
	12.55.3	Under deck insulation of self-supporting roof using stud	Insulation of Self-Supported Roof shall be applied under the roofing by using stud welding to the self-supported roof at a distance not be more than 300 mm in both directions. At each stud insulation roll shall be pushed against the studs so that it gets punctured and then non-returning washer has to be applied at the stud etc. complete, including all material and scaffolding.	sqm	480.00
12.56		Providing and fixing XPS board for over-deck on ceiling surface	Providing and fixing 50 mm thick extruded polystyrene rigid insulation board (XPS) of required size over-deck on ceiling surface, complying with ASTM C 578 - type VI, having thermal conductivity of 0.0289 W/mK as per ASTM C 518, compressive strength of > 350 kPa listed as per ASTM C 1621, density of 34-36 kg/m <sup>3</sup> as per ASTM D 1622, water absorption < 1% by volume as per ASTM C 272, oxygen index of	sqm	1263.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			<p>minimum 24 as per ASTM D 2863 and Fire retardant property as per DIN 4102, Part 1. XPS board insulation shall be laid over clean and leveled RCC roof having proper slope and waterproofing and shall be connected by the ship-laps joints and bitumen shall be applied over the joints and HDPE film vapour barrier of minimum 140 gsm (grams per square metre) shall be laid over the XPS board having minimum 75mm overlap at the edges and reinforcement layer of G.I. chicken mesh/Fibre mesh of minimum 140 gsm shall be laid over the HDPE film vapour barrier and PCC layer of minimum 38mm with preferred stone or pre-cast tiles shall be laid over the XPS board with suitable grouting including providing pre-fabricated EPDM drain outlets (Cement Screed casting shall be done at the junction of roof and parapet walls), all as per the directions of Engineer-in-charge.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.57		XPS board for underdeck application on ceiling surface	Providing and fixing 50 mm thick extruded polystyrene rigid insulation board of required size underdeck on ceiling surface, complying with ISO 4898:2008 & ASTM C 578-08b - type VI, having thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350 kPa listed as per ASTM D 1621, density of 34-36 kg/m <sup>3</sup> as per ASTM D 1622, water absorption < 1% by volume as per ASTM D 2842, oxygen index of 24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576. Fire retardant property as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A, fixed with suitable water based adhesive and fastener, complete in all respect as per the directions of Engineer-in-Charge.	sqm	686.00
12.58		False ceiling with boards (G.I. grid suspension)	Providing and fixing false ceiling at all height including providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 120 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>hangers of 25x10x0.50 mm of required length with nuts &amp; bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in adirection perpendicular to G.I. intermediate channel with connecting clips made out of 2.64 mm dia x 230 mm long G.I. wire at every junction, including fixing perimeter channels 0.5 mm thick 27 mm high having flanges of 20 mm and 30 mm long, the perimeter of ceiling fixed to wall/partition with the help of rawl plugs at 450 mm centre, with 25mm long dry wall screws @ 230 mm interval, including fixing of gypsum board to ceiling section and perimeter channel with the help of dry wall screws of size 3.5 x 25 mm at 230 mm c/c, including jointing and finishing to a flush finish of tapered and square edges of the board with recommended jointing compound , jointing tapes, finishing with jointing compound in 3 layers covering upto 150 mm on both sides of joint and two coats of primer suitable for board, all as per manufacturer's specification and also including the cost of making openings for light fittings, grills, diffusers, cutouts made with frame of perimeter channels suitably fixed, all complete as per drawings, specification and direction of the Engineer in Charge but excluding the cost of painting with</p> <p>:</p>		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.58.1	POP boards	10mm thick plaster of Paris (gypsum anhydrous) sheet 10mm thick pop board		
	12.58.1.1	Flat surfaces	Flat surfaces	sqm	676.00
	12.58.1.2	Curved surfaces	Curved surfaces	Sqm	748.00
	12.58.1.3	Sunk or raised mouldings	Sunk or raised mouldings	sqm	175.00
	12.58.1.4	Extra for pop ceiling	Extra for providing in the plaster of Paris (Gypsum anhydrous) ceiling above 5 metre height from floor level.	sqm per mtr height	59.00
	12.58.2	12.5 mm thick gypsum board	12.5 mm thick tapered edge gypsum board		
	12.58.2.1	Plain gypsum board	Plain board conforming to IS: 2095-Part I : 2011 (Board with BIS certification marks).	sqm	750.00
	12.58.2.2	Fire resistant gypsum board	Fire resistant Glass Reinforced Gypsum (GRG) board conforming to IS: 2095-(Part 3) : 1996 (Board with BIS certification marks)	sqm	866.00
	12.58.2.3	Moisture resistant gypsum board.	Gypsum moisture resistant board.	sqm	920.00
	12.58.2.4	Perforated gypsum board backed with acoustical tissue	Fully Perforated Gypsum Plaster Board having approx. 15 % perforated area with perforation size and pattern as approved by the Engineer-in-charge and as per manufacturer's specification, with all 4 side tapered and backed by acoustical tissue with NRC value not less than 0.60.	sqm	1277.00
	12.58.3	8 mm thick calcium silicate board	8 mm thick Calcium Silicate Board made with Calcareous and Siliceous materials reinforced with cellulose fiber manufactured through autoclaving process.	sqm	1150.00
12.59		False ceiling tiles of approved material on inter locking metal grid system	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		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>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 x1.6 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, allcomplete for all heights as per specifications, drawings and as directed by Engineer-in-charge.</p>		
	12.59.1	GI metal tiles powder coated global white	GI Metal Ceiling Lay in plain Tegular edge Global white color tiles of size 595x595 mm, and 0.5 mm thick with 8 mm drop; made of G I sheet having galvanizing of 100 gms/sqm (both sides inclusive) and electro statically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending.	sqm	1431.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.59.2	20% perforated GI metal tiles	GI Metal Ceiling Lay in perforated Tegular edge global white color tiles of size 595x595 mm and 0.5 mm thick with 8 mm drop; made of GI sheet having galvanizing of 100 gms/sqm (both sides inclusive) and 20% perforation area with 1.8 mm dia holes and having NRC (Noise Reduction Coefficient) of 0.5, electro statically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending and perforation, and backed with a black Glass fiber acoustical fleece.	sqm	1553.00
	12.59.3	PVC laminated Gypsum tiles	12.5 mm thick square edge PVC Laminated Gypsum Tile of size 595x595 mm, made of Gypsum plasterboard, manufactured from natural gypsum as per IS 2095 part I and laminated with white 0.16mm thick fire retardant PVC film on the face side and 12micron metalized polyester on the back side with all edges sealed with the face side PVC film which goes around and wraps the edges and is bonded to the edges and the back side metalized polyester film so as to make the tile a omlpletely sealed unit.	sqm	1004.00
	12.59.4	Perforated gypsum tiles with glass wood backing	12.5 mm thick fully Perforated Gypsum Board tile made from plasterboard having glass fibre conforming to IS: 2095 part I, of size 595x595 mm, having perforation of 9.7x9.7 mm at 19.4 mm c/c with center borders of 48 mm and the side borders of 30 mm, backed with non woven tissue on the back side, having an NRC (Noise Reduction Coefficient) of 0.79, with 50 mm resin bonded glass wool backing.	sqm	1164.00
	12.59.5	Glass fiber acoustical tiles	Glass fiber Acoustical Suspended Ceiling System with 16 mm thick tegular edge or micro look edge tiles of size 595x595mm.The tiles should have Humidity Resistance (RH) of 99%, NRC 0.5, Light Reflectance $\geq 83\%$ , Thermal Conductivity $k = 0.052 - 0.057$ w/m K, Colour White,	sqm	1861.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			Fire Performance UK Class 0 / Class 1 (BS 476 pt - 6 and7) in module size of 600 x 600 x 16mm with Bio Block coating on the face of the tile, suitable for Green Building application, with Recycled content of 38 - 41%. The Tile and Grid system used together should carry a 15 year warranty.		
	12.59.6	8mm thick cement bonded particle board tile	8mm thick non-asbestos multipurpose termite, fire & moisture resistance cement bonded particle board as per IS: 14276, white primed colour tiles of size 595X595 mm.	sqm	666.00
	12.59.7	6mm thick cement bonded particle board tile	6mm thick non-asbestos multipurpose termite, fire & moisture resistance cement bonded particle board as per IS: 14276, white primed colour tiles of size 595X595 mm.	sqm	460.00
12.60		False ceiling tiles on clip in/swing down metal ceiling system	Providing and fixing GI Clip in Metal Ceiling System of 600x600 mm module which includes providing and fixing 'C' wall angle of size 20x30x20mm made of 0.5mm thick pre painted steel along the perimeter of the room with help of nylon sleeves and wooden screws at 300mm center to centre, suspending the main C carrier of size 10x38x10mm made of G.I steel 0.7 mm thick from the soffit and ceiling with help of soffit cleat 37x27x25x1.6 mm, rawl plugs of size 38x12 mm and C carrier suspension clip and main carrier bracket at 1000mm c/c. Inverted triangle shaped Spring Tee having height of 24 mm and width of 34mm made of GI steel 0.45 mm thick is then fixed to the main C carrier and in direction perpendicular to it at 600mm centers with help of suspension brackets. Wherever the main C carrier and		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			spring T have to join, C carrier and spring T connectors have to be used. All sections to be galvanized @ 120 gms/sqm (both side inclusive) Fixing with clip in/swing down tiles into spring 'T' with		
	12.60.1	GI (Plain)	GI Metal Ceiling Clip in /swing down plain Beveled edge global white color tiles of size 600x600 and 0.5mm thick with 25mm height, made of G I sheet having galvanizing of 100 gms/sqm (both sides inclusive) and electro statically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending.	sqm	1500.00
	12.60.2	G.I.metal tiles 20% perforated	GI Metal Ceiling Clip in /swing down plain Beveled edge global white color tiles of size 600x600 and 0.5mm thick with 25mm height, made of G I sheet having galvanizing of 100 gms/sqm (both sides inclusive) and 20% perforation area with 1.8mm dia holes and having NRC of 0.5, electro statically polyester powder coated of thickness 60 microns (minimum), including factory painted after bending and perforation.	sqm	1628.00
12.61		Antibacterial metal tile false ceiling on rigid G.I. system	Providing & Fixing of Unperforated Antibacterial Metal Tile Ceiling System comprising of Tile of 600mm wide and 600mm long manufactured out of 0.7mm thick aluminium alloy 3105 with beveled edge of 4.15mm width and height of 32mm. The Tile will be manufactured on advanced equipment that includes several levelling stages in the manufacturing process by approved certified manufacturers. Tile ends will be raised with pips and stops to ensure positive engagement into the spring to enable for de-mounting of individual panels. The Tile sides will be sufficiently high to ensure a minimum deflection across the length of Tile. All Tiles will be	sqm	2821.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			bevel edged. The Tile shall be epoxy polyester powder coating with ANTIBAC in white colour which is in compliant to rod directive. The Tile shall be clipped into clip in rail of 0.5mm thick G.I. in form of a grid system using a cross connector. The clip in rail shall be supported from slab by means of rigid Suspension of 4mm G.I.Road, Hold on Clamp with Clip. (Rate include all materials and labour).		
12.62		False ceiling with board (frame work to be paid separately)	Providing and fixing board ceiling of approved quality with necessary nails etc. complete (frame work to be paid separately):		
	12.62.1	Insulating board	12mm thick insulating board		
	12.62.1.1	Natural colour	Natural colour insulating board	sqm	550.00
	12.62.1.2	White face	White face insulating board	sqm	614.00
	12.62.1.3	Flame retardant	Flame retardant face insulating board	sqm	700.00
	12.62.2	3 layer particle board	Flat pressed 3 layer medium density particle board or graded particle board (Grade I) IS: 3087 12 mm thick marked in ceiling with necessary nails etc. complete	sqm	633.00
	12.62.3	Cement board	6 mm thick plain MultipurposeCement board ( High Pressure steam cured ) as per IS : 14862, with suitable screws for fibre cement board in ceiling etc. complete	sqm	428.00
	12.62.4	Heavy duty cement board	6mm thick High Pressure Steam Cured non asbestos, reinforced with cellulose fibres,Moistur & fire Resistance heavy duty fibre cement board, Type A,Category 4 conforming to IS 14862:2000.(for wet areas)	sqm	530.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.62.5	Decorative type cement board	4 mm thick High Pressure Steam Cured non asbestos, pre-painted, self-embossed, designer cement board Type B, Category 3 conforming to IS 14862:2000 . of approved texture, design patterns	sqm	403.00
12.63		Extra for circular cutting in board ceiling	Extra for Circular cutting and wastages in ceiling with: board only (frame work) Natural colour insulating 12 mm thick board paid separately.	meter	150.00
12.64		Extra for curved surfaces in narrow width	Extra for providing and fixing ceiling to curved surfaces in narrow widths	sqm	100.00
12.65		False ceiling particle board on aluminium grid system	Providing and fixing false ceiling with 12 mm thick plain/ semi perforated or with design ceiling tiles of BWP type phenol formaldehyde synthetic resin bonded pressed particle board conforming to IS:3087, finished with a coat of aluminium primer on both sides and edges including two coats of synthetic enamel paint of approved quality on exposed face, fixed to a grid made out of anodised aluminium (with 15 micron anodic coating) T- sections 35 x15x1.5 mm size main runners and cross runners 23.5x19x1.5mm fixed to main runners placed 600 mm centre to centre both ways so as to form a grid of 600 mm square. The frame work shall be suspended from ceiling by level adjusting hangers of 6 mm dia M.S rod fixed to roof slab by means of ceiling cleats and dash fastener. The suspenders shall be placed 600 x 1200 mm centre to centre including fixing to the frame with C.P brass screws and applying a priming coat of zinc chromate yellow primer (aluminium frame work shall be paid separately).	sqm	667.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.66		Colour coated profile sheet	Providing and Fixing colour coated profile sheet of minimum 1015 mm effective cover width and nominal 28.5 mm deep ribs with subtle square fluting in the five pan at nominal 203 mm centre-to-centre. The end rib shall be designed for anti-capillary action, to avoid any seepage of water through the lateral overlap. The profile sheet of 0.5 mm thick, Hi-strength steel with min. 550 MPa yield strength, metallic hot dip coated with Aluminium-Zinc alloy (55% Aluminium, 45% Zinc) as per AS 1397 - Zinalume AZ150 (Min. 150 gms/sq.mt total on both sides) with steel quality paint coat. The paint shall have a total coating thickness of nominal 35 µm, comprising of nominal 20 µm exterior coat on top surface and nominal 5 µm reverse coat on back surface over nominal 5 µm primer coat on both surface. The sheet shall have brand marking of the manufacturer giving product details on the back of the sheet at every 1 meter c/c for confirming genuinity of the material. The sheet shall be fixed using self-drilling /self-tapping screws of size (5.5x 55mm) with EPDM seal, complete upto any pitch in horizontal/vertical or curved surfaces excluding the cost of purlins, rafters and trusses and including cutting to size and shape	sqm	430.00
12.67		Extra for acrylic sheets in false ceiling in place of particle board	Extra for providing 3 mm thick translucent white acrylic plastic sheets of approved quality in false ceiling instead of 12 mm thick plain or design particle board ceiling tiles.	sqm	387.00
12.68		False ceiling (thermacol)	Providing and fixing expanded polystyrene (thermacol) false ceiling (frame work to be paid separately) :		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	12.68.1	Type N	With Type N - Normal 50 mm thick	sqm	230.00
	12.68.2	Type SE	With Type SE - Self Extinguishing type 50 mm thick	sqm	270.00
12.69		False ceiling with fabric	Providing and fixing false ceiling with fabric fixing with nail etc. (frame work and beading to be paid separately). costing upto 70/- per metre,		
	12.69.1	Standard fabric	Rs 70- 150 per meter	sqm	97.00
	12.69.2	Medium fabric	Upto 200 per meter	sqm	170.00
	12.69.3	Premium fabric		sqm	225.00
12.70		Perforated linear panel aluminium metal ceiling with acoustics	Providing and fixing perforated Aluminium panel ceiling of white/ natural satin colour supplied by approved manufacturers consisting of panel of standard size with bevel edge, panel length up to 6 m, coil Coated on a Continuous Paint Line suitable for Interior application, double baked and roll formed from enamelled corrosion resistance aluminium alloy AA 5050 (Al. Mg) for higher strength and good roll forming characteristics. Aluminium panels shall be chromatised for maximum bond between metal and paint, enamelled twice under high temperature, one sidewith a full primer and finish coat the other side (inner side) with a primer coating and Skin Coat on a continuous paint line. The panel shall be perforated Aluminium panel having perforation of 2mm diameter at a distance of 5mm centre to centre. Non-woven textile (NWT) made of glass-reinforced fibre glued over theperforation at the back side of the panel for sound absorption to provide noise reduction co efficient upto 0.7 NRc. The Panels shall abut each other with a narrow V groove. Panel shall be clipped to a baked enamelled aluminium panel carrier of respective size in standard length of 5 mtr made of doubled baked black enamelled aluminium alloy AA 5050 (Al. Mg)		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			with cut outs to hold the panels in a module of 300mm closed at a distance of 1.4 mtr. Panel carrier shall be suspended by means of G.I. threaded rod having 6 mm diameter at a distance of 1.5 mtr. Actual distance of threaded rod/carrier might vary and to be calculated based on the actual drawing and site condition. The Measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.		
	12.70.1	300mm wide X30mm deep X 0.7mm thick	With panels of size 300mm wide X30mm deep X 0.7mm thick and panel carrier of size 40.5mm wide X 62mm deep X 0.9mm thick	sqm	3166.00
	12.70.2	150mm wide X 15.5 mm deep X 0.5mm thick	With panels of size 150mm wide X 15.5 mm deep X 0.5mm thick and panel carrier of size 32mm wide X 39mm deep X 0.95mm thick	sqm	2562.00
	12.70.3	84mm wideX16mm deep X 0.5mm thick	With panels of size 84mmwideX16mm deep X 0.5mm thick and panel carrier of size 62mm wide X 29mm deep X 0.95mm thick	sqm	2538.00
12.71		Un-perforated aluminium panel ceiling	Providing and fixing un-perforated Aluminium Panel ceiling Supplied by approved manufacturers of standard white/ natural satin shade consisting of panel 30 mm/80mm/130mm/180mm wide X 15 mm deep X 0.5mm /0.6mm thick respectively, with square edges having panel length up to 6 mtr, Coil Coated on a Continuous Paint Line, Double baked and roll formed from enamelled corrosion resistance Aluminium alloy AA 5050 (Al.Mg) for higher strength and good roll forming characteristics. Aluminium panels shall be chromatised for maximum bond between metal and paint, enamelled twice under high temperature, one side with full primer and finish coat, the other side (inner side) with a primer coating and skin coat on a Continuous Paint Line. Panel	sqm	2753.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			shall be clipped to a baked enamelled Aluminium panel carrier of 62mm wide x 29mm deep made of 0.95mm thick in standard length of 5 mtrs made of doubled baked enamelled Aluminium alloy AA 5050 (Al. Mg) black with cut outs to hold the panels in a module of 200 mm (width of gap 20mm closed with recess profile) and at a distance 1.4 mtrs. Recess Join Profiles are made of enamelled aluminium and shall be inserted in between the panel on top of the panel flanges. The Carrier shall be suspended by means of G.I. suspension rod 4mm diameter, and a Galvanised suspension spring clip at a distance of 1.7mtrs centre to centre. Actual distance of threaded rod/carriermight vary and to be calculated based on the actual drawing and site condition. The Measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.		
12.72		U Baffle aluminium panel ceiling	Providing and fixing U Baffle Aluminium panel ceiling of different colors and finish supplied by approved manufacturers, consisting of panel size 50 mm width X 100 mm deep using 0.6 mm thick, panel length upto 4 mtr, Coil Coated on a Continuous Paint Line, Double baked and roll formed from enamelled corrosion resistance Aluminium alloy AA 3005 (Al. Mg) for higher strength and good rollforming characteristics. Aluminium panels shall be chromatised for maximum bond between metal and paint enamelled twice under high temperature, Exposed side with a full primer and finish coat on a Continuous Paint Line. Panels shall beclipped to a baked enamelled Aluminium carrier of 30 mm wide x 47 mm high x 0.5 mm thick, Black Colour coated, one leg of the carriers with cut outs to hold the panels in a module of 150 mm. Panel carrier shall be suspended by means of threaded		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			rod at a distance of 1.8 mtr c/c. Actual distance of threaded rod/carrier might vary and to be calculated based on the actual drawing and site condition. The measurements shall be wall to wall without any deductions for lights, diffuses, columns etc. As an option, ceiling area above U Baffle can be painted by the contractor in black colour or any other colour as per the architect for better aesthetics before fixing this system.		
	12.72.1	Standard white	Standard White / Natural Satin Shade	sqm	2989.00
	12.72.2	Wooden finish	Wooden Finish	sqm	3855.00
12.73		False ceiling perforated G.I tile or plank on torsion spring system	Supply & Fixing of perforated G.I false ceiling tile or plank using torsion spring fixing system supplied by approved manufacturer comprising of tile of 600 mm wide and 600 mm long manufactured out of 0.5 mm thick or plank of 600mm wide and 1200 mm long manufactured out of 0.6mm thick galvanised steel perforated with 2 mm dia. at a distance of 5mm centre to centre. Non-woven felt made of glass-reinforced fibre glued over the perforation at the back side of panels to provide noise reduction co efficient up to 0.7 NRc. The metal ceiling panels shall be downward accessible with a minimum of four (4) torsion springs per panel. The Plank will be manufactured on advanced CAD/CAM equipment that includes several levelling stages in the manufacturing process. Torsion Spring panel with two side legs die formed and two end legs die formed and punched to receive torsion springs (min two springs each end or side) for secure engagement into Tee Grid main runners which are factory punched to receive torsion springs. Tiles will be square edged. The Plank shall be Polyester powder coated in whitecolour (RAL 9010).The panels will be pre-treated in latest Nano technology		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			process and electro statically powder coated with automatic Caroni system and cured with gas catalytic technology. Main runners 24mm deep, inverted "Tee" sections, 3.6m long, with factory punched flanges to receive torsion spring assembly. Main Tee on centre spacing to match panel length. Cross runners 24 mm deep, inverted "Tee" sections designed to interlock in to web of main tee section on designated spacing. Cross tee length to match panel length. Cross tees are spaced at a spacing of 600 mm on centre maximum. The measurements shall be wall to wall without any deductions for lights, diffusers, columns etc.		
	12.73.1	0.5 mm thick	Tile of 600 mm wide ,600 mm long and 0.5 mm thick	sqm	2321.00
	12.73.2	0.6mm thick	Plank of 600mm wide ,1200 mm long and 0.6mm thick	sqm	2377.00
12.74		Gypsum board glass wool fiber panel	Providing and fixing of composite perforated Gypsum board with Glass wool Fiber panel of Size 595x595x25 mm with 10mm square Perforation tiles false ceiling in true horizontal level suspended on interlocking metal grid of hot dipped galvanized steel section (Galvanized @ 120 gms/sqm both sides inclusive) consisting of main "T" runner with suitably spaced joint to get required length and of size 24x32 mm made from 0.30 mm thick (minimum) sheet spaced joints to get required length and of size 24x26 mm made of 0.30 mm thick (minimum)sheet spaced at 1200 mm long spaced between main "T" at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600mm and wall angle of size24x24x0.4 mm and laying false ceiling tiles of approved Perforation in the grid	sqm	1934.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			including, wherever 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 plates of size 27x37x25x1.6 mm fixed to ceiling with 12.50 mm dia and 40 mm long dash fasteners, 4 mm GI adjustable rods with galvanized butterfly level clips of size 85x30x0.80 mm spaced @ 1200mm centre to centre along with main T, bottom exposed width of 24mm of all T-sections shall be pre-painted with polyester paint all complete at all heights as per specifications and drawings and as directed by Engineer-in-Charge.		
12.75		Acoustical composite ceiling panel (MDF with Glass wool)	Providing and fixing of Composite perforated MDF board with Glasswool Fiber panel of Size 595x595x18 mm 10mm Square Perforation tiles (Square /Tegular Edge) false ceiling in true horizontal level suspended on interlocking metal grid of hot dipped galvanized steel section (Galvanized @ 120 gms/sqm both sides inclusive) consisting of main "T" runner with suitably spaced joint to get required length and of size 24x32 mm made from 0.30 mm thick (minimum) sheet spaced joints to get required length and of size 24x26 mm made of 0.30 mm thick (minimum) sheet spaced at 1200 mm long spaced between main "T" at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.4 mm and laying false ceiling tiles of approved Perforation in the grid including, wherever 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 plates of size	sqm	2116.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			27x37x25x1.6 mm fixed to ceiling with 12.50 mm dia and 40 mm long dash fasteners, 4 mm GI adjustable rods with galvanized butterfly level clips of size 85x30x0.80 mm spaced @ 1200mm centre to centre along with main T, bottom exposed width of 24mm of all T-sections shall be pre-painted with polyester paint all complete at all heights as per specifications and drawings and as directed by Engineer-in-Charge.		
12.76		Glass fibre tissue faced ceiling panel	Providing and fixing of Perforated Gypsum board with Acoustical Glass Fiber Tissue faced panel of Size 595x595x12.5mm, Square 10mm Perforation tiles (Square Edge) false ceiling panels in true horizontal level suspended on interlocking metal grid of hot dipped galvanized steel section (Galvanized @ 120 gms/sqm both sides inclusive) consisting of main "T" runner with suitably spaced joint to get required length and of size 24x32 mm made from 0.30 mm thick (minimum) sheet spaced joints to get required length and of size 24x26 mm made of 0.30 mm thick (minimum)sheet spaced at 1200 mm long spaced between main "T" at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross "T" of length 600 mm and sheet to be interlocked at middle of the 1200x600 mm panel to form grids of 600x600 mm and wall angle of size 24x24x0.4 mm and laying false ceiling tiles of approved Perforation in the grid including, wherever 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 plates of size 27x37x25x1.6 mm fixed to ceiling with 12.50 mm dia and 40 mm long dash fasteners, 4 mm GI adjustable rods with galvanized butterfly level clips of size 85x30x0.80 mm spaced @ 1200mm centre to centre along with main T, bottom exposed width of	sqm	1240.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			24mm of all T-sections shall be pre-painted with polyester paint all complete at all heights as per specifications and drawings and as directed by Engineer-in-Charge.		
12.77		Light weight calcium silicate false ceiling tiles	Providing and fixing false ceiling at all heights with 15 mm thick integral densified tegular edged non-cementitious light weight calcium silicate false ceiling tile reinforced with fibre and natural filler false ceiling tiles of Size 595x595 mm of approved texture, design and patterns having NRC (Noise Reduction coefficient) of 0.50 (minimum) as per IS 8225:1987, Light reflectance of 85% (minimum). Non combustible as per BS:476 (part-4), fire performance as per BS:476 (part 6 &7), humidity resistance of 100%, thermal conductivity < 0.043 W/m K as per ASTM 518:1991, in true horizontal level suspended on interlocking metal T-Grid of hot dipped galvanised iron section of 0.33mm thick (galvanized @ 120 grams per sqm including both sides) comprising of main-T runners of size 24x38 mm of length 3000 mm, cross - T of size 24x32 mm of length 1200 mm and secondary intermediate cross-T of size 24x32 mm of length 600mm to form grid module of size 600 x 600 mm, suspended from ceiling using galvanised mild steel items galvanizing @ 80 grams per sqm) i.e. 50 mm long, 8 mm outer diameter M-6 dash fasteners, 6 mm dia fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x25x2 mm. Galvanised iron perimeter wall angle of size 24x24x0.40 mm of length 3000 mm to be fixed on periphery wall / partition with the help of plastic rawl plugs at 450 mm center to center and 40 mm long dry wall S.S screws. The work shall be carried out as per specifications, drawing and as per directions of the Engineer-in-Charge.	sqm	1453.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.78		Light weight calcium silicate micro look edge false ceiling tiles	Providing and fixing false ceiling at all heights with 15 mm thick integral densified micro look edged non-cementitious light weight calcium silicate false ceiling tile reinforced with fibre and natural filler falseceiling tiles of Size 595x595 mm of approved texture, design and patterns having NRC (Noise Reduction Coefficient) of 0.50 (minimum) as per IS 8225:1987, Light reflectance of 85% (minimum). Non combustible as per BS:476 (part-4), fire performance as per BS:476 (part 6 &7), humidity resistance of 100%, thermal conductivity < 0.043 W/m K as per ASTM 518:1991, in true horizontal level suspended on interlocking metal powder coated T-Grid of hot dipped galvanised iron section of 0.40 mm thick on Silhouette profile, rotary stiched double webbed white with 6mm reveal profile (white/black), comprising of main-T runners of size 15x42mm of length 3000 mm, cross - T of size 15x42 mm of length 1200mm and secondary intermediate cross- T of size 15x42 mm of length 600mm to form grid module of size 600 x 600 mm, suspended from ceiling using galvanised mild steel items (galvanizing @ 80 grams per sqm) i.e. 50 mm long, 8 mm outer diameter M-6 dash fasteners, 6 mm dia fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x2 mm. Galvanised iron perimeter wall angle of size 22x19x0.40 mm of length 3000 mm to be fixed on periphery wall / partition with the help of plastic rawl plugs at 450 mm center to center and 40mm long dry wall S.S screws. The work shall be carried out as per specifications, drawing and as per directions of the Engineer-in-Charge.	sqm	1632.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
12.79		Light weight bio safe calcium silicate false ceiling tiles	Providing and fixing false ceiling at all heights with 15 mm thick integral densified mirolook edge with BIO SAFE coating as per ISO 7251:2005, ISO 20743:2007 and ISO 21527-1:2008, making the tiles resistant to bacterial growth in case of any external bacterial contact made onto the surface of tiles, non-cementitious light weight calcium silicate false ceiling tile reinforced with fibre and natural filler false ceiling tiles of Size 595x595 mm of approved texture, design, patterns and perforation having NRC (Noise Reduction Coefficient) of 0.10-0.20 for plain & designer, 0.15 - 0.40 for pinhole texture and NRC 0.45 - 0.65 for fully perforated tiles as per IS 8225:1987, sound attenuation STA-32 dB. Light Reflectance of 85% (minimum), non-combustible as per BS:476 (part-4), fire performance as per BS:476 (part 6 & 7), humidity resistance of 100%, thermal conductivity 0.050 to 0.052 W/m <sup>o</sup> KC as per ECBC Code 2007, weight 1.900Kg to 2.100 Kg per tile, density 450 Kg/m <sup>3</sup> in edge portion (thickness 15 mm) and 350 Kg/m <sup>3</sup> in central portion (thickness 10 mm), 50-52% recycled content including fly ash and meets the GRIHA & SVAGRIHA norms under the categories : GRIHA V.2015 criterion: 11&12, GRIHA V.3 criterion: 17&29 & SVAGRIHA criterion: 12 in true horizontal level metal T-grid suspended on interlocking metal powder coated T-Grid of hot dipped galvanised iron section of 0.40 mm thick on silhouette profile, rotary stitched double webbed white with 6 mm reveal profile (white/black), comprising of main-T runners of size 15x42 mm of length 3000 mm, cross - T of size 15x42 mm of length 1200 mm and secondary intermediate cross- T of size 15x42 mm of length 600mm to form grid module of size 600 x 600 mm, suspended from ceiling using galvanised mild steel (galvanizing @	sqm	1509.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			80 grams per sqm) i.e. 50 mm long, 12 mm outer diameter M-6 dash fasteners with the help of Z cleat of 27x37x27x2 mm, 6 mm dia fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x25x2 mm. Galvanised iron perimeter wall angle of size 22x19x0.40 mm of length 3000 mm to be fixed on periphery wall / partition with the help of plastic rawl plugs at 450 mm centre to centre and 40mm long dry wall S.S screws. The work shall be carried out as per specifications, drawing and as per directions of the Engineer-in-Charge.		
12.80		Light weight calcium silicate wall panelling tiles	Providing and fixing in position wall panelling at all heights with 15 mm thick fully perforated square/butt edge light weight calcium silicate panels/ tiles., non-cementitious, reinforced with fibre and natural filler, having NRC (Noise Reduction Coefficient) of 0.10-0.20 for plain and designer 0.15-0.40 for pinhole texture and NRC 0.45-0.65 for fully perforated tiles as per IS 8225:1987, sound attenuation STA-32db. of 0.75 (minimum) as per IS 8225:1987, Light Reflectance of 85% (minimum), non-combustible as per BS:476 (part-4), 50-52% recycled content including fly ash, fire performance as per BS:476 (part 6 &7), humidity resistance of 100%, thermal conductivity 0.050 to 0.052 W/m. KC as per ECBC Code 2007, weight 1.900 Kg to 2.100 Kg per tile, density 450 Kg/m <sup>3</sup> in edge portion (thickness 15 mm) and 350 Kg/m <sup>3</sup> in central portion (thickness 10 mm), comprising of a frame made from especially fabricated galvanised mild steel sheet 0.50 mm thick pressed section (galvanizing @120 grams per sqm including both sides) i.e. Vertical studs of size 48 x 34 x 36 mm are placed at 600mm centre to centre in a floor and ceiling channel section of size 50 x 32mm fixed to the floor and soffit at 600 mm centres using 12mm	sqm	1603.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			dia, 40mm long wedge type expanded zinc alloy dash fastener with 10 mm bolt. This same channel is then to be fixed in horizontal direction at 600mm centre to centre so as to form a grid of 600mm x 600mm. Glass wool of 50mm thickness is then to be inserted in the slots and finally calcium silicate non-combustible panels/tiles are to be screw fixed with self-tapping pan head nickel coated mild steel screws of size 13 x 3.2mm on to this grid leaving an even groove of 1 mm between the panels. The joints between the panels are to be duly jointed and finished using recommended jointing calcium silicate based compound and fibre joint tape roll 50mm wide (90 metre) roll and two coats of primer suitable for panelling as per manufacturer's specification as per direction of engineer-in-charge all complete. With 15 mm thick fully perforated square/butt edge light weight calcium silicate panels/ tiles.		
12.81		GRG (glass fibre reinforced) gypsum false ceiling	Providing & fixing false ceiling at all heights with GRG (Glass Fibre Reinforced Gypsum) false ceiling tiles of Size 595x595 mm of approved texture, design and patterns having moisture content less than 2%, humidity resistance of 99%, NRC 0.50 to 0.75 as per IS 8225:1987, Noncombustible as per BS 476 (part 4)-1970 and light reflectance of 85% (minimum) to be laid in true horizontal level suspended on interlocking metal T-Grid of hot dipped galvanised iron section of 0.33mm thick (galvanized @ 120 grams per sqm including both sides) comprising of main-T runners of size 15x32 mm of length 3000 mm, cross - T of size 15x32 mm of length 1200 mm and secondary intermediate cross- T of size 15x32 mm of length 600mm to form grid module of size 600 x 600 mm, suspended from ceiling using galvanised mild steel items		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			(galvanizing @ 80 grams per sqm) i.e. 50 mm long, 8 mm outer diameter M-6 dash fasteners, 6 mm dia fully threaded hanger rod upto 1000 mm length and L-shape level adjuster of size 85x25x2 mm. Galvanised iron perimeter wall angle of size 24x24x0.40 mm of length 3000 mm to be fixed on periphery wall / partition with the help of plastic rawl plugs at 450 mm center to center and 40 mm long dry wall wood screws. The work shall be carried out as per specifications, drawing and as per directions of the Engineer-in- Charge.		
	12.81.1	12mm thick	With semi perforated 12mm thick micro tegular edged GRG false ceiling tiles.	sqm	1210.00
	12.81.2	10mm thick	With fully perforated 10mm thick square edged GRG false ceiling tiles for sound proof and acoustic.	sqm	1307.00
12.82		Calcium silicate 15 mm thick tegular edged	Providing and Fixing 15 mm thick densified tegular edged eco friendly light weight calcium silicate false ceiling tiles of approved texture of size 595 x 595 mm in true horizontal level, suspended on inter locking metal grid of hot dipped 387alvanized steel sections (387alvanized387 @ 120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and of size 24x38 mm made from 0.33 mm thick (minimum) sheet, spaced 1200 mm centre to centre, and cross "T" of size 24x28mm made out of 0.33 mm (Minimum) sheet, 1200 mm long spaced between main'T' at 600 mm centre to centre to form a grid of 1200x600 mm and secondary cross 'T' of length 600 mm and size 24 x28 mm made of 0.33 mm thick (Minimum) sheet to be inter locked at middle of the 1200x 600 mm panel to from grid of size 600x600 mm, resting on periphery walls /partitions on a Perimeter wall angle pre-coated steel of size(24x24X3000	sqm	1196.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>mm made of 0.40 mm thick (minimum) sheet with the help of rawlplugs at 450 mm centre to centre with 25 mm long dry wall screws @ 230 mm interval and laying 15 mm thick densified edges 388alvani silicate ceiling tiles of approved texture in the grid, including, cutting/ making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Main 'T' runners to be suspended from ceiling using G.I. slotted cleats of size 25x35x1.6 mm fixed to ceiling with 12.5 mm dia and 50 mm longdash fasteners, 4 mm G.I. adjustable rods with 388alvanized steel levelclips of size 85 x 30 x 0.8 mm, spaced at 1200 mm centre to centre along main 'T', bottom exposed with 24 mm of all Tsections shall be pre-painted with polyster baked paint, for all heights, as per specifications, drawings and as directed by Engineer-in-Charge.</p> <p>Note :- Only calcium silicate false ceiling area will be measured from wall to wall. No deduction shall be made for exposed frames/ opening (cut outs) having area less than 0.30 sqm. The calcium silicate ceiling tile shall have NRC value of 0.50 (Minimum), light reflection &gt; 85%, non-combustible as per B.S. 476 part IV, 100% humidity resistance and also having thermal conductivity</p>		
12.83		UPVC plank	<p>Providing and fixing upvc plank, Plank size (340 X 2700 ) mm as per approved shade, the panel shall be laser catted end of plank fixing j-trim fixed and corner edge of ceiling fixed u pvc clip same colour and providing and fixing of frame work made of special sections, power pressed from M.S. sheets and galvanized with zinc coating of 125 gms/sqm (both side inclusive) as per IS : 277 and consisting of angle cleats of size 25 mm wide x 1.6 mm thick with flanges of 27 mm and 37mm, at 1200 mm centre to centre, one flange fixed to</p>	sqm	2619.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			the ceiling with dash fastener 12.5 mm dia x 50mm long with 6mm dia bolts, other flange of cleat fixed to the angle hangers of 25x10x0.50 mm of required length with nuts & bolts of required size and other end of angle hanger fixed with intermediate G.I. channels 45x15x0.9 mm running at the spacing of 1200 mm centre to centre, to which the ceiling section 0.5 mm thick bottom wedge of 80 mm with tapered flanges of 26 mm each having lips of 10.5 mm, at 450 mm centre to centre, shall be fixed in a direction perpendicular. j trim end clip includes in this item any other item not be paid separately complete in all respect as per the directions of Engineer-in-Charge. .		
12.84		PVC ceiling system profile panel	<p>Providing &amp; Fixing PVC ceiling system profile panel with click system interlock panel size 4000mmx340mmx1mm resistance to weather perfect finish in wood grain &amp; solid colour maintenance free Resistance to weather truly anti bacterial. with edge profile J-trim on periphery &amp; center profile T-trim in panel joint Complete System to be fixed on G.I. framework of ceiling section at 450 mm distance with enter section suspended by roof by G.I. angle hanger in proper line &amp; level etc complete</p> <p>PRODUCT SPECIFICATIONS:  Meets or exceeds the standard specification of (ASTM D-4477) and its referenced documents.  Impact resistance: No deformation observed. (Tested at 50 LBS)  Tensile strength, MPa: &gt;37.0  Tensile modulus, MPa: &gt;2000  Surface distortion: None at 120F  Squareness: &lt;1/8" of square  Length: Within 1/4" of specification  Lock control: Complies  Color Change: &lt;2 grayscales (16 hrs under 1200W/m2 UV radiation at 50 degrees)</p>	Sqm	3178.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Descripti on</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
12.85		Tensile (fabric) structure system	Design built, supply and erection of Tensile (fabric) structure system including designing and fabrication in M.S. steel tubular structure as per Indian standard section as per approved design and shape including base plate, dash fastener, clits etc. Cutting, patterning, plotting and welding of fabric with the help of tensile structure software. Fabric should be welded by high frequency PVC welding in proper line with PVC cader to be fixed on end of the fabric and to be stretched & fixed on M.S. design structure with the help of. M.S. Flat bar with self-taping screw. M.S. structure to be painted with one coat of epoxy primer with MRF PU paint of approved colour in desired shape. With 1050 GSM tensile fabric		
	12.85.1		With preconstraint tensile membrane 1050 GSM (20 years Warranty)	Sqm	9347.00
	12.85.2		With preconstraint tensile membrane 1050 GSM (15 Years warranty)	Sqm	8151.00



**CHAPTER – 13.0**  
**FINISHING WORK**  
**(PLASTERING AND PAINTING)**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1.	IS 16 (Part-I)	Shellac : Part : I — Hand Made Shellac
	IS 16(Part-II)	Shellac : Part : II — Machine Made Shellac
2.	IS 75	Linseed Oil Raw and Refined
3.	IS 77	Linseed Oil Boiled For Paints
4.	IS 102	Ready Mixed Paint, Brushing, Red Lead, Nonsetting, Priming
5.	IS 104	Specification for Ready Mixed Paint, Brushing, Zinc Chrome, Priming
6.	IS 109	Ready Mixed Paint, brushing, priming Plaster to Indian Standard Colour No.361, 631 White and off White
7.	IS 117	Ready Mixed Paint, Brushing, Finishing Exterior, Semigloss for General Purposes to Indian Standards Colours.
8.	IS 133	Enamel, Interior (a) Under Coating (b) Finishing
9.	IS 137	Ready Mixed Paint, Brushing, Matt Or Egg Shell Flat, Finishing Interior to Indian Standard Colour as required
10.	IS 158	Ready Mixed Paint, Brushing, Bituminous Black, Lead Free, Acid, Alkali and Heat Resisting
11.	IS 217	Specification for Cut Back Bitumen
12.	IS 218	Specification for Creosote and Anthracene Oil For Use As Wood Preservatives
13.	IS 290	Coal Tar Black Paint
14.	IS 337	Varnish, Finishing Interior
15.	IS 341	Black Japan, Types 'A', 'B' and 'C'
16.	IS 347	Varnish, Shellac for General Purposes
17.	IS 348	French Polish
18.	IS 419	Putty for Use On Window Frames
19.	IS 427	Distemper, Dry Colour as Required
20.	IS 428	Distemper, Oil Emulsion, Colour as Required
21.	IS 524	Varnish, Finishing, Exterior, Synthetic Air Drying
22.	IS 533	Gum Spirit of Turpentine (Oil of Turpentine)
23.	IS 712	Specification For Building Limes
24.	IS 1200	Method of Measurements of Building and Civil Engineering Works
	(Part-XII)	Part : XII — Plastering and Pointing
25.	IS 1200	Method of Measurements of Building and Civil Engineering Works.
	(Part-XIII)	Part : XIII — White Washing, Colour Washing Distempering and Painting of Building Surfaces
26.	IS 1200	Methods of Measurements of Building and Civil Engineering Works
	(Part-XV)	Part : XV — Painting, Polishing, Varnishing etc
27.	IS 2339	Aluminium Paint For General Purposes, in Dual Container
28.	IS 2547 (Part-II)	Gypsum Building Plasters Pt.II Premixed Light Weight Plasters
29.	IS 2932	Enamel, Synthetic, Exterior (a) Undercoating, (b) Finishing
30.	IS 2933	Enamel, Exterior (a) Undercoating (b) Finishing
31.	IS 5410	Cement Paint
32.	IS 5411 (Part-1)	Plastic Emulsion : Paint Part I For Interior Use
33.	IS 6278	Code of Practice For White Washing and Colour Washing

**PREAMBLE**  
**FINISHING WORK**  
**(CHAPTER: 13.0)**

### **13.1 Cement Plaster**

The cement plaster shall be 12 mm, 15 mm or 20 mm thick as specified in the item

### **13.2 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

### **13.3 Application of Plaster**

Ceiling plaster shall be completed before commencement of wall plaster.

Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is being taken down. To ensure even thickness and a true surface, plaster about 15 × 15 cm shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. This shall be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and side ways movements at a time. Finally the surface shall be finished off true with trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive troweling or over working the float shall be avoided.

All corners, arrises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises, provision of grooves at junctions etc. where required shall be done without any extra payment. Such rounding, chamfering or grooving shall be carried out with proper templates or battens to the sizes required.

When suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically. When recommencing the plastering, the edge of the old work shall be scrapped cleaned and wetted with cement slurry before plaster is applied to the adjacent areas, to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of wall and not nearer than 15 cm to any corners or arrises. It shall not be closed on the body of the features such as plasters, bands and cornices, nor at the corners of arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakages. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar. No portion of the surface shall be left out initially to be patched up later on. The plastering and finishing shall be completed within half an hour of.

### 13.4 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.

### 13.5 Precaution

Any cracks which appear in the surface and all portions which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer-in-Charge.

- (i) When ceiling plaster is done, it shall be finished to chamfered edge at an angle at its junction with a suitable tool when plaster is being done. Similarly when the wall plaster is being done, it shall be kept separate from the ceiling plaster by a thin straight groove not deeper than 6 mm drawn with any suitable method with the wall while the plaster is green.
- (ii) To prevent surface cracks appearing between junctions of column/beam and walls, 150 mm wide chicken wire mesh should be fixed with U nails 150 mm centre to centre before plastering the junction. The plastering of walls and beam/column in one vertical plane should be carried out in one go. For providing and fixing chicken wire mesh with U nails payment shall be made separately.

### 13.6 Scaffolding

For all exposed brick work or tile work double scaffolding independent of the work having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed. For all other work in buildings, single scaffolding shall be permitted. In such cases the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width or immediately near the skew backs of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

### 13.7 White washing/Colour washing/ Painting/ Distempering etc.

Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings and foreign matter. In case of old work, all loose particles and scales shall be scrapped off and holes in plaster as well as patches of less than 50 cm area shall be filled up with mortar of the same mix. Where so specifically ordered by the Engineer-in-Charge, the entire surface of old white wash shall be thoroughly removed by scrapping and this shall be paid for separately. Where efflorescence is observed the deposits may be brushed clean and washed. The surface shall then be allowed to dry for atleast 48 hours before white washing is done.

### 13.8 Protective Measures

Doors, windows, floors, articles of furniture etc. and such other parts of the building not to be white washed, shall be protected from being splashed upon. Splashings and droppings, if any shall be removed by the contractor at his own cost and the surfaces cleaned. Damages if any to furniture or fittings and fixtures shall be recoverable from the contractor.

### 13.9 Material

The paint shall be (Textured exterior paint/Acrylic smooth exterior paint/premium acrylic smooth exterior paint) of approved brand and manufacture. This paint shall be brought to the site of work by the contractor in its original containers in sealed condition. The material

shall be brought in at a time in adequate quantities to suffice for the whole work or at least a fortnight's work. The materials shall be kept in the joint custody of the contractor and the Engineer-in-Charge. The empty containers shall not be removed from the site of work till the relevant item of work has been completed and permission obtained from the Engineer-in-Charge.

### **13.10 Preparation of Surface**

For new work, the surface shall be thoroughly cleaned off all mortar dropping, dirt dust, algae, fungus or moth, grease and other foreign matter of brushing and washing, pitting in plaster shall make good, surface imperfections such as cracks, holes etc. should be repaired using white cement. The prepared surface shall have received the approval of the Engineer in charge after inspection before painting is commenced.

Before pouring into smaller containers for use, the paint shall be stirred thoroughly in its container, when applying also the paint shall be continuously stirred in the smaller containers so that its consistency is kept uniform. Dilution ratio of paint with potable water can be altered taking into consideration the nature of surface climate and as per recommended dilution given by manufacturer. In all cases, the manufacturer's instructions and directions of the Engineer-in-charge shall be followed meticulously. The lids of paint drums shall be kept tightly closed when not in use as by exposure to atmosphere the paint may thicken and also be kept safe from dust.

Paint shall be applied with a brush/ roller on the cleaned and smooth surface. Horizontal strokes shall be given 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 roller marks.

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

Spraying should be done only when dry condition prevails. Each coat shall be allowed to dry out thoroughly and rubbed smooth before the next coat is applied. This should be facilitated by thorough ventilation. Each coat except the last coat, shall be lightly rubbed down with sand paper or fine pumice stone and cleaned off dust before the next coat is laid.

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

No hair marks from the brush or clogging of Paint puddles in the corners of panels, angles of mouldings etc. shall be left on the work.

In painting doors and windows, the putty round the glass panes must also be painted but care must be taken to see that no Paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out in painting. However, bottom edge of the shutters where the painting is not practically possible, need not be done nor any deduction on this account will be done but two coats of primer of approved make shall be done on the bottom edge before fixing the shutters.

On painting steel work, special care shall be taken while painting over bolts, nuts, rivets overlaps etc.

**TABLE 13.1**

**Measurement**

<b>Sr. No.</b>	<b>Description of work</b>	<b>How measured</b>	<b>Multiplying coefficients</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>I</b>	<b>Wood work doors, windows etc.</b>		
1	Panelled or framed and braced doors, windows etc.	Measured flat (not girthed including)	1.30 (for each side)
2	Ledged and battened or ledged, battened and braced doors, windows etc.	Chowkhat or frame, Edges, chocks, cleats, etc. shall be deemed to be included in the item.	-do-
3	Flush doors etc.	-do-	1.20 (for each side)
4	Part panelled and part glazed or gauzed doors, window etc. (Excluding painting of wire gauze portion)	-do-	1.00 (for each side)
5	Fully glazed or gauzed doors, windows etc. (Excluding painting of wire gauze portion)	-do-	0.80 (for each side)
6	Fully venetioned or louvered doors, windows etc.	-do-	1.80 (for each side)
7	Trellis (or Jaffri) work one way or two way	Measured flat overall, no deduction shall be made for open spaces, sup-orting members shall not be measured separately	2 (for painting all over)
8	Carved or enriched work	Measured flat	2 (for each side)
9	Weather boarding	Measured flat (not girthed supporting frame work shall not be measured separately	1.20 (for each side)
10	Wood shingle roofing	Measured flat (not girthed)	1.10 (for each side)
11	Boarding with cover fillets and match boarding	Measured flat (not girthed)	1.05 (for each side)
12	Tile and slate battening	Measured flat overall no deductions shall be made for open spaces	0.80 (for painting all over)
<b>II</b>	<b>Steel work doors, windows etc.</b>		
13	Plain sheeted steel doors or windows	Measured flat (not girthed) including frame edges etc.	1.10 (for each side)
14	Fully glazed or gauzed steel doors and windows (excluding painting of wire gauze portion)	-do-	0.50 (for each side)
15	Partly panelled and partly glazed or gauzed doors and windows (excluding painting of wire gauze portion)	-do-	0.80 (for each side)

<b>Sr. No.</b>	<b>Description of work</b>	<b>How measured</b>	<b>Multiplying coefficients</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
16	Corrugated sheeted steel doors or windows	-do-	1.25 (for each side)
17	Collapsible gates	Measured flat	1.50 (for each side)
18	Rolling shutters of interlocked laths	Measured flat (size of opening) all over; jamb guides, bottom rails and locking arrangement etc. shall be included in the item (top cover shall be measured separately)	1.10 (for each side)
<b>III</b>	<b>General</b>		
19	Expanded metal, hard drawn steel wire fabric of approved quality, grill works and gratings in guard bars, balustrades, railing partitions and MS Bars in windows frames	Measured flat overall; no deduction shall be made for open spaces; supporting members shall not be measured separately	1 (for Paint all over)
20	Open palisade fencing and gates including standards, braces, rails stays etc. in timber or steel	-do- (see note No. 12)	1 (for Paint all over)
21	Corrugated iron sheeting in roofs, side cladding etc.	-do- Measured flat (not girthed)	1.14 (for each side)
22	AC corrugated sheeting in roofs, side cladding etc	-do-	1.20 (for each side)
23	AC semi corrugated sheeting in roofs, side cladding etc. or Nainital pattern using plain sheets	-do-	1.10 (for each side)
24	Wire gauze shutters including painting of wire gauze	-do-	1.00 (for each side)

### 13.11 Explanatory Notes for Table 13.1

- (i) Measurements for doors windows etc., shall be taken flat (and not girthed) over all including chowkhuts or frames, where provided. Where Chowkhuts or frames are not provided, the shutter measurements shall be taken.
- (ii) Where doors, windows etc, are of composite types other than those included in Table 13.1 the different portion shall be measured separately with their appropriate coefficients, the centre line of the common rail being taken as the dividing line between the two portions
- (iii) The coefficients for door and windows shall apply irrespective of the size of frames and shutter members.
- (iv) In case steel frames are used the area of doors, windows shutters shall be measured flat excluding frames.
- (v) When the two faces of a door, window etc. are to be treated with different specified finishes, measurable under separate items, the edges of frames and shutters shall be



treated with the one or the other type of finish as ordered by the Engineer-in-Charge and measurement of this will be deemed to be included in the measurement of the face treated with that finish.

- (vi) In the case where shutters are fixed on both faces of the frames, the measurement for the door frame and shutter on one face shall be taken in the manner already described, while the additional shutter on the other face will be measured for the shutter only excluding the frame.
- (vii) Where shutters are provided with clearance at top or/and bottom each exceeding 15 cm height, such openings shall be deducted from the overall measurements and relevant coefficient shall be applied to obtain the area payable.
- (viii) Collapsible gates shall be measured for width from outside to outside of gate in its expanded position and for height from bottom to top of channel verticals. No separate measurements shall be taken for the top and bottom guide rails rollers, fittings etc.
- (ix) Coefficients for sliding doors shall be the same as for normal types of doors in the table. Measurements shall be taken outside to outside of shutters, and no separate measurements shall be taken for the painting guide rails, rollers, fittings etc.
- (x) Measurements of painting as above shall be deemed to include painting all iron fittings in the same or different shade for which no extra will be paid.
- (xi) The measurements of guard bars, expanded metal, hard drawn steel wire fabric of approved quality, grill work and gratings, when fixed in frame work, painting of which is once measured elsewhere shall be taken exclusive of the frames. In other cases the measurements shall be taken inclusive of the frames.
- (xii) For painting open palisade fencing and gates etc., the height shall be measured from the bottom of the lowest rail, if the palisades do not go below it, (or from the lower end of the palisades, if they project below the lowest rail), upto the top of rails or palisades whichever are higher, but not up to the top of standards when the latter are higher than the top rails or the palisades. Width of moulded work of all other kinds, as in hand rails, cornices, architraves shall be measured by girth.

For trusses, compound girders, stanchions, lattice girders, and similar work, actual areas will be measured in sq. metre and no extra shall be paid for painting on bolt heads, nuts, washers etc. even when they are picked out in a different tint to the adjacent work.

Painting of rain water, soil, waste, vent and water pipes etc. shall be measured in running metres of the particular diameter of the pipe concerned. Painting of specials such as bends, heads, branches, junctions, shoes, etc. shall be included in the length and no separate measurements shall be taken for these or for painting brackets, clamps etc.



Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.1		12 mm cement plaster	12 mm cement plaster of mix :		
	13.1.1	1:4	1:4 (1 cement : 4 sand)	sqm	173.00
	13.1.2	1:6	1:6 (1 cement : 6 sand)	sqm	160.00
13.2		15 mm cement plaster	15 mm cement plaster on the rough side of single or half brick wall of mix		
	13.2.1	1:4	1:4 (1 cement : 4 sand)	sqm	184.00
	13.2.2	1:6	1:6 (1 cement : 6 sand)	sqm	168.00
13.3		20 mm cement plaster	20 mm cement plaster of mix :		
	13.3.1	1:4	1:4 (1 cement : 4 sand)	sqm	245.00
	13.3.2	1:6	1:6 (1 cement : 6 sand)	sqm	225.00
13.4		12 mm cement plaster finished with a floating coat	12 mm cement plaster finished with a floating coat of neat cement of mix :		
	13.4.1	1:3	1:3 (1 cement : 3 sand)	sqm	210.00
	13.4.2	1:4	1:4 (1 cement : 4 sand)	sqm	203.00
13.5		15 mm cement plaster finished with a floating coat	15 mm cement plaster on rough side of single or half brick wall finished with a floating coat of neat cement of mix		
	13.5.1	1:3	1:3 (1 cement : 3 sand)	sqm	236.00
	13.5.2	1:4	1:4 (1 cement : 4 sand)	sqm	220.00
13.6		18 mm cement plaster cm 1:5& 1:4 smooth finish	18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 sand) finished with a top layer 6mm thick cement plaster 1:4 (1 cement : 4 sand).	sqm	220.00
13.7		18 mm cement plaster cm 1:5 & 1:3 rough finished with sponge	18 mm cement plaster in two coats under layer 12 mm thick cement plaster 1:5 (1 cement : 5 sand) and a top layer 6mm thick cement plaster 1:3 (1 cement : 3 sand) finished rough with sponge.	sqm	236.00
13.8		6 mm cement plaster	6 mm cement plaster of mix : 1:3 (1 cement : 3 sand)	sqm	144.00
13.9		6 mm cement plaster with floating coat	6 mm cement plaster 1:3 (1 cement : 3 sand) finished with a floating coat of neat cement and thick coat of Lime wash on top of walls when dry for bearing of R.C.C. slabs and beams.	sqm	189.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.10		Neat cement punning	Neat cement punning	sqm	30.00
13.11		22mm rough cast plaster	Rough cast plaster upto 10m height above ground level with a mixture of sand and gravel or crushed stone from 6mm to 10mm nominal size dashed over and including the fresh plaster in two layers, under layer 12mm cement plaster 1:4 (1 cement: 4 sand) and top layer 10mm cement plaster 1:3 (1 cement: 3 sand) mixed with 10% finely grounded hydrated lime by volume of cement. Finished with ordinary cement.	sqm	296.00
13.12		22 mm pebble dash plaster	Pebble dash plaster upto 10m height above ground level with a mixture of washed pebble or crushed stone 6mm to 12.5mm nominal size dashed over and including fresh plaster in two layers under layer 12mm cement plaster 1:4 (1 cement: 4 sand) and top layer 10mm cement plaster with cement mortar 1:3 (1 cement: 3 sand) mixed with 10% finely grounded hydrated lime by volume of cement.	sqm	284.00
13.13		21mm sand faced plaster	Providing sand faced plaster upto 10meter high above ground level concrete or brick masonry surfaces into two coats, base coat of 13 mm thick in cement mortar 1:4 (1 cement: 4 sand), clearing the surface by combing it and finishing coat of 8 mm. thick in cement mortar 1:3 (1 cement: 3 sand) and taking out surface grains by mechanical arrangement or applying second coat by mechanical means including cost of all material, labour, and T and P including all lead, lift and scaffolding etc. complete.	sqm	314.00
13.14		Extra for water proofing material in plaster	Extra for providing and mixing water proofing material in cement plaster work in proportion recommended by the manufacturers.	per 50 kg cement used in the mix	79.00
13.15		Extra for plastering exterior/interior walls height more than 10m	Extra for plastering		

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	13.15.1	Exterior walls	Exterior walls of height more than 10 m from ground for every additional height of 3 m or part thereof	sqm	34.00
	13.15.2	Interior walls	Interior walls of height more than 6 m from floor level for every additional height of 3 m or part thereof	sqm	22.00
13.16		Extra for plastering on circular work	Extra for plastering on circular work not exceeding 6 m in radius:		
	13.16.1	One coat	In one coat	sqm	11.00
	13.16.2	Two coat	In two coats	sqm	18.00
13.17		Extra for plastering on moulding cornices	Extra for plastering done on moulding cornices or architraves including neat finish to line and level:		
	13.17.1	One coat	In one coat	sqm	158.00
	13.17.2	Two coat	In two coats	sqm	260.00
13.18		Extra for plastering	Extra for plastering Spherical, Groined ceiling, Flewing soffits.		
	13.18.1	Spherical	Spherical ceiling	sqm	42.00
	13.18.2	Groined	Groined ceiling	sqm	47.00
	13.18.3	Flewing	Flewing soffits	sqm	28.00
13.19		25mm washed stone grit plaster on exterior walls	Washed stone grit plaster on exterior walls of height upto 10 M. aboveground level in two layers, under layer 12mm cement plaster 1:4 (1 cement : 4 sand ) furrowing the under layer with scratching tool, applying cement slurry on the under layer @ 2 Kg of cement per square metre, top layer 15mm cement plaster 1:1/2:2 (1 cement : 1/2 sand : 2 stone chipping 10mm nominal size) in panels with groove all around as per approved pattern including scrubbing and washing, the top layer with brushes and water to expose the stone chippings, complete as per specification and direction of Engineer- in- charge (Payment for providing grooves shall be made separately).	sqm	428.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.20		Forming groove in the top layer of washed stone grit plaster	Forming groove of uniform size 20 or 15 mm wide and 15 mm deep in the top layer of washed stone grit plaster as per approved pattern using wooden battens, nailed to the under layer including removal of wooden battens, repair to the edges of panels and finishing the groove complete as per specifications and direction of the Engineer-in-charge :	meter	24.00
13.21		Extra for grit plaster of height more than 10m	Extra for washed grit plaster on exterior/interior walls of height more than 10m from ground/floor level for every additional height of 3 m or part thereof.	sqm	67.00
13.22		Extra for grit plaster on circular work 6m in radius	Extra for washed stone grit plaster on circular work not exceeding 6m in radius (in two coats).	sqm	36.00
13.23		Grooving stone gritplastered	Forming groove of uniform size from 12x12mm and upto 25x15mm in the top layer of washed stone grit plastered surface as per approved pattern, including providing and fixing aluminum channels of appropriate size and thickness (not less than 2 mm), nailed to the under layer with rust proof screws and nails and finishing the groove complete as per specifications and direction of the Engineer-in-Charge.	meter	69.00
13.24		Extra for using white cement	Extra for using white cement in place of ordinary cement in the top layer of the item of washed stone grit plaster.	sqm	124.00
13.25		Premixed formulated one coat gypsum lightweight plaster	Providing and applying 12 mm thick (average) premixed formulated one coat gypsum lightweight plaster having additives and light weight aggregates as vermiculite/ perlite respectively conforming to IS: 2547 (Part -1 and II) 1976, applied on hacked/ uneven background such as bare brick/ block/ RCC work on walls and ceiling at all floors and locations, excluding in wall which may come in contact with dampness finished in smooth line and level etc. complete.	sqm	161.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.26		Addition of synthetic polyester triangular fibre	Extra for addition of synthetic Polyester triangular fibre of length 6mm, effective diameter 10-40 microns and specific gravity of 1.34 to 1.40 in cement plaster/mortar by using 125gms. Of synthetic Polyester triangular fibre for 50 Kgs. cement used in cement mortars per directions of Engineer-in-Charge.	per bag of 50 kg cement	56.00
13.27		Mesh in plaster	Providing and fixing mesh in vertical and horizontal junction of RCC and brick/AAC work including scaffolding and all lead and lift etc. complete		
	13.27.1	Chicken mesh in plaster	G.I. chicken mesh as per ISI specification and in the required width with 50mm long Bombay nails before plastering up to 10 meter height.	Sqm	62.00
	13.27.2	Fibre mesh in Plaster	Providing and fixing fibre mesh of 145 GSM weight in required width with cement mortar before plastering up to 10m height.	Sqm	45.00
13.28		12 mm thick plain cement mortar band	12 mm thick plain cement mortar bands in cement mortar 1:4 (1 cement : 4 sand) :		
	13.28.1	Flush	Flush Band	cm per m	2.00
	13.28.2	Sunk	Sunk Band	cm per m	2.00
	13.28.3	Raised	Raised Band	cm per m	2.00
	13.28.4	Moulded	Moulded Band	cm per m	4.00
13.29		18 mm thick plain cement mortar band	18 mm thick plain cement mortar band in cement mortar 1:4 (1 cement : 4 sand):		
	13.29.1	Flush	Flush Band	cm per m	2.00
	13.29.2	Sunk	Sunk Band	cm per m	3.00
	13.29.3	Raised	Raised Band	cm per m	3.00
	13.29.4	Moulded	Moulded Band	cm per m	5.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.30		18mm moulded cement mortar band	18 mm thick moulded cement mortar band in two coats under layer 12mmthick with cement mortar 1:5 (1 cement : 5 sand) top layer 6mm thick with cement mortar 1:4(1 cement : 4 sand).	cm per m	5.00
13.31		Pointing on brick work	Pointing on brick work or brick flooring with cement mortar 1:3 (1 cement : 3 sand) :		
	13.31.1	Flush	Flush / Ruled/ Struck or weathered pointing.	sqm	70.00
	13.31.2	Raised	Raised and cut pointing	sqm	112.00
	13.31.3	Sunk	Sunk pointing	sqm	89.00
13.32		Pointing on stone work	Pointing on stone work with cement mortar 1:3 (1 cement: 3 sand).		
	13.32.1	Flush	Flush/ Ruled pointing	sqm	96.00
	13.32.2	Raised	Raised and cut pointing	sqm	172.00
13.33		Raised and cut pointing on stone work	Raised and cut pointing on stone work in white cement mortar 1:3 (1 white cement : 3 marble dust)	sqm	196.00
13.34		Flush pointing on stone slab ceiling	Pointing on stone slab ceiling with cement mortar 1:2 (1 cement : 2 sand): Flush/ Ruled pointing	sqm	56.00
13.35		Extra for pointing at height more than 10 m	Extra for pointing on walls on the outside/inside at height more than 10 metre from ground/floor level for every additional height of 3 m or part there of.	sqm	5.00
13.36		Broken glass on compound wall	Providing and fixing broken glass in cement mortar 1.3 including cost of mortar, over compound walls.	sqm	139.00
13.37		Writing board green	Providing and fixing writing board green writing with chalk (regular modified polyster coated steel surface). of sizes.		
	13.37.1	1200x1800mm	size 1200mmx1800mm	each	7436.00
	13.37.2	1200x2400mm	size 1200mmx2400mm	each	9730.00
	13.37.3	1200x3000mm	size 1200mmx3000mm	each	12126.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.38		POP putty	Providing and applying plaster of paris putty of 2 mm thickness over plastered surface to prepare the surface even and smooth complete	sqm	77.00
13.39		POP punning	Plaster of paris punning		
	13.39.1	10 mm average thickness	Providing and applying plaster of paris punning of 10 mm average thickness over plastered surface to prepare the surface even and smooth complete.	sqm	130.00
	13.39.2	Extra for making grove	Extra for making 12mm flute grove with 6 mm depth to prepare the surface even and smooth complete.	metre	70.00
13.40		Extra for lining out plaster to imitate stone or concrete blocks	Extra for lining out plaster to imitate stone or concrete blocks walling.	sqm	25.00
13.41		White cement based putty	Providing and applying white cement based putty of average thickness 1 mm, of approved brand over the plastered wall surface to prepare the surface even and smooth i/c all cost of material, labour and scaffold etc in all position complete. <b>Note :</b> Putty shall be applied only on the internal walls, for application on the exterior walls prior permission of APD/Chief Engineer will be required.	sqm	74.00
13.42		Special putty in two coats	Providing and applying special putty in two coats based materials varnish, Belgium chalk, turpentine oil, white paint, safeda including sand papering for making the surface smooth for applying any or vinyl paints including all cost of material and labour etc complete.	sqm	52.00
13.43		White washing with lime	White washing with lime to give an even shade: New work (three or more coats)	sqm	11.00
13.44		Colour washing	Colour washing such as green, blue or buff to give an even shade: New work (two or more coats) with a base coat of white washing with lime.	sqm	15.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.45		Acrylic distemper	Distempering with 1st quality acrylic distemper (ready mixed) having VOC (Volatile Organic Compound) content less than 50 grams/ltr of approved manufacturer, of required shade and colour complete, as per manufacturer's specification. Two or more coat on new work.	sqm	75.00
13.46		Plastic emulsion	Wall painting by any mechanical or manual means with plastic emulsion paint of approved brand and manufacture to give an even shade: Two or more coats on new work	sqm	64.00
13.47		Acrylic distemper	Distempering by any mechanical or manual means with 1st quality acrylic distemper, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required, to achieve even shade and colour.		
	13.47.1	One coat	One coat.	sqm	20.00
	13.47.2	Two coat	Two coats.	sqm	32.00
13.48		Acrylic emulsion	Wall painting by any mechanical or manual means with acrylic emulsion paint, having VOC (Volatile Organic Compound) content less than 50 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required, to achieve even shade and colour.		
	13.48.1	One coat	One coat.	sqm	37.00
	13.48.2	Two coats	Two coats.	sqm	56.00
13.49		Acrylic emulsion paint	Wall painting by any mechanical or manual means with premium acrylic emulsion paint of interior grade, having VOC (Volatile Organic Compound) content less than 50 grams/ litre. of approved brand and manufacture, including applying additional coats wherever required to achieve even shade.	sqm	90.00



Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.50		Water proofing cement paint	Finishing walls by any mechanical or manual means with water proofing cement paint of required shade: New work (Two or more coats applied @ 3.84 kg/10 sqm).	sqm	48.00
13.51		Textured exterior paint	Finishing walls by only mechanical or manual means with textured exterior paint of required shade: New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/10 sqm.	sqm	132.00
13.52		Acrylic smooth paint (exterior)	Finishing walls by any mechanical or manual means with Acrylic Smooth exterior paint (Economy Exterior) of required shade including all scaffolding. New work (Two or more coat applied @ 1.67ltr/10sqm over and including one coat undiluted exterior waterproofing coating @ 2.39 litre/10 sqm with crack bridging ability of upto 0.5mm on horizontal surfaces with an elongation of 150% and water proofing of upto 3 bars on vertical surface	sqm	138.00
13.53		Premium acrylic smooth exterior paint (premium exterior)	Finishing walls by any mechanical or manual means with Premium Acrylic Smooth exterior paint (Premium exterior) of required shade including all scaffolding. New work (Two or more coat applied @ 1.67ltr/10sqm over and including one coat undiluted exterior waterproofing coating @ 2.39 litre/10 sqm with crack bridging ability of upto 0.5mm on horizontal surfaces with an elongation of 150% and water proofing of upto 3 bars on vertical surface)	sqm	130.00
13.54		Deluxe multi surface paint	Finishing walls by any mechanical or manual means with Deluxe Multi surface paint system for interiors and exteriors using Primer as per manufacturers specifications :		

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
	13.54.1	Painting wood work	Painting wood work with Deluxe Multi Surface Paint of required shade. Two or more coat applied @0.90 ltr/10 sqm over an under coat of primer applied@0.75 ltr/ 10 sqm of approved brand or manufacture	sqm	69.00
	13.54.2	Painting steel work	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 or manufacture.	sqm	71.00
	13.54.3	Two or more coats	Two or more coats applied on walls @ 1.25 ltr/10 sqm. Over and including one coat of Special primer applied @ 0.75 ltr / 10 sqm.	sqm	81.00
13.55		Silicon and acrylic emulsion water thinnable sealer	Painting with silicon and acrylic emulsion based water thinnable sealer of approved brand and manufacture on wet or patchy portion of plastered surfaces:		
	13.55.1	One coat	One coat	sqm	63.00
	13.55.2	Two coats	Two coats	sqm	101.00
13.56		Epoxy paint	Finishing with Epoxy paint (two or more coats) at all locations prepared and applied as per manufacturer's specifications including appropriate priming coat, preparation of surface, etc. complete.		
	13.56.1	On steel	On steel work	sqm	109.00
	13.56.2	On concrete	On concrete work	sqm	113.00
13.57		Synthetic emulsion Paint on G.S. sheet	Painting on G.S. sheet with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: New work (two or more coats) including a coat of approved steel primer but excluding a coat of mordant solution.	sqm	55.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.58		Mordant solution on G.S. sheet	Applying a coat of mordant solution on G.S. sheet :		
	13.58.1	With copper acetate	With a solution of 38 gms of copper acetate in a litre of soft water	sqm	19.00
	13.58.2	With copper & aluminium	With a solution made of 13 gms of hydrochloric acid in a solution of 13 gms each of copper chloride, copper nitrate and ammonium chloride dissolved in a litre of soft water.	sqm	18.00
13.59		Painting on rain water, soil, waste and vent pipes with black bitumastic paint (new work)	Painting (two or more coats) on rain water, soil, waste and vent pipes and fittings with black anticorrosive bitumastic paint approved brand and manufacture over and including a priming of ready mixed zinc chromate yellow primer on new work :		
	13.59.1	75mm dia	75 mm diameter pipes	meter	19.00
	13.59.2	100 mm dia	100 mm diameter pipes	meter	25.00
	13.59.3	150 mm dia	150 mm diameter pipes	meter	37.00
13.60		Pipe painting with synthetic enamel paint (new work)	Painting (two or more coats) on rain water, soil, waste and vent pipes and fittings with synthetic enamel paint of approved brand and manufacture and required colour over a priming coat of approved steel primer on new work.		
	13.60.1	75 mm	75 mm diameter pipes	meter	22.00
	13.60.2	100 mm	100 mm diameter pipes	meter	29.00
	13.60.3	150mm	150 mm diameter pipes	meter	43.00
13.61		Wood preservative (New work)	Painting with oil type wood preservative of approved brand and manufacture: New work (two or more coats)	sqm	21.00
13.62		Fire retardant paint on wood & ply (New work)	Providing and applying two coats of fire retardant paint on cleaned wood/ply surface @ 3.5 sqm per litre per coat including preparation of base surface as per recommendations of manufacturer to make the surface fire retardant.	sqm	246.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.63		Coal tarring	Coal tarring two coats on new work using 0.16 and 0.12 litre coal tar persqm in the first coat and second coat respectively.	sqm	25.00
13.64		Synthetic enamel paint on new work	Painting with synthetic enamel paint of approved brand and manufacture to give an even shade: Two or more coats on new work.	sqm	53.00
13.65		Synthetic enamel paint over a under coat	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: Two or more coats on new work over an under coat of suitable shade with ordinary paint of approved brand and manufacture.	sqm	77.00
13.66		Synthetic enamel paint, on old work	Painting with synthetic enamel paint, having VOC (Volatile Organic Compound) content less than 150 grams/ litre, of approved brand and manufacture, including applying additional coats wherever required to achieve even shade and colour.		
	13.66.1	One coat.	One coat.	sqm	35.00
	13.66.2	Two coats.	Two coats.	sqm	53.00
13.67		Primers	Applying priming coats with primer of approved brand and manufacture, having low VOC (Volatile Organic Compound) content.		
	13.67.1	On wood	With ready mixed pink or grey primer on wood work (hard and soft wood) having VOC content less than 50 grams/litre.	sqm	28.00
	13.67.2	On steel/iron	With ready mixed red oxide zinc chromatic on steel/ iron works having VOC content less than 250 grams/litre.	sqm	24.00
	13.67.3	On wall	With water thinnable cement primer on wall surface having VOC content less than 50 grams/litre.	sqm	24.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.68		Aluminium paint	Painting with aluminium paint of approved brand and manufacture to give an even shade. Two or more coats on new work.	sqm	45.00
13.69		Acid proof paint	Painting with acid proof paint of approved brand and manufacture of required colour to give an even shade: Two or more coats on new work.	sqm	58.00
13.70		Anti-corrosive bitumastic paint	Painting with black anti-corrosive bitumastic paint of approved brand and manufacture to give an even shade: Two or more coats on new work.	sqm	42.00
13.71		Floor enamel paint	Floor painting with floor enamel paint of approved brand and manufacture of required colour to give an even shade: Two or more coats on new work	sqm	62.00
13.72		Varnish	Varnishing with varnish of approved brand and manufacture:		
	13.72.1	Copal varnish	Two or more coats of glue sizing with copal varnish over an under coat of flattening varnish.	sqm	77.00
	13.72.2	Spar varnish	Two or more coats glue sizing with spar varnish or an under coat of flattening varnish.	sqm	78.00
13.73		French spirit polishing	French spirit polishing: Two or more coats on new works including a coat of wood filler.	sqm	125.00
13.74		Ready mixed wax polish	Polishing on wood work with ready mixed wax polish of approved brand and manufacture: New work.	sqm	54.00
13.75		Lacquer polishing	Lacquer polishing on door windows by preparing the surface applying putty base course. Prepare the surface smooth by sand papering and then applying lacquer polish with air compressor. Two or more coats on new works including a coat of wood filler.	sqm	674.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.76		Mealamine polishing	Mealamine polishing on door windows by preparing the surface applying putty base course. Prepare the surface smooth by sand papering and then applying mealamine polish with air compressor. Two or more coats on new works including a coat of wood filler.	sqm	807.00
13.77		Wax Polishing	Floor polishing on masonry or concrete floors with wax polish of approved brand and manufacture.	sqm	25.00
13.78		Lettering	Lettering with black Japan paint of approved brand and manufacture.	per lette per cm height	1.45
13.79		Flakes textured wall finishing	Providing and applying flakes textured homogeneous wall finishing system consisting of a two component system of dry flakes (9.5kgs per/pack) made of a special grade of heat treated China clay with rigid homopolymer coated with fade resistant pigments and a 100% acrylic polymer Bonding agent (5kgs/pack) applied thickness of the coating being between 0.8-1.2mm, to be applied in single coat, on a cured, smooth level plaster surface without keying, as per the shades/ combinations approved, as per manufacturersdirections for usage, to be applied byapproved applicator of manufacturer, as per direction/ supervision of the engineers-in-charge inclusive of onecoat of primer on the base at all heights etc all complete.	sqm	562.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.80		Granular wall finishing	Providing and applying Granules homogeneous wall finishing system consisting of a two component system of dry granules (25 kgs/pack) made of 92% silica particles coated with fade resistant pigments and a 100% acrylic Polymer Bonding agent (5 kgs/pack) with the applied thickness of coating as required to be applied in single coat, on a cured. Smooth level plaster surface without keying as per the shades/combinations approved. As per the manufacturers directions for usage, to be applied by approved applicator of manufacturer, as per the directions/supervision of engineers in charge, all complete inclusive of primer on the base.		
	13.80.1	0.8-1.2mm thick	0.8-1.2mm thickness	sqm	288.00
	13.80.2	2.0-2.5mm thick	2.0-2.5mm thickness	sqm	338.00
13.81		Roto wall finishing	Providing and Applying Roto Wall finishing system being a dispersion of inorganic fillers, calcite, pure silica, quartz and broad spectrum fungicides stabilized by an acrylic co-polymer, to be applied by means of customized trowels (one for incorporating material on base and spreading and other for finishing) in single coat with a coating thickness of 2.0-2-2.5mm on a cured smooth level plaster without keying, by the approved applicator of manufacturer, of the approved shade as per directions for usage all inclusive including primer coat on the base.	sqm	324.00
13.82		Polymer modified cement based plaster	Providing and plastering over AAC masonry wall with polymer modified cement based readymix factory controlled mortar with self curing, eco-friendly, wet premix in a mechanical mixer in thickness as specified below, and covering area of 2.04 kg per sqm/mm thickness. Readymix mortar having tensile adhesive strength 0.8 N/mm <sup>2</sup> in 28 days and long lasting thermal insulation according to		

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			European norm, (EN13501-2) suitable for high performance on external & internal AAC masonry walls, may be used. Rate includes cleaning of walls and scaffolding etc. complete. Dampening or slight wetting of the wall surface prior to application of plaster should be done. Curing of plaster should be done for minimum 3 days. The Bulk density of ready mix plaster may vary from 1300 to 1600 Kg/cum, Water powder ratio (as per manufacture's direction) may vary from 18-22 % by weight or as specified by the manufacturer and compressive strength may vary from 8-9 Mpa.		
	13.82.1	6 mm	6 mm thick plaster for internal walls	sqm	146.00
	13.82.2	8 mm	8 mm thick plaster for external walls exposed to weather.	sqm	180.00
13.83		UV printing on ACM sheet	Providing and fixing including Designing and UV printing on aluminium composite material (ACM) sheet in different sizes with 720DPI (Dot per inch)		
	13.83.1	2mm thick alum	ACP sheet 2mm thick	sqm	2203.00
	13.83.2	3mm thick alum	ACP sheet 3mm thick	sqm	2403.00
	13.83.3	4mm thick alum	ACP sheet 4mm thick	sqm	2577.00
13.84		UV printing on PVC foam sheet	Providing and fixing including designing and UV printing on pvc foam sheet of different size with 720 DPI (Dot per inch)		
	13.84.1	3.0 mm thick	PVC foam sheet 3.0 mm thick	sqm	1332.00
	13.84.2	5.0 mm thick	PVC foam sheet 5.0 mm thick	sqm	1565.00
	13.84.3	8.0 mm thick	PVC foam sheet 8.0 mm thick	sqm	1995.00



Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
13.85		Acrylic emulsion paint	Finishing walls with 100% Premium acrylic emulsion paint having VOC less than 50 gm/litre and UV resistance as per IS 15489:2004, Alkali & fungal resistance, dirt resistance exterior paint of required shade (Company Depot Tinted) with silicon additives. New work (Two or more coats applied @ 1.43 litre/ 10 sqm. Over and including priming coat of exterior primer applied @ 0.90 litre/10 sqm.	sqm	101.00
13.86		Providing and fixing XPS board for outer wall insulation.	Providing and fixing 50 mm thick extruded polystyrene rigid insulation board (XPS) of required size over outer wall surface, complying with ASTM C 578 - type VI, having thermal conductivity of 0.0289 W/mK as per ASTM C 518, compressive strength of > 240 kPa listed as per ASTM C 1621, density of 34-36 kg/m <sup>3</sup> as per ASTM D 1622, water absorption < 1% by volume as per ASTM C 272, oxygen index of minimum 24 as per ASTM D 2863 and Fire retardant property as per DIN 4102, Part 1. XPS insulation of thickness 50mm shall be placed over brushed, algae free and levelled external wall by connecting the ship-laps joints and fixed by the washer and Self-Tapping Screw of suitable length at each corner and at distance 75mm from the edge and bitumen shall be applied over the joints and G.I. Expanded Mesh (Barfi Jali) shall be fixed over XPS board by a Self-Tapping Screw of suitable length at the centre of the board and 15mm PCC shall be applied over the board (paint of suitable choice can be used), all as per the directions of Engineer-in-Charge.	sqm	1114.00
13.87		Polystyrene rigid insulation board	Providing and fixing 50 mm thick extruded polystyrene rigid insulation board of required size between cavity wall, complying with ISO 4898:2008 & ASTM C 578-08b - type VI, having	sqm	649.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			thermal conductivity of 0.0289 W/m K as per ASTM C 578 (measured as per IS 3346), compressive strength of > 350kPa listed as per ASTM D 1621, density of 34-36 kg/cum as per ASTM D 1622, water absorption < 1% by volume as per ASTM D 2842, oxygen index of 24.1 to 28.1 listed as per ASTM D 2863, cell size 0.4 mm of dia (max) as per ASTM D 3576. Fire retardant property as per DIN 4102, Part 1 of class B2 and as per ASTM E84 class A, fixed with suitable water based adhesive and fastener, complete in all respect as per the directions of Engineer-in-Charge.		
13.88		Wood preservative old work	Painting with oil type wood preservative of approved brand and manufacture: Old work (one or more coats)	sqm	11.00
13.89		Sanding machine	Scrapping/sand papering of existing surface with the help of mechanized sanding machine (having mechanical vacuum machine with bag for dust collection to make surface even and smooth) as per direction of Engineer-in-Charge.	sqm	18.00
13.90		High strength triple booster primer	Providing and applying 1 coat of Triple booster primer-resist dampness, efflorescence, alkali & at the same time improve top coat coverage by 15-20% @ 1.0 lt/ 10 sqm, which confirms certification of IS 109/1968. It can be applied by Brush/ Spray Machine and the work shall be carried out as per specification & the direction of the Engineer-in-Charge.	sqm	27.00
13.91		Water based anti-germ paint	Finishing walls with water based anti-germ paint of with VOC < 50 g/l, that kills disease causing germs, teflon based washability and Anti fungal properties in two or more coats @ 1.08 ltr / 10 sqm over priming coat of interior primer applied @ 1.08 ltr / 10 sqm of required	sqm	118.00

Item No.	Sub Item	Item Name	Description	Unit	Rate (InRs.)
1	2	3	4	5	6
			shade including removing of all dust complete as per direction of Engineer-in-Charge and submission of challans of materials on enquiry.		
13.92		Epoxy coating on O.T. wall	Providing and applying in two coats of 250 micron thick each layer of epoxy coating on prepared surface (cost includes preparing the plastered surface smooth ready to receive epoxy coating) for operation theater walls in desired colour as per direction of Engineer-in-Charge.	sqm	899.00
13.93		Indian ethnic art painting	Indian ethnic art painting such as tribal Art Pithora or warli/Gond or Bhil Painting on any wall surface ( interior or exterior) by using textured/smooth exterior/interior paint of approved brand or Manufacturer including preparation of surface and cost of all material labour and scaffolding etc. complete as per direction of Engineer-in-charge.	sqm	1988.00
13.94		Exposed Concrete	Exposed Concrete is composed of a mix natural and mix elements portland cement, hardest earthen material, special additives, natural grains and special polymers to create external beauty, aesthetic value and heritage effects of concrete. thickness 4mm to 6mm.(payment for providing grooves shall be made separately) First coat:- Base coat Apply of Cementous ready mix coarse dark grey color material for making of groove, applied on smooth plaster surface with the thickness of 0.75mm to 1.5mm by trowel Second coat:-Apply of Cementous ready mix fine material, applied on plaster surface with the thickness of 2mm to 3mm by trowel. with or with out groves as per requirement and with 6mm groves (if grooves requires) with masking top of dark grey colour as per approved sample, for the complete satisfaction of architect/Engineer in charge. Third coat :- Protective clear top coat sealer (water based) applied by roller/sponge.	sqm	1586.00

<b>Item No.</b>	<b>Sub Item</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (InRs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
13.95		Water repellent sealer	Applying two coats of sealer (special silicate water based water repellent protector) with spray gun and allowing sufficient drying time for 1st coat and 2nd coat is allowed to dry for 8 to 12 hrs on exterior stone façade and stone jali. At an approximate coverage of 50 to 70 Sq.f./Ltr.	sqm	230.00

**GOVERNMENT OF MADHYA PRADESH**

**PUBLIC WORKS DEPARTMENT**



**For**

**BUILDING WORK**

**(VOLUME-II)**

**In Force From September 15, 2022**

**Issued by :-**

**PROJECT DIRECTOR**

**MP Public Works Department (P.I.U)**

**BHOPAL**



**GOVERNMENT  
OF  
MADHYA PRADESH  
PUBLIC WORKS DEPARTMENT**

**SCHEDULE OF RATES (SOR)  
*For*  
BUILDING WORKS  
( VOLUME-II )**

**In force from September 15<sup>th</sup>, 2022**

*Issued by -*

**PROJECT DIRECTOR  
M.P. Public Works Department (P.I.U.)  
BHOPAL**



## FOREWORD

Schedule of Rates for Building is issued by the Project Director, Public Works Department, Project Implementation Unit (PIU) from time to time. Since its inception the Public Work Department has issued Schedule of Rates for Building works at several occasion. Last such exercise was done by the Project Director, PWD PIU, on 01-12-2020. Since this date, various amendments were required to be issued over the time. A part from this introduction of new item using new technologies and newer materials have necessitated the issuance of this new revised SOR. Due to increased size SOR is being released in two volumes (**Volume I & II**). Volume -I containing chapters 1 to 13 and Volume-II containing chapters 14 to 31.

Due care has been taken to frame this Schedule of Rates as correctly as possible. It is however, possible that some errors might have crept in. In case any error or omission if noticed, the same may be brought to the notice of this office. New chapter of "**New Technologies and Material**", along with Preambles and Appendix have been included.

In order to simplify understanding of SOR, item name to each Item has been assigned. It is advised that cost abstract of the estimate may include only item number, item name, unit, rate, quantity and amount. This will enable easy at a glance reading of the estimate. However it always required to include full description of items in detailed estimate & BOQ.

Schedule of Testing Charges for Building Material (Civil) has also been added, which includes rates of testing of material from Departmental/Government Laboratory/National Accreditation Board for Testing and Calibration Laboratories (NABL).

The effort of **Mr. S. L. Suryavanshi, Additional Project Director, Bhopal, Mr. Anand Prakash Rane, Joint Project Director Bhopal, Mr. Praveen Nigam Executive Engineer (Design), Mrs. Shireen Khan Executive Engineer and Mrs. Amrita Singh Executive Engineer(SOR CELL), Mr. Abhay Malviya Assistant Engineer, and Mr. Ravi Prakash Chidar Assistant Engineer**, is highly appreciated who have taken this challenge of bringing out this Schedule of Rates (SOR) into effect in view of modern technologies and invention in the fields of Building & related fields as per latest National Building Code & other Standards.

I also extend my gratitude and thanks to **Mr. S.R. Baghel Additional Project Director Indore, Mr. R. K. Ahirwar Additional Project Director Jabalpur, Mr. V. K. Aarakh Additional Project Director Gwalior, Mr. Surendra Rao Gourkhede, Joint Project Director, Mr. R. D. Choudhary, Joint Project Director and Mr. Mukesh Manhar Chief Architect.**

Suggestion, if any, towards further improvement to this schedule of Rates for Building works shall be highly appreciated.

This Schedule of Rates (SOR) is available on the departmental website [www.mppwd.gov.in](http://www.mppwd.gov.in) and shall be in forced w.e.f. **September 15<sup>th</sup>, 2022.**

Place: Bhopal

Date: September 15<sup>th</sup>, 2022



(Er. G.P. Mehra)  
Project Director

MP Public Works Department P.I.U. Bhopal

## GENERAL NOTES

1. Reference mentioned herein shall be applicable to all sections to the extent the context permits and are intended to supplement the provisions in the particular section. In case of any discrepancy/ deviation, the provisions in the particular section shall take precedence.
2. In absence of any stipulation to the contrary, unit rates for various items of works are for completing works to the requirements of the specifications including full compensation for all operations and inclusive of all labour, materials, royalties, lease rent, wastages, temporary work, plant, equipment over head charges and profit, unless specified otherwise.

### 3. Interpretations

- 3.1 The Project Director, Public works Department (Project Implementation Unit) Government of M.P. shall be the sole deciding authority as to the meaning, interpretation and implications for various provisions in this publication. His decision shall be final and binding.
- 3.2 Wherever any reference is made to any Indian Standard, it shall be taken as reference to the latest edition with all amendments issued thereto.
- 3.3 In the event of any variation between the CPWD specifications (adopted) and the Indian Standard, the former shall take precedence over the later.
- 3.4 Precedence of specification in SOR: - In case of any contradiction in the provisions of the CPWD specifications (adopted) and this document the provisions of this document would take precedence.
- 3.5 Precedence of Rate in SOR: - The rates as given in this schedule for all items are final, binding and conclusive. In case of doubt and printing mistakes if any, the decision of the Project Director, P.W.D. (P.I.U.) Government of M.P. shall be final and binding.

### 4. Definitions

The following terms and expressions in the SOR shall have the meaning or implication hereby assigned to them unless otherwise specified elsewhere.

- 4.1 Specifications would refer to the Central Public Works Department (CPWD) specification as applicable as on date along with upto date amendments, addendums and errata.
- 4.2 Engineer-in-Charge: The “Engineer-in-Charge” means an engineer of the Executive Engineer rank in Building and Road (B&R) Division or Divisional Project Engineer of Project Implementation Unit (PIU), who shall supervise and be in-charge of the work.
- 4.3 IS: The standards, specification and code of practices issued by the Bureau of Indian Standards along with up to date amendments.
- 4.4 Superintending Engineer means officer in-charge of the circle in Building and Roads.
- 4.5 Chief Engineer means officer in-charge of Zone.
- 4.6 Additional Project Director means an officer of Chief Engineer level, in-charge of Zone in PWD (PIU)
- 4.7 Project Director MP PWD PIU means head of the department, an officer of E- in-C level, who heads Building wing of MPPWD.



- 4.8 Engineer-in-Chief means head of department who heads Building and Road wing of M.P. PWD.
- 4.9 Site: The 'site' shall mean the land/or other places on, in, into or through which the work is to be executed under the contract or any adjacent land, path or street through which the 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.
- 4.10 Best: The word 'best' when used shall mean that in the opinion of the Engineer- in-Charge, there is no superior material/ article and workmanship obtainable in the market and trade respectively. As far as possible the standard required shall be specified in preference to the word 'best'.
- 4.11 Department: "Department" mean Public Works Department of Govt. of M.P.

## 5. Floor and Levels of Building

- 5.1 **Floor 1:-** It is the lowest floor above the ground level in the building unless otherwise specified in a particular case. The floors above floor 1 shall be numbered in sequence as floor 2, floor 3 and so on the number shall increase upwards.
- 5.2 **Floor Level :** - For floor 1, top level of finished floor shall be the floor level and for all other floors above floor 1, top level of the structural slabs shall be the floor level.
- 5.3 **Plinth level:** -Floor 1 level or 1.2 m above the ground level whichever is lower shall be the plinth level.

## 6. Floor Levels of Special Structures

For structures like retaining walls, wing walls, chimneys, reservoirs/ tanksand other elevated structures, where elevations/ heights above a defined datum level have not been specified and identification of floors cannot be done as in case of building. Level, at 1.2 m above the ground level shall be the floor 1 level as well as plinth level. Level at a height of 3.6 m above floor 1 level will be reckoned as floor 2 level and level at a height of 3.6 m above the floor 2 level will be floor 3 level and so on. Where the total height above floor 1 level is not a whole number multiple of 3.6 metre, top most floor level shall be the next in sequence to the floor level below even if the difference in height between the two upper most floor levels is less than 3.6 metres.

## 7. Foundation and Plinth

The work in foundation and plinth shall include:

- 7.1 For buildings: All works up to 1.2 metre above ground level or up to floor 1(one) level whichever is lower.
- 7.2 For abutments, piers and well staining: All works upto 1.2metre above the bed level.
- 7.3 For retaining wall, wing walls, compound walls, chimneys, over head reservoirs/ tanks and other elevated structures: All works upto 1.2 metre above the ground level:
- 7.4 For reservoirs/tanks (other than overhead reservoirs /tanks): All works upto 1.2 metre above the ground level.
- 7.5 For basements: All works upto 1.2 metre above ground level or upto floor 1 (one) level whichever is lower.
- 7.6 For boundary walls: All works upto plinth beam or upto 1.2 metre aboveground level whichever is lower.

## 8. Measurements

Mode of measurement shall be as per the provisions of the contract and as specified in the BOQ.

- 8.1 The order of dimensions shall be consistent and in the sequence of length,width and

height or depth or thickness (LBD).

8.2 Rounding off: Rounding off where required shall be done in accordance with IS:2-1960.

9. **Rates:** -The rates include elements of hire and running charges of all types of plants, machinery and equipment required to complete the work, unless specified otherwise. Due diligence for safety and health of workers shall be observed by the contractor by observing all necessary protocol as per law; cost of which shall be deemed to have been included in rates of SOR. The rates provided in this schedule of rates include cost of all materials lead, lift, water and electricity charges performance of all workmanship; providing erecting and removing centering, forms, scaffolding, benching ladders, templates, safety equipment tools and plants and all other applications etc, required for the proper execution of work unless otherwise specified inclusive charges of duty, royalty and insurance etc.as may be applicable but excluding GST, since all taxes such as VAT, entry taxes etc. have been subsumed now in GST, rate shall not include GST which shall be payable to the contractor at prevailing rate on gross amount of contractor's bill. Provisions for covering etc. necessary to protect the work/ structure from inclement weather etc. and damage arising from falling materials or other cause such as rain, fire etc. shall be the contractor's responsibility and cost of all such arrangements shall be deemed included in SOR rates. SOR rates are also inclusive of curing wherever required including arrangement of water and its lead or lift whatsoever. If there is any source of water like tube well, hand pump, well etc. under Govt. custody and if water from this source is provided free of cost for construction activity by the contractor then water charge will be deducted at the rate of 1% of the amount paid to the contractor from the items involving use of water. SOR rates are also inclusive of testing charges and provision for laboratory at site as well SOR rate are also inclusive of any certification to be obtained from statutory authority before putting the work machineries equipment fitment to use.

10. **Materials**

10.1 **Only Approved Material:** - The contract shall get approval from Engineer-in-Charge for Samples of all materials to be used on the work. The approved samples duly authenticated and sealed shall be kept in the custody of the Engineer-in-Charge till the completion of the work. All materials to be provided by the contractor shall be brand new and as per the samples approved by the Engineer-in-Charge. Contractor shall bring to site for use in construction only from list of approved make issued by the department. Engineer-in-Charge shall be final authority to make final selection from amongst branded makes of item. Items for which list of approved are not declared brand make are not by the department that shall be selected by the APD/CE/Engineer- in-Charge.

10.2 **Temporary Accommodation at site:** -For work, if the amount of contract exceeds Rs. 100.00 lacs, the contractor shall provide a temporary accommodation of atleast 20 sqm within boundaries of site where all the approved material shall be kept for display under lock and key of Engineer-in-Charge the after completion of work this accommodation could be further used as maintenance office . If the contract amount is more than Rs.500.00 lacs additional temporary site accommodation of 20 sqm shall also be provided by the contractor for SQC (Services for Quality Control) office use related to work.

- 10.3 **Vigilance by CCTV :** - For work, if the amount of contract exceeds Rs. 1000.00 lacs contractor shall install a CCTV setup covering whole site, the access to the vision should be given to Engineer-in-Charge along with its supervision team.
- 10.4 **Materials from approved source only:** -Materials obtained by the contractor from the sources approved by the department shall be subjected to the mandatory tests. Where such materials do not conform to the relevant specifications, the material shall be rejected notwithstanding the fact that the material / make is the approved make by the department.
- 10.5 **Sampling and Testing before use of materials:-** Samples, whether submitted for approval to government bulk supplies or required for testing before use or samples bearing 'standard mark', if required for testing, shall be provided free of cost by the contractor. All other incidental expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. shall be borne by the contractor and shall be deemed included in SOR.
- 10.6 **Protection of Material at site:** - Materials stored at site, depending upon the individual characteristics, shall be protected from atmospheric effects due to rain, sun, wind and moisture to avoid deterioration.
- 10.7 **Assistance for lease/permits:** - It will not be obligatory on the part of Engineer-In-Charge to provide any assistance in obtaining lease/permits for excavation of minor minerals. The contractor shall not be entitled to any excuse, whatsoever on account of any delay in obtaining permit etc. for minor minerals to be used on the work.
- 10.8 **Warranty:-** Warranty card shall be given of all the items which covered under warranty to Engineer-in-Charge at the time of execution, payment shall not be made for such items if warranty card/certificate is not given. The warranty card/certificate shall be given to the concern department at the time of handover of the building.

## 11. Testing

- 11.1 **SOR Rates include testing charges:-** The rates also include the element of testing of samples of various materials brought by the contractor for use on the work, as well as other necessary tests for items of work as stipulated in the specifications.
- 11.2 **Testing Frequency:** -Frequency of such tests to be carried out must not be less than the prescribed frequencies.
- 11.3 **Field Laboratory:** -The contractor shall have to establish a field laboratory at the site of work, if the amount of contract exceeds Rs. 100.00 lacs.
- 11.4 **Testing in Laboratory other than field laboratory:** -In other cases, testing of construction materials should be got done from any of the testing laboratories of the government works departments, and technical institutes, engineering college, etc. In case the contract provides for testing of material through third party like NABL accredited lab or any other lab directed by the Engineer-In-Charge, the cost of testing shall be borne by the contractor.
- 11.5 **Payment only after testing:** -The work shall not be accepted in any case, if the contractor fails to observe the instructions of the department, regarding testing of materials. Before making any payment, it will be the responsibility of the officers making payment to ensure that all testing as per prescribed frequencies, have been carried out, and shall certify that the test results are in conformity with the requirement. If tests are not conducted to the prescribed frequency, the Engineer-In-Charge should reject that part of the work. Duly certified (by the representative of Engineer-in-Charge) copies of registers, containing records of tests shall have to

be presented along with running account bills. Register (in original) shall have to be submitted along with the final bill. Tests shall have to be conducted by the contractor's engineer under the supervision of the Engineer-In-Charge or his authorized representatives.

12. **Acceptance at Reduced Rate:** -If any item of work is found not upto the prescribed standard but the Engineer-In-Charge is of the opinion that the same is structurally adequate and can be accepted at a reduced rate, then in such cases, the Engineer-In-Charge shall have to submit proposals for appropriate reduction of rates supported by an analysis, in justification thereof, through a D.O. letter to the territorial Superintending Engineer or Additional Project Director to obtain his approval expeditiously (ordinarily within 15 days). The approved analysis along with orders of the Superintending Engineer /Additional Project Director shall have to be appended to the bills of the contractor. Where Superintending Engineer is not the supervising authority of Engineer-in-Charge, proposal shall be submitted to the Chief Engineer or equivalent officer who is supervising him.
13. **The Site Order Book:** - The "Site Order Book" shall be in custody of departmental supervisory staff. In case of a work for which a separate agency for supervision of work has been engaged by the department, the site order book shall be in possession of the field staff of SQC agency. The Engineer-In-Charge or his authorized representative may record his instructions in this book, which shall be noted by the contractor or his authorized representative for compliance.
14. **Cement at Site:** - A duplicate cement register as per format here under shall be maintained at site of work. Extract certified copies of the entries for each month/each running bill shall be submitted to the Engineer-in-Charge by the Contractor. The original register shall also be submitted to the Engineer-in- Charge on completion of the work by the Contractor.

S. No.	Date of receipt of cement	No. of bags	Name and address of firm, from whom purchased	Signature of contractor or his authorised representative	Signature of authorised representative of Engineer-In-Charge	Result of test for initial and final setting time	Result of tests for compressive strength of cement	Remarks

15. **Only Tested Cement:** -Where contract provides for cement to be arranged by the contractor himself, only I.S. marked cement of relevant I.S. specifications shall be allowed to be used in the work subject to the following tests. :
  - 15.1 Test for initial and final setting time as per IS: 3536 –1996, 1 Test for 10 tonnes or part thereof.
16. **Volumetric use of cement:**-When cement is used for mortar/volumetric mix etc. batch of one bag mix cement or its multiples shall be mixed and the measurement of box for metal, sand to be of 35 liters or multiples of it (convenient box size 40x35x25cm.). For design mix concrete batching shall be done by weight. 0020

17. **Aggregates:** -The aggregates to be used for all cement concrete items shall be crushed in the mechanical crushers. All concrete shall have to be mixed in power driven mixers having hoppers and capacity of mixing concrete mix of at least one bag of cement.
18. **Sand:** -Nothing extra shall be payable on account of use of Narmada sand or sand brought from any other quarry/river. Sand should conform to the requirements of IS: 1542 and IS: 2166 for using it in construction work.
19. **Rubbles from excavation:** -Rubble available from excavation of hard rock shall be the property of the contractor subject to recovery of Rs. 150/- per cum. of the quantity of the rock excavated.
20. **Ban on Teak wood:** -Teak wood shall not be used in any building work unless specific sanction of the State Government is obtained. Provision of teak wood shall not be made in any of the estimate without prior sanction of the state Government. Item such as teak wood beading, veneering, style and rail of flush door shall not be banned.
21. **Non SOR item in on-going agreement:** -If any new item is not included in SOR and is proposed to be executed in any on-going work, proposal with full justification thereof along with financial implication and detailed rate analysis must be submitted to Superintending Engineer of respective circle (B & R) or Additional Project Director, PWD, PIU for obtaining approval as on extra item.
22. In case of any difference in item description and rate between BOQ and SOR, the rate and description of BOQ shall be prevail on the other hand if there is difference in between rates only while description being the same in BOQ and SOR, rates of SOR with upto date amendment shall be prevail.
23. **Non SOR items for tendering:** -If any Non S.O.R. Item is to be executed in any proposed project, rate analysis with full justification thereof must be approved by the Technical Senction Authority, PWD PIU, and shall be included in BOQ under sub head of non SOR items at the last. Tender shall be invited on amount inclusive of SOR and non SOR items and in such cases non SOR items shall become schedule (BOQ) items for that particular tender only. However it is made clear that such non SOR items shall not be assumed as sanctioned rates for other agreements.



(Er. G.P. Mehra)  
Project Director

MP Public Works Department (P.I.U.) Bhopal.

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**CHAPTER – 14.0**

**REPAIRS TO BUILDINGS AND  
STRUCTURAL REHABILITATION**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
<b>1</b>	<b>2</b>	<b>3</b>
1.	IS 419	Specifications for Putty for use in Window Frames
2.	IS 14900	Specifications for Transparent Float Glass



**PREAMBLE**  
**REPAIRS TO BUILDINGS AND STRUCTURAL REHABILITATION**  
**(CHAPTER: 14.0)**

**14.1 Repairs to Plaster**

The work includes cutting the patch and preparing the wall surface. Patches of 2.50 square metres and less in area shall be measured under item of 'Repairs to Plaster' under this sub-head. Plastering in patches over 2.5 square metres in area shall be paid for at the rate as applicable to new work under sub head Finishing.

**14.2 Cutting**

The mortar of the patch, where the existing plaster has cracked, crumbled or sounds hollow when gently tapped on the surface, shall be removed. The patch shall be cut out to a square or rectangular shape at position marked on the wall as directed by the Engineer-in-Charge or his authorized representative. The edges shall be slightly under cut to provide a neat joint.

**14.3 Preparation of Surface**

The masonry joints which become exposed after removal of old plaster shall be raked out to a minimum depth of 10 mm in the case of brick work and 20 mm in the case of stone work. The raking shall be carried out uniformly with a raking tool and not with a basuli, and loose mortar dusted off. The surface shall then be thoroughly washed with water, and kept wet till plastering is commenced. In case of concrete surfaces, the same shall be thoroughly scrubbed with wire brushes after the plaster had been cut out. The surface shall be washed and cleaned and kept wet till plastering is commenced.

**14.4 Fixing Door, Window or Clerestory Window Chowkhats in Existing Opening**

For embedding hold fasts of doors, windows or clerestory windows, the requisite number of holes at the correct positions shall be cut out in the masonry. The size of the holes shall be such that the chowkhats with the hold-fasts can be conveniently erected in position. Where necessary, masonry shall be chipped uniformly to facilitate easy insertion of the frame in the opening.

Special care shall be taken when holes are made in load bearing pillars or wall portions separated by openings to ensure that beams etc. supported by them are properly propped up. In such portions cutting holes shall be done on one side at a time. The sides of the holes shall be truly parallel and perpendicular to the plane of the wall. Due care shall be taken, not to disturb the adjoining masonry and the masonry under the bearings of lintels and arches etc. spanning the opening. The holes shall then be cleaned of all dust, mortar and brick bats or stone pieces and thoroughly wetted.

#### **14.5 Making Opening in the Masonry Construction and Fixing Chowkhats for Doors, Windows and Clerestory Windows**

Before making opening it is necessary to examine that the wall exclusive of opening is adequate to take the load coming on the structure. All the structural members supported on the walls which have direct bearing over the area in which opening is to be made, shall be properly supported with props to relieve the load from masonry wall till the lintel over the opening is strong enough to take the load. Care should also be taken not to disturb the adjoining masonry. All precautions as explained in Chapter 15.0 (Demolition and Dismantling) should be followed in case of dismantling the external walls. The portion to be dismantled may be clearly marked on both sides of the wall. Dismantling shall be carried out from top to bottom within the marked area. The sides of the opening shall be as far as possible, parallel and perpendicular to the plane of wall.

### **RENEWING FLOATING GLASS PANES WITH PUTTY AND NAILS**

#### **14.6 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.

#### **14.7 Removing Broken Glass Panes**

The specifications shall be the same as described above except that the wooden fillets including nails shall be taken out carefully.

#### **14.8 Glazing**

The specifications for glass panes and their fixing shall be the same as per IS 14900. The fillet shall either be fixed flush or projected uniformly to match with the existing work by means of nails (brads). The new fillet provided shall be painted or finished otherwise to match with the existing finish of the joinery work. The glass panes shall be cleaned with methylated spirit of all sorts of splashing and droppings of wash and paints. All rubbish and unserviceable materials shall be disposed off in the dumping ground promptly as per the direction of Engineer-in-Charge.

### **FIXING FAN CLAMPS IN EXISTING R.C.C. SLABS**

#### **14.9 Fixing**

A 15 x 7.5 cm size chase shall be cut from the ceiling to expose the reinforcement and upto 2.5 cm clear round the reinforcement bar as directed. This shall be done without any damage to adjoining portion of the ceiling. The two arms at the ends of the clamps shall be passed through the space over the reinforcement bar from the bottom of the slab. Then the two arms shall be bent down about 1.5 cm by means of a crow bar. The clamp shall be held in position and chase in the ceiling filled with cement concrete 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 20 mm nominal size). The ceiling shall then be finished to match the existing surface and properly cured. The exposed portion of the clamp shall be given two or more coats of paint including one priming coat of shade as directed by the Engineer-in-Charge.

## WHITE WASH WITH LIME

### 14.10 Preparation of Surface

Before new work is white washed, the surface shall be thoroughly brushed free from mortar droppings and foreign matter. In case of old work, all loose particles and scales shall be scrapped off and holes in plaster as well as patches of less than 50 cm area shall be filled up with mortar of the same mix. Where so specifically ordered by the Engineer-in-Charge, the entire surface of old white wash shall be thoroughly removed by scrapping and this shall be paid for separately. Where efflorescence is observed the deposits may be brushed clean and washed. The surface shall then be allowed to dry for at least 48 hours before white washing is done.

### 14.11 Structural audit and diagnosis of existing building

Structural audit and diagnosis of existing building to find present serviceability and structural viability of structure, to suggest appropriate repairs and retrofitting measures required for the building to perform better in its service life.

Stages in Carrying Out Structural Audit

1. Study of architectural and structural drawings, design criteria, design calculations, structural stability certificate of existing structures
2. If architectural and structural drawings are not available, as built drawings can be prepared by an engineer
3. **Inspection:-** To recognize the types of structural defects, to identify any signs of material deterioration, to identify any signs of structural distress and deformation, to identify any alteration and addition in the structure, misuse which may result in overloading. The inspection report should reveal the following listings along with photographs and sketches.

#### a) General information of the building

- Name and address of the building
- Number of stories in each block of building
- Description of main usage of building viz. residential, commercial, institutional
- Maintenance history of the building

#### b) Structural System of the building

- Sub structure: Settlement of columns or foundations, Settlement of walls and floors, Deflection and cracks in Retaining wall, Soil bearing capacity through trial pits or From adjacent soil data
- Super structure: Materials used and framing system of structure, identification of the Critical structural members like floating columns, transfer beams, slender members, Rusting of exposed steel and its extent.
- Mention the status of all building elements like beams, slabs, columns, balconies, Canopy, false ceiling, chajja, parapet and railings with respect to parameters Deflection, cracks, leakages and spalling of concrete

- Likewise, verify the status of water tank, staircase, and lift and lift machine room.

#### c) Addition or Alterations in the building

- Identification of change of occupancy
- Alteration or addition of partition walls
- Alteration or addition in loadings- stacking
- Alteration or addition of toilets, water tank
- Alteration or addition of balcony

#### d) Dampness and leakages

- Detect the dampness in walls
- Identify the leakages in Terrace, toilets, plumbing lines, drainage lines and overhead tanks.

4. **Testing** (nondestructive and destructive) the real strength and quality of a concrete structure to be checked with non-destructive tests. A number of non-destructive tests (NDT) for concrete members are available to determine present strength and quality of concrete. Some of these tests are very useful in assessment of damage to RCC structures subjected to corrosion, chemical attack, and fire and due to other reasons. These tests have been put under four categories depending on the purpose of test as under:

#### 4.1 Concrete Strength

- Rebound Hammer Test: To measure surface hardness of concrete
- Ultrasonic Pulse Velocity Test: To assess homogeneity of concrete, to assess strength Of concrete qualitatively, to determine structural integrity
- Core Sampling and Testing: To measure strength, permeability, density of concrete.

#### 4.2 Chemical Attack

- Carbonation Test: To assess depth of carbonation and pH of concrete
- Chloride Test: To assess total water/acid soluble chloride contents
- Sulphate Test: To assess total water/water soluble sulphate contents of concrete

#### 4.3 Corrosion Potential Assessment

- Cover Meter: To measure cover of reinforcement, diameter of reinforcement and Spacing of reinforcement
- Half Cell Method: To assess probability of corrosion in the embedded steel
- Permeability Test: To assess permeability of concrete due to water and air

#### 4.4 Homogeneity and integrity Assessment

- Ultrasonic pulse velocity for determination of cracks and discontinuities

#### **4.5 Core Testing**

This is direct method of assessing strength of concrete. In this method cylindrical core samples are taken from existing structures. The cores are visually inspected and tested in laboratory to check its compressive strength.

#### **4.6 Pushover Analysis**

Generally Push over analysis is used to understand the existing capacity of structure for seismic and gravity loading which will show different occupancy levels like immediate occupancy, life safety and collapse prevention. The seismic evaluation of existing buildings compares their capacity against earthquake demand at specific site and concerns the potential earthquake-caused risk to building systems and elements that are closely related to human life safety.

#### **4.7 Report**

Based on the above inspection, analysis and test results, the report should prepare as per annexure - that, conclude the critical areas that need immediate repairs and retrofitting. For example: number of columns requiring immediate repair and strengthening, repair of critical slab and beams, water proofing of terrace, toilet blocks, cracks in walls or structural elements etc.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.1		Repairs to plaster	Repairs to plaster of thickness 12mm to 20mm in patches of area 2.5 sq. metres and underincluding cutting the patch inproper shape, raking out joints and preparing and plastering the surface of the walls completeincluding disposal of rubbish tothe dumping ground within 50metres lead : With cement mortar 1:4 (1 cement : 4 sand).	sqm	180.00
14.2		Fixing chowkhats with holdfasts	Fixing chowkhats in existing opening including embedding chowkhats in floors or walls cutting masonry for holdfasts, embedding hold fasts in cement concrete blocks of size 15 x 10 x 10 cm with cement concrete 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size), painting two coats of approved wood preservative to sides of chowkhats and making good the damages to walls and floors as required complete including disposal of rubbish tothe dumping ground within 50 meters lead :		
	14.2.1	Door	Door chowkhats	each	544.00
	14.2.2	Window	Window chowkhats	each	325.00
	14.2.3	Clerestory	Clerestory window chowkhats	each	238.00
14.3		Fixing chowkhat with dash fasteners/ chemical fastener	Fixing chowkhat in existing opening in brick / RCC wall with dash fasteners/ chemical fastener of appropriate size (3nos on each vertical member of door chowkhat and 2 nos. on each vertical member of window chowkhats) including cost of dash fasteners/ chemical fastener.	each	146.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.4		Making opening in brick masonry	Making the opening in brick masonry including dismantling in floor or walls by cutting masonry and making good the damages to walls, flooring and jambs complete to match existing surface i/c disposal of mulba/ rubbish as directed by Engineer-in-charge. For door/ window/ clerestory window.	sqm	323.00
14.5		Renewing Float glass panes with putty	Renewing glass panes, with putty and nails wherever necessary including racking out the oldputty:		
	14.5.1	4.0mm	Float glass panes of thickness 4 mm	sqm	679.00
	14.5.2	5.5mm	Float glass panes of thickness 5.5 mm	sqm	759.00
14.6		Renewing float glass panes, with wooden fillets	Renewing glass panes with new wooden fillets wherever necessary:		
	14.6.1	4 mm	Float glass panes of thickness 4 mm	sqm	801.00
	14.6.2	5.5mm	Float glass panes of thickness 5.5 mm	sqm	882.00
14.7		Renewing glass panes and refixing existing wooden fillet	Renewing glass panes and refixing existing wooden fillets:		
	14.7.1	4 mm thick glass	Float glass panes of thickness 4 mm	sqm	697.00
	14.7.2	5.5 mm thick glass	Float glass panes of thickness 5.5 mm	sqm	778.00
14.8		New wooden fillet	Supplying and fixing new wooden fillets wherever necessary:		
	14.8.1	T.W.	2nd class teak wood fillets	meter	30.00
	14.8.2	H.W.	Haldu/Bija/Kail wood fillets.	meter	26.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
14.9		Renewal of old putty	Renewal of old putty of glass panes (length).	meter	15.00
14.10		Refixing old glass panes with putty	Refixing old glass panes with putty and nails.	sqm	199.00
14.11		Fixing old glass panes with wooden fillet	Fixing old glass panes with wooden fillets (excluding cost of fillets).	sqm	162.00
14.12		M.S. Fan clamps	Providing and fixing 16 mm M.S. Fan clamps of standard shape and size in existing R.C.C. slab including cutting chase, anchoring clamp to reinforcement bar, including cleaning, refilling, making good the chase with matching concrete, plastering and painting the exposed portion of the clamps complete.	each	165.00
14.13		Replacing sand stone slabs	Replacing sand stone slabs in roofing laid in cement mortar 1:4 (1 cement : 4 sand) including necessary repairs and cement pointing with same mortar complete including disposal of rubbish to dumping ground within 50 metres of lead :		
	14.13.1	Red/ white sand stone	Red/ white sand stone slabs 30 to 50 mm thick.	sqm	631.00
14.14		Renewing wooden battens in roofs	Renewing wooden battens in roofs, including making good the holes in wall and painting with oil type wood preservative of approved brand and manufacture complete including removal of rubbish to the dumping ground within 50 metres lead :		
	14.14.1	Sal wood	Sal wood battens.	cum	74943.00
14.15		Renewing wooden beams in roofs	Renewing wooden beams in roofs including making good the holes in walls and painting with oil type wood preservative of approved brand and manufacture complete including removal of rubbish to the dumping ground within 50 metres lead :		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	14.15.1	Upto 4.0m	Not exceeding 4.00 metres in length.		
	14.15.1.1	Sal	Sal wood beams	cum	76349.00
	14.15.1.2	H.W.	Haldu/Bija/Kail wood fillets.	cum	76349.00
	14.15.2	4.0m upto 5m	Above 4.00 metres and upto 5.00 metres length.		
	14.15.2.1	Sal	Sal wood beams	cum	78106.00
	14.15.2.2	H.W.	Haldu/Bija/Kail wood fillets.	cum	78101.00
14.16		Repointing or Replastering	Raking out joints in lime or cement mortar and preparing the surface for re-pointing or replastering including disposal of rubbish to the dumping ground within 50 metres lead.	sqm	17.00
14.17		Taking out wind ties	Taking out wind ties from roof including cutting out rusted bolts, nuts etc. and removing materials to any distance within compound and stacking.	kg	1.2
14.18		Fixing of old wind tie	Fixing of old wind tie with new fittings including painting two or more coats with anticorrosive bitumastic paint of approved brand and manufacturer over and including priming coat of ready mixed zinc chromate yellow primer of approved brand.	meter	61.00
14.19		Renewing bottom rail and/or top runner of collapsible gate	Renewing bottom rail and/or top runner of collapsible gate including making good all damages and applying priming coat of zinc chromate yellow primer of approved brand and manufacturer.	kg	119.00
14.20		Renewing wheel or roller of steel door or gate	Renewing Wrought iron or M.S. Wheel or roller of steel door or gate and fitting and fixing the same with necessary clamps, nuts and bolts/welding and erection		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			etc. complete.		
	14.20.1	Upto 50mm dia	Wheel 50 mm dia. and below.	per wheel	136.00
	14.20.2	>50mm	Wheel above 50 mm dia.	per wheel	211.00
14.21		Cupboard shutters	Providing and fixing 25 mm thick shutters for cupboard etc. :		
	14.21.1	Panelled shutter	Panelled or panelled and glazed shutters :		
	14.21.1.1	Superior T.W.	Superior class teak wood including nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	3794.00
	14.21.1.2	1 <sup>st</sup> Class T.W.	Ist class teak wood including nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	3413.00
	14.21.2	Glazed shutters	Glazed shutters :		
	14.21.2.1	Superior T.W.	Superior class teak wood including nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	4021.00
	14.21.2.2	1 <sup>st</sup> Class T.W.	Ist class teak wood including nickel plated bright finished M.S. piano hinges with necessary screws.	sqm	3611.00
14.22		Plain jaffri door and window shutters	Providing and fixing plain jaffri door and window shutters including bright or/and black enamelled M.S. butt hinges with necessary screws 35x10mm laths placed 35mm apart (frames to be paid separately) including fixing 50x12mm beading complete with:		
	14.22.1	T.W.	Second class teak wood.	sqm	3105.00
	14.22.2	H.W.	Hard wood, finger jointed	sqm	1340.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.23		Brass curtain rods	Providing and fixing curtain rods of 1.25mm thick brass plates with two brass brackets fixed with brass screws and wooden plugs etc. wherever necessary complete.		
	14.23.1	20mm	20 mm diameter.	meter	265.00
	14.23.2	25mm	25 mm diameter.	meter	294.00
14.24		M.S. round or square bars in wooden frames	Providing and fixing M.S. round or square bars with M.S. flats at required spacing in wooden frames of windows and clerestory windows.	kg	67.00
14.25		Joists hoisting & fixing	Providing joists (karries) including hoisting fixing in position and applying wood preservative on unexposed surface etc. complete with:		
	14.25.1	Sal	Sal wood.	cum	73829.00
	14.25.2	H.W.	Haldu/Bija/Kail wood.	cum	73829.00
14.26		White washing old work	White washing with lime old work to give an even shade :		
	14.26.1	Two coats	two or more coats	sqm	7.00
	14.26.2	One coats	one or more coats	sqm	4.00
14.27		Scrapping	Removing white or colour wash by scrapping and sand papering and preparing the surface smooth including necessary repairs to scratches etc. complete.	sqm	5.00
14.28		Dry distemper	Distemping with dry distemper of approved brand and manufacture (one or more coats) and of required shade on old work to give an even shade.	sqm	19.00
14.29		Oil bound washable distemper	Distemping with oil bound washable distemper of approved brand and manufacture to give an even shade: Old work (one or more coats).	sqm	21.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.30		Removing dry or oil bound distemper	Removing dry or oil bound distemper, water proofing cement paint and the like by scrapping, sand papering and preparing the surface smooth including necessary repairs to scratches etc. complete.	sqm	6.00
14.31		Painting G.S. sheet with synthetic enamel paint	Painting on G.S. sheet with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: Old work (one or more coats).	sqm	28.00
14.32		Pipe Painting bitumastic paint (Old work)	Painting (one or more coats) on rain water, soil, waste and vent pipes and fittings with black anticorrosive bitumastic paint of approved brand and manufacture on old work :		
	14.32.1	75mm	75 mm diameter pipes	meter	9.00
	14.32.2	100mm	100 mm diameter pipes	meter	11.00
	14.32.3	150mm	150 mm diameter pipes	meter	17.00
14.33		Pipe Painting with aluminium paint (Old work )	Painting (one or more coats) on rain water, soil, waste and vent pipes and fittings with aluminium paint of approved brand and manufacture on old work :		
	14.33.1	75mm	75 mm diameter pipes	meter	21.00
	14.33.2	100mm	100 mm diameter pipes	meter	31.00
	14.33.3	150mm	150 mm diameter pipes	meter	46.00
14.34		Pipe Painting with synthetic enamel paint	Painting (one or more coats) on rain water, soil, waste and vent pipes and fittings with synthetic enamel paint of approved brand and manufacture and required colour on old work :		
	14.34.1	75mm	75 mm diameter pipes	meter	10.00
	14.34.2	100mm	100 mm diameter pipes	meter	13.00
	14.34.3	150mm	150 mm diameter pipes	meter	19.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
14.35		Painting with oil type wood preservative (Old work )	Painting with oil type wood preservative of approved brand and manufacture: Old work (one or more coats)	sqm	20.00
14.36		Painting wall with plastic emulsion paint (Old work )	Wall painting with plastic emulsion paint of approved brand and manufacture to give an even shade: One or more coats on old work.	sqm	41.00
14.37		Painting with synthetic enamel paint (Old work )	Painting with synthetic enamel paint of approved brand and manufacture of required colour to give an even shade: One or more coats on old work.	sqm	35.00
14.38		Painting with aluminium paint(Old work)	Painting with aluminium paint of approved brand and manufacture to give an even shade: One or more coats on old work.	sqm	32.00
14.39		Painting with acid proof paint (Old work)	Painting with acid proof paint of approved brand and manufacture of required colour to give an even shade: One or more coats on old work.	sqm	42.00
14.40		Painting with black anti-corrosive bitumastic paint (Old work)	Painting with black anti-corrosive bitumastic paint of approved brand and manufacture to give an even shade: One or more coats on old work.	sqm	28.00
14.41		French spirit polishing	French spirit polishing: One or more coats on old work.	sqm	59.00
14.42		Melamine polishing	Mealamine polishing on wood work by preparing the surface applying putty base course. Prepare the surface smooth by sand papering and then applying Mealamine polish with air compressor. One or more coats on old work.	sqm	807.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.43		Lacquer polishing on wood work	Lacquer polishing on wood work by preparing the surface applying putty base course. prepare the surface smooth by sand papering and then applying Lacquer polish with air compressor		
	14.43.1		One or more coats on old work.	sqm	674.00
14.44		Polishing on wood work with wax polish	Polishing on wood work with readymade wax polish of approved brand and manufacture :		
	14.44.1		Old work	sqm	28.00
14.45		Re-lettering with black Japan paint	Re-lettering with black Japan paint of approved brand and manufacture.	per letter per cm height	0.9
14.46		Painting with black Japan paint (Old work)	Painting (one or more coats) with black Japan paint of approved brand and manufacture to give an even shade.	sqm	30.00
14.47		C.P. brass chain and rubber plug	Providing and fixing C.P. brass chain and rubber plug complete for sink or wash basin :		
	14.47.1	32mm dia	32 mm dia	each	72.00
	14.47.2	40mm dia	40 mm dia	each	74.00
14.48		Distempering with acrylic washable distemper (Old work)	Distempering with 1st quality acrylic washable distemper (ready mixed) of approved manufacturer and of required shade and colour complete. As per manufacturer's specification. One or more coats on old work.	sqm	20.00
14.49		Water proofing cement paint on wall (Old work)	Finishing walls with water proofing cement paint of required shade :		
	14.49.1	With Primer	Old work (one or more coats applied @ 2.20 kg/10 sqm) over priming coat of primer applied @ 0.80 liters/10 sqm complete including cost of Priming coat.	sqm	42.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	14.49.2	Without primer	Old work (one or more coats @ 2.20 kg/10 sqm) complete.	sqm	30.00
14.50		Textured exterior paint (Old work)	Finishing walls with textured exterior paint of required shade :		
	14.50.1	@ 3.28 litre/10 sqm	Old work (Two or more coats on existing cement paint surface applied @ 3.28 ltr/10 sqm.	sqm	112.00
	14.50.2	@ 1.82litre/10 sqm	Old work (One or more coats) applied @ 1.82 ltr/10 sqm.	sqm	67.00
14.51		Acrylic Smooth exterior paint	Finishing walls with Acrylic Smooth exterior paint of required shade :		
	14.51.1	@ 1.67 ltr/ 10 sqm	Old work (Two or more coat applied @ 1.67 ltr/ 10 sqm) on existing cement paint surface).	sqm	87.00
	14.51.2	@ 0.90 ltr/10 sqm	Old work (One or more coat applied @ 0.90 ltr/10 sqm).	sqm	52.00
14.52		Premium Acrylic Smooth exterior paint with Silicone additives	Finishing walls with Premium Acrylic Smooth exterior paint with Silicone additives of required shade		
	14.52.1	@ 1.43 ltr/ 10 sqm	Old work (Two or more coats applied @ 1.43 ltr/ 10 sqm) over existing cement paint surface.	sqm	65.00
	14.52.2	@ 0.83 ltr/10 sqm	Old work (one or more coats applied @ 0.83 ltr/10 sqm).	sqm	41.00
14.53		Deluxe Multi surface paint interiors and exteriors (Old work)	Finishing walls with DeluxeMulti surface paint system for interiors and exteriors using Primer as per manufacturer's specifications :		
	14.53.1	On wall	One or more coats applied on walls @ 0.85 ltr/10 sqm.	sqm	58.00
	14.53.2	On Wood	Painting wood work with Deluxe Multi Surface Paint of required shade. One or more coat applied @0.70 ltr/10 sqm	sqm	52.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	14.53.3	On steel	Painting Steel work with Deluxe Multi Surface Paint to give an even shade. One or more coat applied @0.70 ltr/10 sqm.	sqm	52.00
14.54		Varnishing (Old work)	Varnishing with varnish of approved brand and manufacture:		
	14.54.1	Copal	One or more coats with copal varnish.	sqm	32.00
	14.54.2	Spar	One or more coats with spar varnish.	sqm	33.00
14.55		Melamine polishing (Old work)	Melamine polishing on wood work (one or more coat). Old work	sqm	90.00
14.56		Flatting varnish (old work)	Varnishing with flatting varnish of approved brand and manufacture one or more coats on old work.	sqm	30.00
14.57		Floor painting with floor enamel paint (old work)	Floor painting with floor enamel paint of approved brand and manufacture of required colour to give an even shade. One or more coat on old work.	sqm	50.00
14.58		Stone flooring stone to be supplied by the department	40 mm thick stone flooring over 20 mm (average) thick base of cement mortar 1:5 (1 cement : 5 sand) including pointing with cement mortar 1:2 (1 cement : 2 sand) with an admixture of pigment to match the shade of stone. Red sand stone / White sand stone) stone to be supplied by the department.		
	14.58.1	Rough dressed	Rough chiseled dressed stone	sqm	177.00
	14.58.2	Fine dressed	Fine dressed stone	sqm	207.00
14.59		C.R. masonry stone supplied by the department	Coursed rubble masonry (second sort) with hard stone in Cement mortar 1:6 (1 cement : 6 sand) (Stone shall be supplied by the department)	cum	2112.00
14.60		Laying paver blocks (CC paver blocks supplied by the	Laying old cement concrete interlocking paver blocks of any design/shape laid in required line,	sqm	142.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		department)	level, curvature, colour and pattern over and including 50mm thick compacted bed of sand, filling the joints with sand etc. all complete as per the direction of Engineer-in-charge. (Old CCpaver blocks shall be supplied by the department free of cost).		
14.61		Laying kerb stone (stones supplied by the department)	Laying at or near ground level old kerb stones of all types in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 sand) including making joints with or without grooves (thickness of joints, except at sharp curve, shall not be more than 5mm) including making drainage opening wherever required etc. complete as per direction of Engineer-in-charge. (Length of finished kerb edging shall be measured for payment). (Old kerb stones shall be supplied by the department free of cost).	meter	27.00
14.62		Colour washing with lime (Old work)	Colour washing with lime to give an even shade:		
	14.62.1	One coat	(one or more coats)	sqm	9.00
	14.62.2	Two Coat	(two or more coats)	sqm	11.00
14.63		Scanning to detect the steel reinforcement in existing RCC elements	Conducting adequate no's. of scanning to detect the steel reinforcement in existing RCC elements by using ground/ Wall penetrating radar system to avoid the cutting of Main bars during drilling for inserting bolts etc. complete.	sqm	800.00
14.64		Removing loose plaster and Concrete work by low impact Hammer	Chipping, Removing, Carefully loose plaster and Concrete work by low impact Hammer, Breaker without damaging the structure as Instructed by Engineer-in-Charge.	sqm	120.00
14.65		Casting & Repairing of excessively damaged members	Providing & casting & Repairing of excessively damaged members with micro-concrete at all levels	kg	61.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
		with micro-concrete	with all leads & lift or as directed including formwork, centering, scaffolding, and mixing, laying, levelling, and finishing including curing etc. complete (excluding steel reinforcement)		
14.66		Strengthening structural elements with non-metallic composite fiber wrapping system	Strengthening structural elements with non-metallic composite fiber wrapping system comprise of fiber sheet and compatiblesaturate, by dry/wet layup system including, Wrapping the fiber sheet to structural element at desired orientation using tamping roller to avoid any air voids etc. repeat the same procedure for multiple layers (if any) with the interval of 8 hrs. Sand pasting: Applying second coat of saturant after min. 12 hrs, rectify air voids if any paste the river sand on it to make surface rough to take any further finishes (Mode of measurement: surface area of Fiber Consumed).		
	14.66.1	300 GSM	300 GSM Carbon UD	sqm	3670.00
	14.66.2	400 GSM	400 GSM Carbon UD	sqm	4245.00
	14.66.3	600 GSM	600 GSM Carbon UD	sqm	5200.00
	14.66.4	900 GSM	900 GSM Carbon UD	sqm	7200.00
	14.66.5	1200 GSM	1200 GSM Carbon UD	sqm	8500.00
	14.66.6	400 GSM	400 GSM Carbon Angle layup $\pm 45^\circ$	sqm	4480.00
14.67		Applying procured laminated with compatible structural adhesive	Providing Applying procured laminate with compatible structural adhesive including, Surface preparation: Grinding concrete substrate, cleaning it with wire brush removing oil, laitance if present, etc. complete. Profiling: Applying compatible		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			primer on prepared substrate, Filling the holes and uneven surface with thixotropic putty etc. complete Application of plate: Marking the application area on structural element, cutting the plate to require size, applying compatible structural adhesive on plate in parabolic manner, pastethe plate on desire area by using tamping roller to avoid any air voids etc. complete. Sand pasting: Applying second coat of saturant after min. 12 hrs, rectify air voids if any paste the river sand on it to make surface rough to take any further finishes (Mode of measurement: Per running Mt. of plate applied).		
	14.67.1	50mm wide(1.4mm thick)	50mm wide and 1.4 mm Thick Carbon Laminate NPS	meter	1900.00
	14.67.2	100mm wide (1.4mm thick)	100mm wide and 1.4 mm Thick Carbon Laminate NPS	meter	3400.00
	14.67.3	100mm wide (3mm thick)	100mm wide and 3 mm Thick Carbon Laminate NPS	meter	4900.00
	14.67.4	100mm wide (4.2mm thick)	100mm wide and 4.2 mm Thick Carbon Laminate NPS	meter	6300.00
	14.67.5	Steel Plate	Providing, Supplying Aluminum Steel Plate (High grade) Including Cutting, Fixing etc. complete. (100mm wide & 6 mm thick.)	meter	1800.00
	14.67.6	Epoxy putty	Providing and applying structural epoxy adhesive putty for levelling of surfaces and connecting aluminium plate which ever required.	kg	525.00
14.68		Mechanical prestress anchor	Providing and fixing mechanical prestress anchor Aluminum Plate (High grade) system for fixing of carbon laminates at specify location at the end of carbon laminate as per design. (Plate	each	4910.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			size 200x270x12 mm with 6 nos M12 and M16 anchors each).		
14.69		Fiber bars with adhesive	Providing and placing in position procured fiber bars with compatible structural adhesive including, groove making, Surface preparation, cleaning it with wire brush removing oil, laitance if present, etc. complete. Profiling: Applying compatible primer on prepared substrate, Filling the holes and uneven surface with thixotropic putty etc. complete. Application of plate: cutting the bars to require size, applying compatible structural adhesive on bars, place the bars in desired grooves etc. complete. rectify air voids if any paste the river sand on it to make surface rough to take any further finishes (Mode of measurement: Per running metre of bar applied) 12 mm dia Carbon rod	meter	1500.00
14.70		Rebaring of TMT bars	Rebaring of TMT bars by drilling hole & embedding bars of different diameter using epoxy grouting compound including all tools and tackles complete.		
	14.70.1	8 mm dia bar	8 mm dia bar 10 mm dia hole	Per 100 mm	73.00
	14.70.2	10 mm dia bar	10 mm dia bar 12 mm dia hole	Per 100 mm	88.00
	14.70.3	12 mm dia bar	12 mm dia bar 16 mm dia hole	Per 100 mm	102.00
	14.70.4	16 mm dia bar	16 mm dia bar 20 mm dia hole	Per 100 mm	131.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	14.70.5	20 mm dia bar	20 mm dia bar 25 mm dia hole	Per 100 mm	265.00
	14.70.6	25 mm dia bar	25 mm dia bar 32 mm dia hole	Per 100 mm	364.00
	14.70.7	32 mm dia bar	32 mm dia bar 40 mm dia hole	Per 100 mm	525.00
14.71		Chromium plated brass butt hinges	Providing and fixing chromium plated brass butt hinges with necessary chromium plated brass screws etc. complete.		
	14.71.1	125x70x4 mm	125x70x4 mm (ordinary type)	each	44.00
	14.71.2	100x70x4 mm	100x70x4 mm (ordinary type)	each	105.00
	14.71.3	75x65x4 mm	75x65x4 mm (heavy type)	each	122.00
	14.71.4	75x40x2.5 mm	75x40x2.5 mm (ordinary type)	each	74.00
	14.71.5	50x40x2.5 mm	50x40x2.5 mm (ordinary type)	each	30.00
14.72		Chromium plated brass pull bolt lock	Providing and fixing 85x42 mm chromium plated brass pull bolt lock with necessary chromium plated brass screws, nuts, bolts and washers etc. complete.	each	185.00
14.73		Repair to plaster	Repair to plaster of thickness 12mm to 20 mm in patches of area 2.5 sqm and under, including cutting the patch in proper shape, raking out joints and preparing plastering the wall surface with white cement based polymer modified self curing mortar, including disposal of rubbish, all complete as per the direction of Engineer-In-Charge.	sqm	355.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.74		Cleaning of terrace/loft storage tank	Cleaning of terrace/loft water storage tank (inside surface area) upto 2000 litre capacity at all heights with coconut brushes, duster etc., removal of silt,rubbish from the tank and cleaning the tank with fresh waterdisinfecting with bleaching powder @ 0.5gm per litre capacity of tank including marking the date of cleaning on the side of tank body with the help of stencil and paint and disposing of malba all complete as per direction of Engineer-in-Charge. (The old date already written on tank should be removed with paint remover or black paint and if date is not written with the stencil or old date is not removed deduction will be made @ Rs. 0.10 per litre) (if during cleaning any GI fittings or ball cock is damaged that is to be repaired by contractor at his own cost and nothing extra will be paid on this account)	litre	0.15
14.75		Cleaning of gully trap chamber	Cleaning and desilting of gully trap chamber, including removal of rubbish mixed with earth etc. and disposal of same, all as per the direction of Engineer- in-charge.	each	48.00
14.76		Chipping of concrete from slabs, beams, columns etc	Chipping of unsound/weak concrete material from slabs, beams, columns etc. with manual Chisel and/ or by standard power driven percussion type or of approved make including tapering of all edges, making square shoulders of cavities including cleaning the exposed concrete surface and reinforcement with wire brushes etc. and disposal of debris for all lead and lifts all complete as per direction of Engineer-In-Charge		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	14.76.1	75 mm	75 mm average thickness	sqm	190.00
	14.76.2	50 mm	50 mm average thickness	sqm	128.00
	14.76.3	25 mm	25 mm average thickness	sqm	64.00
14.77		Cleaning of reinforcement	Cleaning of reinforcement from rust from the reinforcing bars to give it a total rust free steel surface by using alkaline chemical rust remover of approved make with paint brush and removing loose particles after 24 hours of its application with wire brush and thoroughly washing with water and allowing it to dry, all complete as per direction of Engineer-In-Charge.		
	14.77.1	Upto 12 mm diameter	Bars upto 12 mm diameter	metre	4.00
	14.77.2	Above 12 mm diameter	Bars above 12 mm diameter	metre	9.00
14.78		Drilling holes in concrete	Drilling suitable holes in reinforced or plain cement concrete with power driven drill machine to a minimum depth of 100mm upto 200mm in RCC beams, lintels, columns and slabs to introduce steel bars for sunshades/balconies including fixing the steel bars in position using epoxy resin anchor grout of approved make but excluding the cost of reinforcement, all complete as per direction of Engineer-In-Charge.		
	14.78.1	Upto and including 12mm dia	Upto and including 12mm dia	metre	78.00
14.79		Bonding coat on chipped portion of RCC	Providing, mixing and applying bonding coat of approved adhesive on chipped portion of RCC as per specifications and direction of Engineer-In-charge complete in all respect.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	14.79.1	SBR Polymer bond coat	SBR Polymer (@10% of cement weight) modified cementitious bond coat @ 2.2 kg cement per sqm of surface area mixed with specified proportion of approved polymer	sqm	81.00
	14.79.2	Epoxy bonding adhesive	Epoxy bonding adhesive having coverage 2.20 sqm/kg of approved make	sqm	318.00
14.80		SBR polymer modified cement mortar	Providing, mixing and applying SBR polymer (of approved make) modified Cement mortar in proportion of 1:4 (1 cement: 4 graded coarse sand with polymer minimum 2% by wt. of cement used) as per specifications and directions of Engineer-in-charge. <b>Note:</b> Measurement and payment: The pre-measurement of thickness shall be done just after the surface preparation is completed and Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding / tapping with a blunt metal instrument and/or the 75mm size cube crushing strength at the end of 28 days to be not less than 30 N/Sqmm <sup>2</sup> )		
	14.80.1	12 mm	12 mm average thickness	sqm	195.00
	14.80.2	25 mm	25 mm average thickness in 2 layers.	sqm	324.00
	14.80.3	50 mm	50 mm average thickness in 3 layers.	sqm	648.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.81		SBR polymer modified cement concrete	<p>Providing, mixing and applying SBR polymer (of approved make @ minimum 2% by wt. of cement used) modified plain/reinforced cement concrete for structural members having minimum characteristic compressive strength [with ordinary portland cement, coarse sand and graded stone aggregate of 10mm maximum size in proportion as per design criteria] with specified average thickness.</p> <p><b>Note:</b> Rates shall be for finished surface area of concrete and shall include the cost of labour, concrete and appropriate approved Super-Plasticiser for rendering concrete as flowable and SBR polymer but shall exclude cost of reinforcement, bond coat, Shear Keys, centering and shuttering, strutting, propping etc (Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding/tapping with a blunt metal instrument)</p>		
	14.81.1	50 mm thick in M 25	50mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	486.00
	14.81.2	75 mm thick in M 25	75mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	729.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.82		SBR polymer modified concrete jacket for structural members	<p>Providing and laying SBR Polymer modified (of approved make @ minimum 2% by wt. of cement used) plain/reinforced concrete jacket for the structural members e.g. columns, pillars, piers, beams etc with concrete having the specified minimum characteristic compressive strength [with ordinary portland cement, coarse sand and graded stone aggregate of 10mm maximum size in proportion as per design criteria] with specified average thickness all-round existing core of RCC member.</p> <p><b>Note:</b> Rates shall be for finished surface area of concrete and shall include the cost of making holes in existing RCC slab, if required, for pouring concrete in shuttering mould of jacket and appropriate approved Super-Plasticiser for rendering concrete as flowable self compacting and SBR polymer but shall exclude cost of reinforcement, bond coat, Shear Keys, centering and shuttering, strutting, propping etc (Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding/tapping with a blunt metal instrument)</p>		
	14.82.1	50 mm thick in M 25	50mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	486.00
	14.82.2	75 mm thick in M 25	75mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	729.00
	14.82.3	100 mm thick in M 25	100mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	972.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.83		Injecting grout in cracks/honeycomb of concrete/masonry	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.)		
	14.83.1	Acrylic Polymer	Stirrer mixed Acrylic Polymer of approved make @ 2% of weight of cement used) modified Cement slurry made with non shrink compound in concrete/RCC work	kg	65.00
	14.83.2	SBR Polymer	Stirrer mixed SBR Polymer (of approved make) modified Cement slurry made with Shrinkage Compensating Cement in concrete/RCC work.	kg	68.00
	14.83.3	Epoxy	Epoxy injection grout in concrete/RCC work of approved make	kg	658.00
14.84		Removing temporary protective screens	Providing, erecting, maintaining and removing temporary protective screens made out of specified fabric with all necessary fixing arrangement to ensure that it remains in position for the work duration as required by the Engineer-in-charge		
	14.84.1	Wooven PVC cloth	Wooven PVC cloth	kg	28.00
14.85		Cleaning exposed concrete surface	Cleaning of exposed concrete surface of sticking material including loose and foreign material by sand blasting with coarse sand followed by and including cleaning with oil free air blast as per direction of Engineer in charge.	sqm	242.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
14.86		Shotcreting RCC members	Shotcreting R.C.C. columns, beams and slabs etc. in layers with approved design mix concrete having the specified minimum characteristic compressive strength [with ordinary portland cement, coarse sand and graded stone aggregate of 10 mm maximum size in proportion as per design criteria] including the cost of centering and shuttering at edges and corners etc. as directed by Engineer- inCharge <b>Note:</b> Rates shall include the providing necessary ground wires etc. The levelling gauges, if used, shall be paid for separately. Payment under this item shall be made only after proper wet curing has been done and surface has been satisfactorily evaluated by sounding/tapping with a blunt metal instrument.		
	14.86.1	25 mm thick	25mm thick in Grade M 25 with cement content not less than 330 kg per cum	Sqm	452.00
	14.86.2	50 mm thick	50mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	742.00
	14.86.3	75 mm thick	75mm thick in Grade M 25 with cement content not less than 330 kg per cum	sqm	1079.00
14.87		Galvanised steel injection nipple	Providing and inserting 12mm dia galvanised steel injection nipple in honey comb area and along crack line including drilling of holes of required diameter (20mm to 30mm) up to depth from 30mm to 80mm at required spacing and making the hole & crack dust free by blowing compressed air, sealing the distance between injection nipple with adhesive chemical of approved make and allow it to cure complete as per	each	136.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			direction of Engineer-In-Charge.		
14.88		Steel wire febric jacketing	Providing and fixing hard drawn steel wire fabric of size 75 x25 mm mesh or other suitable size wire mesh to be fixed & firmly anchored to the concrete surface by means of "L" shaped mild steel shear key welded with existing reinforcement includingthe cost of materials, labour, tool & plants as approved by Engineer-incharge.	sqm	291.00

**CHAPTER – 15.0**  
**DISMANTLING AND DEMOLISHING**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
<b>1</b>	<b>2</b>	<b>3</b>
1.	IS 1200 (Part - XVIII)	Method of Measurements of Building and Civil Engineering Works (Part -XVIII) Demolition and Dismantling
2.	IS 4130	Demolition of Buildings-Code of Safety

**PREAMBLE**  
**DISMANTLING AND DEMOLISHING**  
**(CHAPTER: 15.0)**

**15.1 Dismantling:**

The term ‘Dismantling’ implies carefully separating the parts without damage and removing. This may consist of dismantling one or more parts of the building as specified or shown on the drawings.

**15.2 Demolition:**

The term ‘Demolition’ implies breaking up. This shall consist of demolishing whole or part of work including all relevant items as specified or shown on the drawings.

**15.3 Precautions**

All materials obtained from dismantling or demolition shall be the property of the Government unless otherwise specified and shall be kept in safe custody until they are handed over to the Engineer-in- Charge/authorized representative.

The demolition shall always be well planned before hand and shall generally be done in reverse order of the one in which the structure was constructed. The operations shall be got approved from the Engineer-in-Charge before starting the work. Due care shall be taken to maintain the safety measures prescribed in IS 4130.

Necessary propping, shoring and or under pinning shall be provided to ensure the safety of the adjoining work or property before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damage is caused to the adjoining work or property. Wherever specified, temporary enclosures or partitions and necessary scaffolding with suitable double scaffolding and proper cloth covering shall also be provided, as directed by the Engineer-in-Charge.

Necessary precautions shall be taken to keep noise and dust nuisance to the minimum. All work needs to be done under the direction of Engineer-in-Charge. Helmets, goggle, safety belts etc. should be used whenever required and as directed by the Engineer-in-Charge. The demolition work shall be proceeded with in such a way that it causes the least damage and nuisance to the adjoining building and the public.

Dismantling shall be done in a systematic manner. All materials which are likely to be damaged by dropping from a height or by demolishing roofs, masonry etc. shall be carefully removed first. Chisels and cutters may be used carefully as directed. The dismantled articles shall be removed manually or otherwise, lowered to the ground (and not thrown) and then properly stacked as directed by the Engineer-in-Charge.

Where existing fixing is done by nails, screws, bolts, rivets, etc., dismantling shall be done by taking out the fixing with proper tools and not by tearing or ripping off.

Any serviceable material, obtained during dismantling or demolition, shall be separated out and stacked properly as directed by the Engineer-in-Charge within a lead of 50 metres. All unserviceable materials, rubbish etc. shall be disposed off as directed by the Engineer-in-Charge.

The contractor shall maintain/disconnect existing services, whether temporary or permanent, where required by the Engineer-in-Charge.



No demolition work should be carried out at night especially when the building or structure to be demolished is in an inhabited area.

Screens shall be placed where necessary to prevent injuries due to falling pieces.

Water may be used to reduce dust while tearing down plaster from brick work.

Safety belts shall be used by labourers while working at higher level to prevent falling from the structure. First-aid equipment shall be got available at all demolition works of any magnitude.

## **RECOMMENDATIONS FOR DEMOLITION OF CERTAIN SPECIAL TYPES AND ELEMENTS OF STRUCTURES**

### **15.4 Roof Trusses**

If a building has a pitched roof, the roof structure should be removed to wall plate level by hand method. Sufficient purlins and bracing should be retained to ensure stability of the remaining roof trusses while each individual truss is removed progressively.

Temporary bracing should be added, where necessary, to maintain stability. The end frame opposite to the end where dismantling is commenced, or a convenient intermediate frame should be independently and securely guyed in both directions before work starts.

On no account should the bottom tie of roof trusses be cut until the principal rafters are prevented from making outward movement.

### **15.5 Heavy Floor Beams**

Heavy bulks of timber and steel beams should be supported before cutting at the extremities and should then be lowered to a safe working place. A single span arch can be demolished by hand by cutting narrow segments progressively from each springing parallel to the span of the arch until the width of the arch has been reduced to a minimum which can then be collapsed.

### **15.6 In-situ Reinforced Concrete**

Before commencing demolition, the nature and condition of the concrete, the condition and position of reinforcement, and the possibility of lack of continuity of reinforcement should be ascertained. Attention should be paid to the principles of the structural design to determine which parts of the structure depend on each other to maintain overall stability. Demolition should be commenced by removing partitions and external non-load bearing cladding. It should be noted that in some buildings the frame may rely on the panel walls for stability. Where hard demolition methods are to be used, the following procedures should be used.

- (i) Reinforced Concrete Beams: For beams, a supporting rope should be attached to the beam. Then the concrete should be removed from both ends by pneumatic drill and the reinforcement exposed. The reinforcement should then be cut in such a way as to allow the beam to be lowered under control to the floor.
- (i) Reinforced Concrete Columns: For columns, the reinforcement should be exposed at the base after restraining wire guy ropes have been placed round the member at the top. The reinforcement should then be cut in such a way as to allow the column to be pulled down to the floor under control.
- (ii) Reinforced Concrete Walls: Reinforced concrete walls should be cut into strips and demolished as for columns.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.1		Demolishing lime concrete	Demolishing lime concrete manually/by mechanical means and disposal of material within 50 metres lead as per direction of Engineer-in-Charge.	cum	202.00
15.2		Demolishing cement concrete	Demolishing cement concrete manually/by mechanical means including disposal of material within 50 metres lead as per direction of Engineer-in-Charge.		
	15.2.1	1:3:6 or richer	Nominal concrete 1:3:6 or richer mix (i/c equivalent design mix).	cum	578.00
	15.2.2	1:4:8 or leaner	Nominal concrete 1:4:8 or leaner mix (i/c equivalent design mix).	cum	356.00
15.3		Demolishing R.C.C.	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge.	cum	844.00
15.4		Cutting reinforcement bar	Extra for cutting reinforcement bars manually/ by mechanical means in R.C.C. work (Payment shall be made on the cross sectional area of R.C.C. work) as per direction of Engineer-in-Charge.	sqm	276.00
15.5		Scrapping, cleaning straightening reinforcement	Extra for scrapping, cleaning and straightening reinforcement from R.C.C. work.	kg	2.25
15.6		Demolishing brick work	Demolishing brick work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.6.1	Mughal bricks	In lime mortar with old mughal bricks.	cum	421.00
	15.6.2	In lime mortar	In lime mortar.	cum	202.00
	15.6.3	In cement mortar	In cement mortar.	cum	487.00
15.7		Removing mortar from bricks	Removing mortar from bricks and cleaning bricks including stacking within a lead of 50 m (stacks of cleaned bricks shall be measured) :		
	15.7.1	In lime mortar	From brick work in lime mortar.	1000 nos	1254.00
	15.7.2	In cement mortar	From brick work in cement mortar.	1000 nos	1560.00
15.8		Demolishing stone rubble masonry	Demolishing stone rubble masonry manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge:		
	15.8.1	In lime mortar	In lime mortar.	cum	275.00
	15.8.2	In cement mortar	In cement mortar.	cum	582.00
15.9		Dismantling dressed stone work ashlar face stone work	Dismantling dressed stone work ashlar face stone work, marble work or precast concrete work manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-Charge:		
	15.9.1	In lime mortar	In lime mortar.	cum	348.00
	15.9.2	In cement mortar	In cement mortar.	cum	680.00
15.10		Removing mortar from and cleaning stones	Removing mortar from and cleaning stones and concrete articles (net quantity of stacks of cleaned materials will be measured) :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.10.1	In lime mortar	In lime mortar.	cum	112.00
	15.10.2	In cement mortar	In cement mortar.	cum	162.00
15.11		Dismantling tile/ kota /marble/ Granite work	Dismantling tile/ Kota stone/ Marble / Granite work in floors/walls and roofs laid in cement mortar including stacking material within 50 metres lead.		
	15.11.1	Upto 25mm thick	For thickness of tiles 10 mm to 25 mm.	sqm	17.00
	15.11.2	Above 25mm thick	For thickness of tiles above 25 mm and upto 40 mm.	sqm	26.00
15.12		Dismantling stone slab flooring	Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	sqm	64.00
15.13		Taking out paver blocks	Taking out existing CC interlocking paver blocks from footpath/ central verge,including removal of rubbish etc., disposal of unserviceable material to the dumping ground for which payment shall be made separately and stacking of serviceable material within 50 metre lead as per direction of Engineer-in-Charge.	sqm	31.00
15.14		Dismantling doors, windows, shutter including chowkhats,	Dismantling doors, windows and clerestory windows (steel or wood) shutter including chowkhats, architrave, holdfasts etc. complete and stacking within 50 metres lead :		
	15.14.1	Area upto 3 sq.m.	Of area 3 sq. metres and below.	each	85.00
	15.14.2	Area>3.0 sq.m.	Of area beyond 3 sq. metres.	each	117.00
15.15		Taking out doors, windows shutters	Taking out doors, windows and clerestory window shutters (steel or wood) including stacking within 50 metres lead:		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.15.1	Area up to 3.0 sq.m.	Of area 3 sq. metres and below.	each	33.00
	15.15.2	Area>3.0 sq.m.	Of area beyond 3 sq. metres.	each	44.00
15.16		Dismantling wood work in frames, trusses, purlins and rafters upto 10 metres span	Dismantling wood work in frames, trusses, purlins and rafters upto 10 metres span and 5 metres height including stacking the material within 50 metres lead:		
	15.16.1	Section up to 40 sqm.cm	Of sectional area below 40 square centimetres.	metre	4.00
	15.16.2	Sectional area > 40 sqm	Of sectional area 40 square centimetres and above.	cum	1023.00
15.17		Dismantling trusses, rafters, purlins etc. of wood work beyond 10 span	Extra for dismantling trusses, rafters, purlins etc. of wood work for every additional span of one metre or part thereof beyond 10 metres :		
	15.17.1	Section up to 40 sqm.cm	Of sectional area below 40 square centimetres.	metre per metre span	0.45
	15.17.2	Sectional area > 40 sqm	Of sectional area 40 square centimetres and above.	cum per metre span	151.00
15.18		Dismantling trusses, rafters, purlins etc. of wood work for additional height	Extra for dismantling trusses, rafters, purlins etc. of wood work for every additional height of one metre or part thereof beyond 5 metres :		
	15.18.1	Section up to 40 sqm.cm	Of sectional area below 40 square centimetres.	metre per metre span	0.80
	15.18.2	Sectional area > 40 sqm	Of sectional area 40 square centimetres and above.	cum per metre span	213.00
15.19		Dismantling steel work in single sections	Dismantling steel work in single sections including dismembering and stacking within 50 metres lead in:		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.19.1	Joist	R.S. Joists	kg	1.33
	15.19.2	Angle, Tees etc	Channels, angles, tees and flats	kg	0.92
15.20		Dismantling steel work in built up sections with span upto 10 meter including dismembering	Dismantling steel work in built up sections with span upto 10 meter and height 5 meter in angles, tees, flats and channels including all gusset plates, bolts, nuts, cutting rivets, welding etc. including dismembering and stacking within 50 metres lead.	kg	2.28
15.21		Dismantling steel work in built up sections with span upto 10 meter without dismembering	Dismantling steel work manually/ by mechanical means in built up sections with span upto 10 meter and height 5 meter without dismembering and stacking within 50 metres lead as per direction of Engineer-in-Charge.	kg	0.90
15.22		Extra for dismantling steel work of beyond 10 metres	Extra for dismantling trusses, rafters, purlins etc. of steel work for every additional span of one metre or part thereof beyond 10 metres	kg per metre span	0.20
15.23		Extra for dismantling steel work beyond 5 metres height	Extra for dismantling trusses, rafters, purlins etc. of steel work for every additional height of one metre or part thereof beyond 5 metres.	kg per metre height	0.20
15.24		Extra for marking of structural steel	Extra for marking of structural steel work required to be re-erected.	kg	1.00
15.25		Removal of old Tarfelt	Removal of old Tarfelt i/c disposal as directed by Engineer in charge.	per sqm	8.70
15.26		Demolishing brick tile in terracing	Demolishing brick tile covering in terracing including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	sqm	24.00
15.27		Dismantling roofing sheet	Dismantling roofing including ridges, hips valleys and gutters etc., and stacking the material within 50 metres lead of:		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.27.1	G.S.	G.S. Sheet	sqm	39.00
	15.27.2	AC & Non A.C.	Asbestos/ Non asbestors sheet	sqm	18.00
15.28		Dismantling stone slab roofing	Dismantling stone slab roofing over wooden karries or R.C.C. battens (dismantling karries and battens to be paid for separately) including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	cum	636.00
15.29		Dismantling tiled roofing	Dismantling tiled roofing with battens boarding etc. complete including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	sqm	82.00
15.30		Dismantling wooden ballies in posts and struts	Dismantling wooden ballies in posts and struts including stacking within 50 metres lead.	metre	5.00
15.31		Dismantling fencing posts or struts	Dismantling and stacking within 50 metres lead, fencing posts or struts including allearth work and dismantling of concrete etc. in base of :		
	15.31.1	Iron or pipe	T' or 'L' iron or pipe	each	73.00
	15.31.2	R.C.C.	R.C.C.	each	87.00
15.32		Cutting ballies or wooden posts of fencing	Cutting ballies or wooden posts of fencing at the point of projection above the concrete or ground and stacking the same within 50 metres lead.	each	8.00
15.33		Dismantling barbed wire or flexible wire rope in fencing	Dismantling barbed wire or flexible wire rope in fencing including making rolls and stacking within 50 metres lead.	kg	9.00
15.34		Dismantling ornamental design work	Dismantling wooden trellis work excluding frames but including stacking the serviceable material within 50 metres lead.	sqm	15.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.35		Dismantling expanded metal	Dismantling expanded metal or I.R.C. fabrics with necessary battens and beading including stacking the serviceable material within 50 metres lead.	sqm	18.00
15.36		Dismantling wooden board in wall lining	Dismantling wooden boardings in lining of walls and partitions, excluding supporting members but including stacking within 50 metres lead :		
	15.36.1	Thickness Upto 10 mm	Upto 10 mm thick	sqm	15.00
	15.36.2	Thickness 10-25mm	Thickness above 10 mm upto 25 mm	sqm	19.00
	15.36.3	Thickness 25-40 mm thick	Thickness above 25 mm upto 40 mm	sqm	22.00
15.37		Dismantling precast concrete or stone slabs	Dismantling precast concrete or stone slabs in walls, partition walls etc. including stacking within 50 metres lead:		
	15.37.1	Thickness Upto 40 mm	Thickness upto 40 mm	sqm	69.00
	15.37.2	Thickness 40-75mm	Thickness above 40 mm upto 75 mm	sqm	104.00
15.38		Dismantling cement asbestos or other hard board ceiling or partition	Dismantling cement asbestos or other hard board ceiling or partition walls including stacking of serviceable materials and disposal of unserviceable materials within 50 metres lead.	sqm	13.00
15.39		Dismantling C.I. or asbestos rain water pipe with fittings	Dismantling C.I. or asbestos rain water pipe with fittings and clamps including stacking the material within 50 metres lead :		
	15.39.1	75 to 80mm $\phi$ pipe	75 to 80 mm dia pipe.	metre	18.00
	15.39.2	100mm $\phi$	100 mm dia pipe	metre	19.00
	15.39.3	150mm $\phi$	150 mm dia pipe	metre	19.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.40		Dismantling G.I. pipes (external work)	Dismantling G.I. pipes (external work) including excavation and refilling trenches after taking out the pipes manually/ by mechanical means including stacking of pipes within 50 metres lead as per direction of Engineer-in-Charge :		
	15.40.1	15 -40mm $\phi$ pipe	15 mm to 40 mm nominal bore	metre	40.00
	15.40.2	Above 40mm $\phi$ pipe	Above 40 mm nominal bore	metre	47.00
15.41		Dismantling C.I. pipes	Dismantling C.I. pipes including excavation and refilling trenches after taking out the pipes manually/ by mechanical means, breaking lead caulked joints, melting of lead and making into blocks including stacking of pipes and lead at site within 50 metre lead as per direction of Engineer-in-Charge:	metre	
	15.41.1	Upto 150mm $\phi$	Upto 150 mm diameter	metre	114.00
	15.41.2	> 150mm upto 300mm $\phi$	Above 150 mm dia upto 300 mm dia.	metre	153.00
	15.41.3	> 300mm $\phi$	Above 300 mm diameter	metre	198.00
15.42		Taking out C.I. cover with frame of manholes	Taking out C.I. cover with frame from R.C.C. top slab of manholes of various sizes including demolishing of R.C.C. work manually/ by mechanical means and stacking of useful materials near the site and disposal of unserviceable materials within 50 metres lead as per direction of Engineer-in-Charge.	each	174.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.43		Taking out C.I. cover of inspection chambers	Taking out C.I. cover with frame from R.C.C. top slab of inspection chambers of various sizes including demolishing of R.C.C. work manually/ by mechanical means and stacking of useful materials near the site and disposal of unserviceable materials within 50 metres lead as per direction of Engineer-in-Charge.	each	103.00
15.44		Dismantling of road gully chamber	Dismantling of road gully chamber of various sizes including C.I. grating with frame including stacking of useful materials near the site and disposal of unserviceable materials within 50 metres lead including refilling the excavated gap.	each	236.00
15.45		Dismantling of flushing cistern of all types	Dismantling of flushing cistern of all types (C.I./PVC/Vitrious China) including stacking of useful materials near the site and disposal of unserviceable materials within 50 metres lead.	each	223.00
15.46		Dismantling of C.I. sluice valve	Dismantling of C.I. sluice valve including stacking of useful materials within a lead of 50 metres		
	15.46.1	Upto 150mm $\phi$	Upto 150 mm diameter	each	83.00
	15.46.2	>150mm $\phi$	Above 150 mm diameter	each	276.00
15.47		Dismantling of spindle fire hydrant	Dismantling of spindle fire hydrant including stacking of useful materials within 50 metres lead.	each	163.00
15.48		Dismantling old plaster or skirting	Dismantling old plaster or skirting raking out joints and cleaning the surface for plaster including disposal of rubbish to the dumping ground within 50 metres lead.	sqm	13.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.49		Dismantling aluminium/ Gypsum partitions, doors, windows, fixed glazing and false ceiling	Dismantling aluminium/ Gypsum partitions, doors, windows, fixed glazing and false ceiling including disposal of unserviceable surplus material and stacking of serviceable material with in 50 meters lead as directed by Engineer-in-Charge.	sqm	13.00
15.50		Dismantling of old S.W. pipes	Dismantling of old S.W. pipes including breaking of joints and bed concrete stacking of useful materials near the site within 50 m lead and disposal of unserviceable materials into municipal dumps:		
	15.50.1	100 mm $\phi$	100 mm diameter	metre	21.00
	15.50.2	150 mm $\phi$	150 mm diameter	metre	23.00
	15.50.3	200 mm $\phi$	200 mm diameter	metre	25.00
	15.50.4	250 mm $\phi$	250 mm diameter	metre	26.00
	15.50.5	300 mm $\phi$	300 mm diameter	metre	28.00
	15.50.6	350 mm $\phi$	350 mm diameter	metre	32.00
	15.50.7	400 mm $\phi$	400 mm diameter	metre	35.00
	15.50.8	440 mm $\phi$	440 mm diameter	metre	36.00
15.51		Dismantling of manhole including R.C.C. top slab, C.I. cover with frame	Dismantling of manhole including R.C.C. top slab, C.I. cover with frame including stacking of useful materials near the site and disposal of unserviceable materials into municipal dumps within 50 m lead :		
	15.51.1	90x80 cm	Rectangular manhole 90x80 cm and 45 cm deep	each	611.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.51.2	120x90 cm	Rectangular manhole 120x90 cm and 90 cm deep.	each	1069.00
	15.51.3	140x90cm	Rectangular arch type manhole 140x90cm and 2.45m deep.	each	2023.00
	15.51.4	122 cm diameter	Circular manhole 122 cm diameter and 1.68 m deep	each	1553.00
15.52		Extra for depth of manholes dismantled	Extra for depth of manholes dismantled:		
	15.52.1	90x80 cm	Rectangular manhole 90x80 cm and beyond 45 cm depth.	each	486.00
	15.52.2	120x90 cm	Rectangular manhole 120x90 cm and beyond 90 cm depth.	each	579.00
	15.52.3	140x90cm	Rectangular arch type manhole 140x90 cm and beyond 2.45m deep (upto 4.25 m depth).	each	468.00
	15.52.4	122cm diameter	Circular manhole 122 cm diameter and beyond 1.68 m deep (upto 2.29 m depth).	each	322.00
15.53		Taking out existing kerb stones	Taking out existing kerb stones of all types from footpath/ central verge, including removal of mortar etc., disposal of unserviceable material to the dumping ground and stacking of serviceable material within 50 metre lead as per direction of Engineer-in- Charge.	metre	9.00
15.54		Demolishing dry brick pitching	Demolishing dry brick pitching in floors, drains etc. including stacking of serviceable material and disposal of unserviceable material within 50 metres lead :	cum	513.00
15.55		Demolishing mud phaska	Demolishing mud phaska in terracing and disposal of material within 50 metres lead.	cum	356.00
15.56		Dismantling jack arch roofing and floors	Dismantling jack arch roofing and floors including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	Sqm	99.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
15.57		Demolishing R.B. work	Demolishing R.B. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.	cum	1236.00
15.58		Dismantling of roads	Dismantling manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge :		
	15.58.1	W.B.M. road	Water bound macadam road	sqm	86.00
	15.58.2	Bituminous road	Bituminous road	sqm	168.00
15.59		Dismantling steel cylinder R.C. pipes	Dismantling steel cylinder R.C. pipes including excavation and refilling trenches after taking out the pipes, manually/ by mechanical means breaking lead caulked joints, melting of lead and making into blocks including stacking of pipes & lead at site within 50 metres lead as per direction of Engineer-in-charge :		
	15.59.1	Up to 600 mm diameter	Up to 600 mm diameter	per metre	285.00
	15.59.2	Above 600 mm diameter	Above 600 mm diameter	per metre	720.00
15.60		Dismantling asbestos cement pressure pipes	Dismantling asbestos cement pressure pipes including excavation and refilling trenches after taking out the pipes manually/ by mechanical means and stacking the pipes within 50 metres lead as per direction of Engineer-in-charge		
	15.60.1	Up to 150 mm diameter	Up to 150 mm diameter	per metre	129.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	15.60.2	Above 150 mm diameter	Above 150 mm diameter	per metre	156.00
15.61		Dismantling of R.C.C. spun vent shaft	Dismantling of R.C.C. spun vent shaft including excavating the cement concrete pit completely, taking out the shaft, refilling the excavated gap, stacking the useful materials near the site and disposal of unserviceable materials within 50 metres lead.	each	1776.00
15.62		Dismantling of cement concrete platform	Dismantling of cement concrete platform along with curtain walls and base concrete etc. including stacking of useful materials near the site and disposal of unserviceable materials within 50 metres lead:		
	15.62.1	120 x 120 cm	120 x 120 cm (outside to outside)	each	429.00
	15.62.2	210 x 120 cm	210 x 120 cm (outside to outside)	each	932.00
15.63		Dismantling of flexible pavement	Dismantling of flexible pavement (bituminous courses) by mechanical means and disposal of dismantled material up to a lead of 1 kilometre, as per direction of Engineer-in-charge.	cum	203.00
15.64		Disposal of building rubbish / malba / similar unserviceable, dismantled or waste materials	Disposal of building rubbish / malba / similar unserviceable, dismantled or waste materials by mechanical means, including loading, transporting, unloading to approved municipal dumping ground or as approved by Engineer-in-charge, beyond 50 m initial lead, for all leads including all lifts involved.	cum	121.00

**CHAPTER – 16.0**  
**TUBE WELL AND RAIN WATER**  
**HARVESTING**

**PREAMBLE**  
**TUBE WELL AND**  
**RAIN WATER HARVESTING**  
**(CHAPTER: 16.0)**

**16.1 General Specifications**

- Tube wells drilled shall be perfectly vertical and the rates of drilling are inclusive of vertically test required to be conducted.
- Total depth of bore shall generally be 200 ft. (60 meters) but the same may be increased or decreased depending upon the strata and the yield.
- The size of the bore shall be determined by the internal dia of casing pipe in all cases.
- Non-perforated black mild steel casing pipe of specified diameter and thickness shall be lowered for a depth of 9 meters from ground level in all cases but if the strata beyond 9 meters continuous to be soft casing pipe shall be lowered upto the rock level or the hard stratum level to be decided by the Engineer-in Charge. The black casing shall protrude 0.3 meters to 0.75 meters above ground level and a M.S. cap shall be screwed at top.
- The diameter of the bore shall be 6mm less than internal dia of the casing pipe beyond the end of casing pipe upto rock level and in rock the size of the bore shall be reduced by another 6mm.
- In water bearing strata other than rock perforated or slotted pipes of suitable diameter and strainer shall have to be fitted below the casing pipe properly coupled with each other in continuation to the casing pipe.
- For bores in sandy strata suitable size say 3mm to 10mm of washed gravel will have to be shrouded around the annular space of the strainer and perforated or slotted pipes. This should be properly filled in layers and rammed so that the gravel may occupy the cavities in the strata around and there is no further sinking. The space around the casing shall be filled up with earth from spoils and properly rammed.
- The gravel packing shall be applied for 30mm to 150mm all round the slotted or perforated pipe, depending upon the nature of strata encountered and the require size of finished bore.
- Measurements for the gravel packed bores shall be allowed as per the internal dia of the casing pipe. The rates for drilling for the gravel packed bores shall be inclusive of lowering and removal of the housing pipe. Drilling has to be done upto rock level.
- The rates for drilling provided in the schedule are inclusive of depreciation charges of all T & P required for drilling operation transportation of drilling machine, erection at site, removal of machine from site after completion, cost of water, cost of drilling, fuel labour and all other unforeseen item for drilling work and clearance of site after completion of work.
- The rates for other items of work provided in the schedule of rates are inclusive of cost of all material including taxes etc. And labour including transportation, erection operation, fuel and all other unforeseen item pertaining to the execution of the work, clearance of site etc. complete.
- No payment will be made to the contractor for drilling in case any collapse of bore occurs during boring or during lowering the pipes etc. Any precautions, steps required to control caving of the bore shall also be the contractor's responsibility for which no extra charges will be paid for.



- If during any of the operation carried out for completion of the tube well, any tools, pipes etc. fall down in the well, the contractor shall carry out the necessary finishing operation of his own cost. He shall use his own equipment for such operation. If the tube becomes useless due to any fall of an article, it shall be treated as abandoned tube well and no payment shall be made.
- Requirement of casing pipe: The casing pipe generally conforming to IS specifications IS: 4260-1992 shall be used.
- Requirement of GI Pipes Fully galvanized GI pipes conforming to IS Specification IS: 1239 (part-I) 1990 medium quality shall be used.
- Deep well guide hand pump suitable for fixing on a bore having a minimum diameter of 100mm complete with brass cylinders and double buckets of suitable size for pumping 900 litres of water per hour at 40 strokes per minutes from a maximum suction of 50 meters hand pump to be equipped with M.S. handle and bracket and additional M.S. support to prevent guide flange from the breakage and thus prevent breakage of handle and bracket too. The pump to be in two halves provided with flanged joint for ease of erection. The pump to be fitted with two vertical bright turned guide rods and provided with gun metal gland nuts and to have detachable compression cock spout and to be tapped for 32mm and 40mm pipes.

## 16.2 Yield Test:

Yield test means and include the observation of discharge from the well for the specified period varying from 4 to 20 hours, obtained by continuous pumping, for small and big bores, the rates include provision and transport to site of works all necessary equipment required for conducting the yield test and observation of yield in comparison to draw down and recuperation.

The rates include transportation for drilling machine to and from. No extra charges for installation and removal of the drilling machine from site of works are payable.

**Well Development** For wells in unconsolidated or in consolidated formations development work shall consist of de-sanding by pumping the well with a gradually increasing capacity pumping is started with an amount of 20% of the permanent capacity and carried on till the water has become clear, free of sand and silt. The rate of flow is then augmented to 40% and the process repeated. Descending is continued to an amount of 15% of the permanent capacity if for this rate of flow the water is free from all materials surrounding the wall, the water will be perfectly clear for the normal capacity, when air is used submergence ratio, (ratio of length of drop pipe submerged to total length) 60% to 75% shall be adopted.

**Disinfection** After the well is complete constructed, before putting it to use for human consumption, the well should be cleaned thoroughly of all foreign substances, the casing pipe swabbed with alkalis to remove oil, grease etc. and the well disinfected with a chlorine solution. The chlorine solution must be of such volume and strength that a concentration of at least 50 mg/L of chlorine is obtained in all parts of the well.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
16.1		Bore well upto 90 meter depth	Boring/drilling bore well of required dia perfectly vertical to receive casing/ strainer pipe, by suitable method prescribed in IS: 2800 (part I), including collecting samples from different strata, preparing and submitting strata chart/bore log, including hire and running charges of all equipments, tools, plants and machineries required for the job, all complete as per direction of Engineer-in-Charge, upto 90 metre depth below ground level.		
	16.1.1	All types of soil upto 90 meter	All types of soil upto 90 metre depth.		
	16.1.1.1	100 mm dia	100 mm dia.	meter	378.00
	16.1.1.2	150 mm dia	150 mm dia.	meter	413.00
	16.1.1.3	200 mm dia	200 mm dia.	meter	451.00
	16.1.2	Rocky strata upto 90 meter	Rocky strata including Boulders.Upto 90 metre depth.		
	16.1.2.1	100 mm dia	100 mm dia.	meter	554.00
	16.1.2.2	150 mm dia	150 mm dia.	meter	625.00
	16.1.2.3	200 mm dia	200 mm dia.	meter	690.00
	16.1.3	All soil beyond 90 meter	All types of soil beyond 90 metre depth.	meter	
	16.1.3.1	100 mm dia	100 mm dia.	meter	385.00
	16.1.3.2	150 mm dia	150 mm dia.	meter	428.00
	16.1.3.3	200 mm dia	200 mm dia	meter	495.50
	16.1.4	Rocky strata beyond 90 meter	Rocky strata including Boulders. Beyond 90 metre depth.		
	16.1.4.1	100 mm dia	100 mm dia.	meter	572.00
	16.1.4.2	150 mm dia	150 mm dia.	meter	656.00
	16.1.4.3	200 mm dia	200 mm dia	meter	716.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
16.2		Unplasticized PVC bore well casing	Supplying, assembling, lowering and fixing in vertical position in bore well, unplasticized PVC medium well casing (CM) pipe of required dia, conforming to IS: 12818, including required hire and labour charges, fittings and accessories etc. all complete, for all depths, as per direction of Engineer-in-Charge.		
	16.2.1	100 mm dia	100 mm nominal dia. (minimum wall thickness 5mm).	meter	376.00
	16.2.2	150 mm dia	150 mm nominal dia (minimum wall thickness 7.5mm).	meter	423.00
	16.2.3	200 mm dia	200 mm nominal dia (minimum wall thickness 10mm).	meter	559.00
16.3		Unplasticized PVC bore well screen	Supplying, assembling, lowering and fixing in vertical position in bore well unplasticized PVC medium well screen (RMS) pipes with ribs, conforming to IS: 12818, including hire and labour charges, fittings and accessories etc. All complete, for all depths, as per direction of Engineer-in-Charge.		
	16.3.1	100 mm dia	100 mm nominal size dia.	meter	446.00
	16.3.2	150 mm dia	150 mm nominal size dia.	meter	551.00
	16.3.3	200 mm dia	200 mm nominal size dia.	meter	878.00
16.4		Mild steel bore casing pipe	Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 mild steel screwed and socketed/plain ended casing pipes of required dia, conforming to IS: 4270, of reputed and approved make, including painted with outside surface with two coats of anticorrosive paint of approved brand and manufacture, including required		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			hire and labour charges, fittings and accessories, all complete, for all depths, as per direction of Engineer- in-Charge.		
	16.4.1	100 mm dia	100 mm nominal size dia having minimum wall thickness 4.50 mm.	meter	795.00
	16.4.2	150 mm dia	150 mm nominal size dia having minimum wall thickness 4.85 mm.	meter	1191.00
	16.4.3	200 mm dia	200 mm nominal size dia having minimum wall thickness 5.40 mm.	meter	1611.00
16.5		Plain slotted mild steel bore pipe (type A)	Supplying, assembling, lowering and fixing in vertical position in bore well, ERW (Electric Resistance Welded) FE 410 plain slotted (having slot of size 1.6/3.2 mm) mild steel threaded and socketed /plain bevel ended pipe (type A) of required dia, conforming to IS: 8110, of reputed and approved make, having wall thickness not less than 5.40 mm, including painted with outside surface with two coats of anticorrosive bitumestic paint of approved brand and manufacture, including hire and labour charges, fittings and accessories, all complete, for all depths, as per direction of Engineer-in-Charge.		
	16.5.1	100 mm dia	100 mm nominal size dia.	meter	855.00
	16.5.2	150 mm dia	150 mm nominal size dia.	meter	1271.00
	16.5.3	200 mm dia	200 mm nominal size dia.	meter	1691.00
16.6		Gravel packing in tubewell	Gravel packing in tubewell construction in accordance with IS: 4097, including providing gravel fine/ medium/ coarse, in required grading and sizes as per actual requirement, all complete as per direction of Engineer-in-charge.	cum	947.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
16.7		Development of tube well	Development of tube well in accordance with IS : 2800 (part I) and IS: 11189, to establish maximum rate of usable water yield without sand content (beyond permissible limit), with required capacity air compressor, running the compressor for required time till well is fully developed, measuring yield of well by "V" notch method or any other approved method, measuring static level and draw down etc. by step draw down method, collecting water samples and getting tested in approved laboratory, i/c disinfection of tubewell, all complete, including hire and labour charges of air compressor, tools and accessories etc., all as per requirement and direction of Engineer-in-Charge.	hour	478.00
16.8		Mild steel cap or welded plate to the top of bore well pipe	Providing and fixing suitable size threaded mild steel cap or spot welded plate to the top of bore well housing/ casing pipe, removable as per requirement, all complete for borewell of:		
	16.8.1	100 mm dia	100 mm dia	each	244.00
	16.8.2	150 mm dia	150 mm dia	each	366.00
	16.8.3	200 mm dia	200 mm dia	each	488.00
16.9		M.S. clamp	Providing and fixing M.S. clamp of required dia made of 100 x10 mm flat to the top of casing/ housing pipe of tubewell as per IS: 2800 (part I), including necessary bolts and nuts of required size complete.		
	16.9.1	100 mm dia	100 mm clamp.	each	1068.00
	16.9.2	150 mm dia	150 mm clamp.	each	1129.00
	16.9.3	200 mm dia	200 mm clamp.	each	1281.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
16.10		Bail plug /Bottom plug	Providing and fixing Bail plug/ Bottom plug of required dia to the bottom of pipe assembly of tubewell as per IS: 2800 (part I).		
	16.10.1	100 mm dia	100 mm dia	each	196.00
	16.10.2	150 mm dia	150 mm dia	each	242.00
	16.10.3	200 mm dia	200 mm dia	each	265.00
16.11		Boring for hand pump/ tube well	Boring with 100 mm diameter casing pipe for hand pump/ tube well in all soils except ordinary hard rocks requiring blasting including lowering the casing pipe.		
	16.11.1	Upto 6 metres	Upto 6 metres depth.	meter	236.00
	16.11.2	>6 m and upto 12 m	Beyond 6 m and upto 12 m depth.	meter	280.00
	16.11.3	> 12 m and upto 18 m	Beyond 12 m and upto 18 m depth.	meter	326.00
16.12		Filters with brass strainer	Providing and placing in position filters to 40 mm diameter G.I. pipe with brass strainer of approved quality. Filter of 32 mm dia	meter	545.00
16.13		40 mm G.I. pipe for tube well	Providing and fixing to filter and lowering to proper levels 40 mm G.I. pipe for tube well including cleaning and priming the tube well. Filter of 32 mm dia meter.	meter	386.00
16.14		Hand pump of India mark II	Providing and placing in position hand pump of Indiamark II of approved quality for 40 mm diameter G.I. pipe complete with all accessories.	each	841.00
16.15		Stone boulders in recharge pit	Supplying, filling, spreading and leveling stone boulders of size range 5 cm to 20 cm, in recharge pit, in the required thickness, for all leads and lifts, all complete as per direction of Engineer-in-charge.	cum	760.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
16.16		Gravels of in the recharge pit	Supplying, filling, spreading and leveling gravels of size range 5 mm to 10 mm, in the recharge pit, over the existing layer of boulders, in required thickness, for all leads and lifts, all complete as per direction of Engineer-in-Charge.	cum	877.00
16.17		Coarse sand in recharge pit	Supplying, filling, spreading and leveling coarse sand of size range 1.5 mm to 2 mm in recharge pit, in required thickness over gravel layer, for all leads and lifts, all complete as per direction of Engineer-in- Charge.	cum	819.00
16.18		Precast R.C.C. perforated drain covers	Providing and fixing factory made precast RCC perforated drain covers, having concrete of strength not less than M-25, of size 1000 x 450x50 mm, reinforced with 8 mm dia four no longitudinal and 9 nos cross sectional T.M.T. Hoop bars, including providing 50 mm dia perforations @ 100 to 125 mm c/c, including providing edge binding with M.S. flats of size 50 mm x 1.6 mm complete, all as per direction of Engineer-in- Charge.	each	959.00
16.19		Rain water harvesting filter kit unplasticised PVC	Providing and fixing of unplasticised rigid PVC rain water harvesting filter kit UV protected with filter, PVC valve, conforming to IS: 1392, working pressure 4 kg\sqcm Type B, minimum capacity 20 kilolitre/ hour, of approved make including all accessories like unplasticied PVC pipe clips of approved design with bombay nail of required length including making good the wall etc. complete for designed catchment		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			area.		
	16.19.1	75 mm dia for 100 square meter area	75mm diameter PVC pipe, having wall thickness 3.2 mm for 100 m <sup>2</sup> catchment area	each	5858.00
	16.19.2	90 mm dia for 150 square meter area	90 mm diameter PVC pipe, having wall thickness 3.2 mm for 150 m <sup>2</sup> catchment area	each	7100.00
	16.19.3	110 mm dia for 250 square meter area	110 mm diameter PVC pipe, having wall thickness 3.2 mm for 250 m <sup>2</sup> catchment area	each	8900.00
	16.19.4	160 mm dia for 450 square meter area	160 mm diameter PVC pipe, having wall thickness 3.2 mm for 450 m <sup>2</sup> catchment area	each	16500.00
16.20		Rain water harvesting filter kit unplasticised (filter dia 160mm)	Providing and fixing of unplasticised rigid PVC rain water harvesting filter kit including filter of 160 mm diameter wall thickness 3.2mm with PVC valve, 110 mm diameter UV protected conforming to ID: 13592 for working pressure 6 kg\sqcmTypeB capacity 40 kilo liter\hour including all accessories like unplasticised PVC pipe clips of approved design with bombay nail of required length including making good the wall etc complete for catchment area upto 200 sqm.	each	8679.00
16.21		Rain water harvesting kit filter (filter dia 90mm)	Rain water filter made out of ABS plastics material, designed to operate on gravity of rainwater from roof through down pipe, having inlet (id) of 110 mm, outlet (id) of 110 mm; provided with SS 304 wire mesh filter element having diameter of not less than 90 mm and height not less than 500 mm with cap of		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			not less than 70 mm height with two holes of not less than 10 mm on cap as a safety feature. Element must have back wash cap at bottom for cleaning dried particles. Filter must have flush outlet of not less than 60 mm moulded opposite to inlet connection. Flush valve must be supplied along with filter. Rainwater filter must be manufactured from injection moulding process, blended with uv stabilizers. Rainwater filters width to be not less than 400 mm, depth to be not less than 140 mm and height must not be less than 600 mm overall. Moulded projection to be given at bottom to fix on wall and a polymer clamp to fix at top.		
16.21.1		75 mm dia for 100 square meter area	System size 75mm diameter (filter, rain tee, door bend, and valve 75mm) For the catchment up to 100 square meter.	each	5900.00
16.21.2		110 mm dia for 200 square meter area	System size 110mm diameter (filter, rain tee, door bend, and valve 110mm) For the catchment up to 200 square meter.	each	7750.00
16.21.3		160 mm dia for 300 square meter area	System size 160mm diameter (filter, rain tee, door bend, and valve 110mm) For the catchment up to 300 square meter.	each	11900.00
16.22		Borewell adaptor	Borewell adaptor for connecting Rain Water Harvesting pipe line to borewell.		
	16.22.1	75 mm dia	Borewell adaptor 75mm	each	250.00
	16.22.2	110 mm dia	Borewell adaptor 110mm	each	300.00
	16.22.3	160 mm dia	Borewell adaptor 160mm	each	400.00

**CHAPTER – 17.0**  
**SANITARY INSTALLATIONS**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1.	IS 771 (Part-1)	Specification for glazed fire clay sanitary appliances: Part 1: General requirements.
2.	IS 771 (Part-2)	Specification for glazed fire clay sanitary appliances: Part 2: Specific requirements of kitchen and laboratory sink.
3.	IS 772	Specific action for general requirements for enameled cast iron sanitary appliances.
4.	IS 774	Flushing cisterns for water closets and urinals (Other than plastic cistern)-Specifications.
5.	IS 1300	Phenolic moulding materials.- Specifications
6.	IS 1703	Water fittings- copper alloy float valves (horizontal plunger type) - Specification.
7.	IS 1729	Cast iron /Ductile Iron Drainage Pipes and pipe fittings for Over ground non-pressure pipe line Socket and Spigot Series
8.	IS 1795	Specification for pillar taps for water supply purposes.
9.	IS 2267	Polystyrene moulding and extrusion materials - Specifications
10.	IS 2326	Specification for Automatic Flushing Cisterns for Urinals (Other than plastic cisterns)
11.	IS 2548 (Part-1)	Plastic seats and covers for water closets Part 1: Thermo set seats and covers - Specifications
12.	IS 2548 (Part-2)	Plastic seats and covers for water closets Part 2: Thermoplastic seats and covers.- Specifications
13.	IS 2556	Vitreous sanitary appliances (vitreous china) –Specifications
14.	IS 2556 (Part-1)	Part-1: General requirements
15.	IS 2556 (Part-2)	Part-2: Specific requirements of wash-down water closets.
16.	IS 2556 (Part-3)	Part-3: Specific squatting pans
17.	IS 2556 (Part-4)	Part-4: Specific requirements of wash basins
18.	IS 2556 (Part-5)	Part-5: Specific requirements of laboratory sinks
19.	IS 2556 (Part-6)	Part-6: Specific requirements of Urinals and Partition plates
20.	IS 2556 (Part-7)	Part-7: Specific requirements of accessories for sanitary appliances
21.	IS 2556 (Part-14)	Part-14: Specific requirements of integrated squatting pans.
22.	IS 2556 (Part -15)	Part-15: Specific requirements of universal water closets.
23.	IS 2963	Specification for Copper alloy waste fittings for wash basins and sinks.
24.	IS 3076	Specification for low density polyethylene pipes for potable water supplies
25.	IS 3389	Urea formaldehyde moulding materials. – Specifications
26.	IS 3989	Specification for centrifugally cast (spun) iron spigot and socket soil, waste and ventilating pipes fittings and accessories.
27.	IS 4827	Specification for electroplated coating of nickel and chromium on copper and copper alloys.
28.	IS 4984	Specification for high density polyethylene pipes for potable water supplies.
29.	IS 4985	Unplasticised P.V.C. pipes for potable water supply - Specifications.
30.	IS 7231	Plastic flushing cisterns for water closets and urinals
31.	IS 13983	Specifications. Stainless steel sinks for domestic purposes - Specifications.

**PREAMBLE**  
**SANITARY INSTALLATIONS**  
**(CHAPTER: 17.0)**

**All vitreous sanitary appliances (Vitreous China) shall conform to IS 2556 (Part-I) general Requirements**

**17.1 General Requirements for Installation of Sanitary Fittings**

The work shall be carried out, complying in all respects with the requirements of relevant laws of the local body in whose jurisdiction the work is situated.

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.

- (i) **Masonry Work:** The masonry work shall be made good by using the same class of bricks, tiles or stones as was damaged during the execution of the work. The mortar used shall be cement mortar 1:5 (1 cement: 5 sand) or as directed by the Engineer-in- Charge.
- (i) **Plain Concrete Work :** Concrete work for sub-grade of the flooring, foundations and other plain concrete works shall be cement concrete 1:5:10 (1 cement : 5 sand : 10 graded stone aggregate 40 mm nominal size). A coat of neat cement slurry shall be applied at the junction with old work, before laying fresh concrete.
- (i) **Cement Concrete Flooring and R.C.C. Work :** Cement concrete 1:2:4 (1 Cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) shall be used after applying a coat of neat cement slurry at the junction with old work, and the surface finished to match with the surrounding surface.
- (iv) Urinals shall be installed at a height of 65 cm from standing floor level to top of lip of the urinal until otherwise specified.
- (v) The floor slab shall be suitably sunk to receive the stall urinal. Where the floor slab is not sunk, the stall urinal shall be provided over a platform. The lip of the stall urinal shall be flush with the finished floor level adjacent to it.
- (vi) Wash basin shall be fixed at height of 750-800 mm from the floor level

**17.2 Flushing Cisterns**

The flushing cisterns shall be automatic or manually operated high level or low level as specified, for water closets and urinals. A high level cistern is intended to operate with minimum height of 125 cm and a low level cistern with a maximum height of 30 cm between the top of the pan and the under side of the cistern. Cisterns shall be of following type

- (i) Vitreous China (IS 774) for Flushing type
- (i) Automatic Flushing Cistern (IS 2326) and
- (iii) Plastic cisterns (IS 7231).

The cistern shall be provided with a removable cover which shall fit closely and shall be secured against displacement. In designs, where the operating mechanism is attached to the cover, the cover may be made in two sections, the section supporting the mechanism being

securely fixed or booked to the body. The flush pipe (except plastic flush pipe) shall have an internal diameter of  $32 + 1$  mm for high level cistern and  $38 + 1$  mm for low level cistern. The steel flush pipe shall be not less than 1 mm thick whereas the lead flush pipe shall have a minimum thickness of 3.5 mm. For high density polyethylene pipes, the outside diameter of the pipes shall be 40 mm. For unplasticised PVC plumbing pipes the outside diameter of the pipe shall be 40 mm for high level cisterns, and 50 mm for low level cisterns. In the case of high level flushing cisterns, a pipe clip fitted with a rubber buffer shall be fixed to the flush pipe to prevent damage either to the pipe or to the seat when the seat is raised. No flush pipe is required for coupled cisterns.

## **OPERATIONAL AND PERFORMANCE REQUIREMENTS**

### **17.3 Flushing Arrangement**

The cistern under working conditions and with the float valve in closed position shall operate on a single operation of the operating mechanism/lever without calling for a sudden jerk in pulling. If a valve is used instead of siphon for flushing purposes, the valve shall be completely leak proof.

### **17.4 Working Water Level**

The working water-level shall be a minimum of 6.5 cm. below the effective top edge of the cistern and shall be legibly and permanently marked on the inside of the cistern. Effective top edge shall be taken on edge after top of the body without considering bead.

### **17.5 Freedom from Self Siphonage**

The siphonic system shall be capable of being rapidly brought into action when the water is at the working water level, but shall not self siphon or leak into the flush pipe when the water is up to 1 cm above the invert of the overflow pipe.

### **17.6 Reduced Water Level**

The discharge shall operate satisfactorily when the cistern is filled to a level up to 1 cm. below the working water level.

### **17.7 Discharge Capacity**

When tested in accordance with IS 7231, cistern of 5 litres and 10 litres capacities, when required to give a full flush, shall respectively discharge 5 litres and 10 litres with variation of  $\pm 0.5$  litres. Dual-flush cistern of 10 litres capacity shall discharge alternatively a short flush of  $5 \pm 0.5$  litres. Dual flush cistern of 6/3 litres capacity shall discharge  $6 \pm 0.5$  litres and alternatively a half flush of  $3 \pm 0.5$  litres.

### **17.8 Discharge Rate**

When tested in accordance with IS 7231, the discharge rate shall be  $10 \pm 0.5$  litres within 6 seconds and  $5 \pm 0.5$  litres within 3 seconds for cistern of capacities 10 litres and 5 litres and  $6 \pm 0.5$  litres within 6 second and  $3 \pm 0.5$  litres within 3 second for cistern of 6/3 litres capacity respectively. The cistern shall be so designed that there is no appreciable variation in the force of the flush during the discharge of the required quantity of water. For coupled cisterns, this test shall not be applicable.

### **17.9 Special Requirements Distortion Resistance Test**

The cisterns, complete with its fittings, shall be installed and filled with water to the marked water line and observed for any distortion. The cistern shall not budge more than 6 mm and the cover shall not be dislodged.

### **17.10 Dead Load Test**

When the flushing mechanism incorporates chain pull or hand operated lever, the cistern, complete with its fittings, when installed and filled with water to the marked water line and tested by the application of a dead load of 230 N applied 6 mm from the end of the operating lever arm for 30 seconds, shall not distort to such an extent that any part becomes detached. In the case of other operating mechanism, the dead load applied shall be a mass equivalent to the operating force required to overcome the normal hydrostatic head; Thirty seconds after the load is removed, the function and appearance of the cistern shall not be impaired.

### **17.11 Front Thrust Test**

The front thrust test shall be applied only to cisterns intended for low level use. The cistern complete with its fittings, when installed and filled with water to the marked water line and tested by the method described in IS 7231, shall not distort to such an extent as to be inoperable or unsightly when the load is removed.

### **17.12 Impact Test**

The cistern, complete with its fittings, when installed and filled as described in IS 7231 shall show no defect after one impact. Repeat the test but with the cistern empty. The cistern shall show no defect after the further impact.

### **17.13 Plastic Seat and Covers for Water Closet.**

The seat and cover shall be of thermosetting or thermoplastic conforming to IS 2548 as specified. Unless otherwise specified these shall be of closed pattern.

### **17.14 Strength:**

The seats shall withstand without permanent distortion of the seat or hinge fittings or damage to any finish, a load of 1150 N for 30 minutes applied in the manner prescribed in IS 2548.

### **17.15 Sand Cast Iron or Centrifugally Cast (Spun) Iron Pipes and Fittings**

Sand cast iron spigot and socket soil, waste and ventilating pipes, fittings and accessories shall conform to IS 1729. Centrifugally cast (Spun) iron spigot and socket soil, waste and ventilating pipes, fittings and accessories shall conform to IS 3989. The fittings shall conform to the same I.S. specifications to which the pipe itself conforms in which they are connected. The pipes shall have spigot and socket ends, with head on spigot end in case of sand cast iron pipes and without head on spigot end in case of cast iron (Spun) pipes. The pipes and fittings shall be true to shape, smooth and cylindrical, their inner and outer surface being as nearly as practicable concentric. They shall be sound and shall be free from cracks, taps, pinholes and other imperfections and shall be neatly dressed and carefully fettled. All pipes and fittings shall ring clearly when struck with a light hand hammer. The ends of pipes and fittings shall be reasonably square to their axis. The sand cast iron pipes shall be 1.5/1.8/2.0 metre in length including socket ends, cast iron (Spun) pipes shall be 1.5/1.75/2.0/2.5/3.0 metre in length excluding socket ends, unless shorter lengths are either specified or required at junctions etc. The pipe and fittings shall be supplied without ears, unless specified or directed otherwise. All pipes and fittings shall be coated internally and externally with the same material at the factory, the fitting being preheated prior to total immersion in a bath containing a uniformly heated composition having a tar or othersuitable base. The coating material shall have good adherence and shall not scale off. In all instances where the coating material has tar or similar base it shall be smooth and tenacious and hard enough not to flow when exposed to a temperature of 77 degree centigrade but not so brittle at a temperature of 0 degree centigrade as to chip off when scribed lightly with a pen knife. The standard weights and thicknesses of pipes and their tolerances shall be as prescribed in.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
17.1		W.C. Indian type with flushing cistern	Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100mm sand cast Iron P or Strap, UPVC P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231, with all fittings and fixtures complete including cutting and making good the walls and floors wherever required :		
	17.1.1	Size 580x440mm	White Vitreous china Orissa pattern W.C. pan of size 580x440mm with integral type foot rests.	each	2995.00
	17.1.2	Size 580x480mm	Stainless Steel AISI-304(18/8) Orissa pattern W.C. pan of size 585x480 mm with flush pipe and integrated type foot rests.	each	7031.00
17.2		W.C. European type PVC flushing cistern	Providing and fixing white vitreous china pedestal type water closet (European type W.C. pan) with seat and lid, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever), conforming to IS : 7231, with all fittings and fixtures complete including cutting and making good the walls and floors wherever required :		
	17.2.1	White plastic seat cover and lid	W.C. pan with ISI marked white solid plastic seat and lid	each	3036.00
	17.2.2	Black plastic seat cover and lid	W.C. pan with ISI marked black solid plastic seat and lid	each	3013.00
	17.2.3	Extra for S.S.304 european seat	Providing and fixing AISI-304 (18/8) European type WC instead of white vitreous china pedestal type water closet.	each	4536.00
17.3		W.C. European type china flushing cistern C.P. flush bend	Providing and fixing white vitreous china pedestal type water closet (European type) with seat and lid, 10 litre low level white vitreous china flushing cistern and C.P. flush bend with fittings and C.I.brackets, 40mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved		



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (in Rs)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			municipal design complete including painting of fittings and brackets, cutting and making good the walls and floors wherever required :		
	17.3.1	White plastic seat cover and lid	W.C. pan with ISI marked white solid plastic seat and lid.	each	4613.00
	17.3.2	Black plastic seat cover and lid	W.C. pan with ISI marked black solid plastic seat and lid.	each	4590.00
17.4		W.C. Anglo Indian type	Providing and fixing vitreous china dual purpose closet suitable for use as squatting pan or European type water closet (Anglo Indian W.C pan) with seat and lid fixed with C.P. brass hinges and rubber buffers, 10 litre low level flushing cistern with fitting and brackets, 40mm flush bend, 20mm over flow pipe, with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required White vitreous china dual purpose WC pan with white solid plastic seat and lid with 10liter low level flushing cistern i/c C.P. flush bend.	each	5120.00
17.5		W.C. wall mounted	Providing and fixing white vitreous china extended wall mounting water closet of size 780x370x690 mm of approved shape including providing and fixing white vitreous china cistern with dual flush fitting, of flushing capacity 3 litre/6 litre (adjustable to 4 litre/8 litres), including seat cover, and cistern fittings, nuts, bolts and gasket etc complete.	each	10761.00
17.6		Urinal flat back or wall corner type with automatic flushing cistern	Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350mm and 340x410x265 mm sizes respectively with automatic flushing cistern with standard flush pipe and C.P. brass spreaders with brass unions and G.I clamps complete, including painting of fittings and brackets, cutting and making good the walls and floors wherever required :		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
	17.6.1	One urinal	One urinal basin with 5 litre white P.V.C. automatic flushing cistern.	each	2754.00
	17.6.2	Range of two urinal	Range of two urinal basins with 5 litre white P.V.C. automatic flushing cistern.	each	4458.00
	17.6.3	Range of three urinal	Range of three urinal basins with 10 litre white P.V.C. automatic flushing cistern.	each	6312.00
	17.6.4	Range of four urinal	Range of four urinal basins with 10 litre white P.V.C. automatic flushing cistern.	each	8384.00
17.7		Urinal flat back half stall urinal with automatic flushing cistern	Providing and fixing white vitreous china flat back half stall urinal of size 580x380x350mm with white PVC automatic flushing cistern, with fittings, standard size C.P. brass flush pipe, spreaders with unions and clamps (all in C.P. brass) with waste fitting as per IS : 2556, C.I. trap with outlet grating and other couplings in C.P. brass including painting of fittings and cutting and making good the walls and floors wherever required		
	17.7.1	Single half stall urinal	Single half stall urinal with 5 litre P.V.C. automatic flushing cistern.	each	5567.00
	17.7.2	Range of two half stall urinals	Range of two half stall urinals with 5 litre P.V.C. automatic flushing cistern.	each	8660.00
	17.7.3	Range of three half stall urinals	Range of three half stall urinals with 10 litre P.V.C. automatic flushing cistern.	each	12764.00
	17.7.4	Range of four half stall urinals	Range of four half stall urinals with 10 litre P.V.C. automatic flushing cistern.	each	15547.00
17.8		Squatting plate with flushing cistern	Providing and fixing one piece construction white vitreous china squatting plate with an integral longitudinal flushing pipe, white P.V.C. automatic flushing cistern, with fittings, standard size G.I. / PVC flush pipe for back and front flush with standard spreader pipes with fittings, G.I clamps and C.P. brass		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			coupling complete including painting of fittings and cutting and making good the walls and floors etc. wherever required :		
	17.8.1	Single squatting plate	Single squatting plate with 5 litre P.V.C. automatic flushing cistern.	each	3478.00
	17.8.2	Range of two squatting plates	Range of two squatting plates with 5 litre P.V.C. automatic flushing cistern.	each	5128.00
	17.8.3	Range of three squatting plates	Range of three squatting plates with 10 litre P.V.C. automatic flushing cistern.	each	7151.00
	17.8.4	Range of four squatting plates	Range of four squatting plates with 10 litre P.V.C. automatic flushing cistern.	each	8689.00
17.9		Urinal china water less	Providing and fixing white vitreous china water less urinal of size 600x330x315 mm having antibacterial /germs free ceramic surface, fixed with cartridge having debris catcher and hygiene seal.	each	12300.00
17.10		Urinal infrared sensor operated	Providing and fixing white vitreous china battery based infrared sensor operated urinal of approx. size 610 x 390 x 370 mm having pre and post flushing with water ( 250 ml and 500 ml consumption), having water inlet from back side, including fixing to wall with suitable brackets all as per manufacturers specification and direction of Engineer-in-Charge.	each	5032.50
17.11		Wash basin	Providing and fixing wash basin with C.I. brackets, 15 mm C.P. brass pillar taps,32 mm C.P. brass waste of standard pattern, including painting of fittings and brackets, cutting and making good the walls wherever require :		
	17.11.1	630x450 mm flat back pair of pillar cock (china clay)	White Vitreous China Wash basin size 630x450 mm with a pair of 15 mm C.P. brass pillar taps.	each	2460.00
	17.11.2	630x450 mm flat back single pillar cock (china clay)	White Vitreous China Wash basin size 630x450 mm with a single 15 mm C.P. brass pillar tap.	each	2187.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.11.3	550x400 mm flat back pair of pillar cock (china clay)	White Vitreous China Wash basin size 550x400 mm with a pair of 15 mm C.P. brass pillar taps.	each	1938.00
	17.11.4	550x400 mm flat back single pillar cock (china clay)	White Vitreous China Flat back wash basin size 550x400 mm with single 15 mm C.P. brass pillar tap.	each	1664.00
	17.11.5	600x480 mm Angle back single pillar cock (china clay)	White Vitreous China Angle back wash basin size 600x480 mm with single 15 mm C.P. brass pillar tap.	each	1775.00
	17.11.6	400x400 mm Angle back single pillar cock (china clay)	White Vitreous China Angle back wash basin size 400x400 mm with single 15 mm C.P. brass pillar tap.	each	1502.00
	17.11.7	450x300 mm flat back single pillar cock (china clay)	White Vitreous China Flat back wash basin size 450x300 mm with single 15 mm C.P. brass pillar tap.	each	1525.00
	17.11.8	660x460 mm Surgeon type pair of Elbow pillar cock (china clay)	White Vitreous China Surgeon type wash basin of size 660x460 mm with a pair of 15 mm C.P. brass pillar taps with elbow operated lever ISI marked.	each	3761.00
	17.11.9	660x460 mm Surgeon type single of E-bow pillar cock (china clay)	White Vitreous China Surgeon type wash basin of size 660x460 mm with single 15 mm C.P. brass pillar taps with elbow operated levers ISI marked.	each	2907.00
	17.11.10	Oval shap single pillar cock (china clay)	Oval shape wash basin over counter /under counter with 15 mm C.P brass pillar tap (Counter to be paidsepratly).	each	7153.00
	17.11.11	405x355 mm round single pillar cock (S.S)	Stainless Steel AISI-304(18/8) Round basin 405x355 mm with single 15mm C.P. brass pillar tap	each	3308.00
	17.11.12	530x345 mm single pillar cock (S.S)	Stainless Steel AISI-304(18/8) Wash basin 530x345 mm with single 15 mm C.P. brass pillar tap.	each	2948.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.12		Pedestal vitreous china	Providing and fixing white vitreous china pedestal for wash basin completely recessed at the back for the reception of pipes and fittings.	each	1065.00
17.13		Kitchen sink (White glazed fire clay)	Providing and fixing kitchen sink with C.I. brackets, C.P. brass chain with rubber plug, 40 mm C.P. brass waste complete, including painting the fittings and brackets, cutting and making good the walls wherever required : White glazed fire clay kitchen sink of size 600x450x250mm.	each	2492.00
17.14		Kitchen sink (stainless Steel)	Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS 13983 with C.I. brackets and stainless steel plug 40 mm including painting of fittings and brackets, cutting and making good the walls wherever required :		
	17.14.1	With drain board	Kitchen sink with drain board		
	17.14.1.1	Depth 250mm	510x1040 mm bowl depth 250mm.	each	8074.00
	17.14.1.2	Depth 225mm	510x1040 mm bowl depth 225mm.	each	7609.00
	17.14.1.3	Depth 200mm	510x1040 mm bowl depth 200mm.	each	7493.00
	17.14.1.4	Depth 178mm	510x1040 mm bowl depth 178mm.	each	5286.00
	17.14.2	Without drain board	Kitchen sink without drain board		
	17.14.2.1	Depth 200mm	610x510 mm bowl depth 200 mm.	each	4583.00
	17.14.2.2	Depth 200mm	610x460 mm bowl depth 200 mm.	each	4351.00
	17.14.2.3	Depth 178mm	470x420 mm bowl depth 178 mm.	each	3422.00
17.15		Laboratory sink vitreous china	Providing and fixing white vitreous china laboratory sink with C.I. brackets, C.P. brass chain with rubber plug 40mm C.P brass waste and 40mm C.P. brass trap with necessary C.P. brass unions complete including painting of fittings and brackets, cutting and making good the wall wherever required :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.15.1	Depth 150mm	Size450x300x150mm	each	2341.00
	17.15.2	Depth 200mm	Size600x450x200mm	each	3328.00
17.16		Draining board (White glazed fire clay)	Providing and fixing White glazed fire clay draining board of size 600x450x25mm with C.I. brackets including painting of brackets, cutting and making good the walls wherever required.	each	1043.00
17.17		Water closet Indian type	Providing and fixing white vitreous china water closet squatting pan (Indian type)		
	17.17.1	Long pattern	Long pattern W.C. pan of size 580 mm	each	765.00
	17.17.2	Orissa pattern	Orissa pattern W.C. pan of size 580x440 mm	each	1322.00
17.18		Extra for coloured W.C. pan	Extra for using coloured W.C. pan instead of white W.C. pan Orissa pattern W.C. pan 580x440 mm	each	842.00
17.19		W.C. Pedestal type European type	Providing and fixing white vitreous china pedestal type (European type/ wash down type) water closet pan.	each	1235.00
17.20		Extra for coloured pedestal type W.C pan	Extra for using coloured pedestal type W.C pan (European type) with low level cistern of same colour instead of white vitreous china W.C pan and cistern.	each	1452.00
17.21		Foot rests	Providing and fixing a pair of white vitreous china foot rests of standard pattern for squatting pan water closet:		
	17.21.1	250x130x30 mm	250x130x30 mm	pair	200.00
	17.21.2	250x125x25 mm	250x125x25 mm	pair	142.00
17.22		Flushing cistern low Level (P.V.C)	Providing and fixing P.V.C. low level flushing cistern with manually controlled device (handle lever) conforming to IS: 7231, with allfittings and fixtures complete. 10 litre capacity		
	17.22.1	White	White	each	945.00
	17.22.2	Coloured	coloured	each	1037.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.23		Controlled flush, low level cistern made of vitreous china	Providing and fixing controlled flush, low level cistern made of vitreous china with all fittings complete.10 litre (full flush capacity)		
	17.23.1	White	White	each	1615.00
	17.23.2	Coloured	Coloured	each	2196.00
17.24		Plastic seat cover with lid for pedestal type W.C.	Providing and fixing solid plastic seat with lid for pedestal type W.C. pan complete :		
	17.24.1	White	White	each	456.00
	17.24.2	Black	Black	each	433.00
	17.24.3	Coloured	Coloured (other than black and white)	each	688.00
17.25		Inlet connection for flush pipe	Providing and fixing G.I. inlet connection for flush pipe connecting with W.C. pan.	each	114.00
17.26		Urinal (flat back or wall corner type)	Providing and fixing white vitreous china flat back or wall corner type lipped front urinal basin of 430x260x350mm or 340x410x265mm sizes respectively.	each	733.00
17.27		Urinal flat back (half stall )	Providing and fixing white vitreous china flat back half stall urinal of size 580x380x350mm.	each	2243.00
17.28		Squatting plate urinal	Providing and fixing white vitreous china squatting plate urinal with integral rim longitudinal flush pipe.	each	1564.00
17.29		Wash basin white vitreous china excluding the cost of fittings	Providing and fixing white vitreous china wash basin including making all connections but excluding the cost of fittings :		
	17.29.1	630x450mm. Flat back	Flat back wash basin of size 630x450mm.	each	1379.00
	17.29.2	550x400mm Flat back	Flat back wash basin of size 550x400mm.	each	857.00
	17.29.3	600x480mm. Angle back	Angle back wash basin of size 600x480mm.	each	967.00
	17.29.4	400x400mm. Angle back	Angle back wash basin of size 400x400mm.	each	694.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
	17.29.5	450x300mm. Flat back	Flat back wash basin of size 450x300mm.	each	717.00
	17.29.6	660x460mm. Surgeon type	Surgeon type wash basin of size 660x460mm.	each	1519.00
17.30		Kitchen sink glazed fire clay	Providing and fixing kitchen sink including making all connections excluding cost of fittings. White glazed fire clay sink of size 600x450x250mm.	each	1843.00
17.31		Laboratory sink vitreous china	Providing and fixing white vitreous china laboratory sink including making all connections excluding cost of fittings:		
	17.31.1	depth 150 mm.	Size 450x300x150 mm.	each	1236.00
	17.31.2	depth 200 mm.	Size 600x450x200 mm.	each	2025.00
17.32		soil, waste and vent pipes	Providing and fixing soil, waste and vent pipes:		
	17.32.1	CI Pipe (sand cast)	Sand cast iron socket and spigot (S&S) pipe as per IS: 1729		
	17.32.1.1	75 mm dia	75 mm dia with wall thickness of 5 mm	metre	790.00
	17.32.1.2	100 mm dia	100 mm dia with wall thickness of 5 mm	metre	970.00
	17.32.2	CI (Spun cast)	Spun cast iron socket and spigot (S&S) pipe as per IS: 3989		
	17.32.2.1	75 mm dia	75 mm dia with wall thickness of 3.5 mm	metre	840.00
	17.32.2.2	100 mm dia	100 mm dia with wall thickness of 4 mm	metre	1020.00
	17.32.2.3	150 mm dia	150mm dia with wall thickness of 5mm	metre	2460.00
	17.32.3	CI (Hubless)	Hubless Centrifugally cast (spun) iron pipe epoxy coated in side & out side including complete coupling assembly (EPDM rubber gasket stainless steel clamp and external metallic/ protective shield as per IS:15905)		
	17.32.3.1	75 mm dia	75 mm dia with wall thickness of 3.5 mm	metre	773.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
	17.32.3.2	100 mm dia	100 mm dia with wall thickness of 3.5mm	metre	910.00
	17.32.3.3	150 mm dia	150mm dia with wall thickness of 4 mm	metre	2430.00
17.33		pipe joints with cement mortar 1:2	Providing and filling the joints with spun yarn cement slurry and cement mortar 1:2 ( 1 cement : 2 sand) in S.C.I./ C.I. Pipes :		
	17.33.1	75 mm dia	75 mm dia pipe	each	39.00
	17.33.2	100 mm dia	100 mm dia pipe	each	46.00
17.34		M.S. holder	Providing and fixing M.S. holder-bat clamps of approved design to Sand Cast iron/cast iron (spun) pipe embedded in and including cement concrete blocks 10x10x10cm of Cement Concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) including cost of cutting holes and making good the walls etc. :		
	17.34.1	75 mm dia	For 75 mm dia pipe	each	37.00
	17.34.2	100 mm dia	For 100 mm dia pipe	each	66.00
	17.34.3	150 mm dia	For 150 mm dia pipe	each	105.00
17.35		Bend (with lid )	Providing and fixing bend of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete.		
	17.35.1	150 mm dia	150 mm dia		
	17.35.1.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5mm	each	400.00
	17.35.1.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 5 mm	each	430.00
	17.35.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3.5 mm	each	680.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.35.2	100 mm dia	100 mm dia		
	17.35.2.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5mm	each	364.00
	17.35.2.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 4 mm	each	408.00
	17.35.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3 mm	each	450.00
	17.35.3	75mm dia	75 mm dia		
	17.35.3.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5 mm	each	294.00
	17.35.3.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 3.5 mm	each	341.00
	17.35.3.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3 mm	each	370.00
17.36		end (Plain)	Providing and fixing plain bend of required degree.		
	17.36.1	150 mm dia	150 mm dia		
	17.36.1.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5mm	each	702.00
	17.36.1.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 5 mm	each	825.00
	17.36.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3.5 mm	each	600.00
	17.36.2	100 mm dia	100 mm dia		
	17.36.2.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5mm	each	381.00
	17.36.2.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 4 mm	each	390.00
	17.36.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3 mm	each	344.00
	17.36.3	75 mm dia	75 mm dia		
	17.36.3.1	Sand cast	Sand cast iron as per IS – 1729 minimum wall thickness 6.5mm	each	230.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.36.3.2	Spun cast	Spun cast iron as per IS – 3989 minimum wall thickness 3.5 mm	each	259.00
	17.36.3.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness 3 mm	each	242.00
17.37		Heel rest sanitary bend of cast iron	Providing and fixing heel rest sanitary bend		
	17.37.1	100 mm dia	100 mm dia		
	17.37.1.1	Sand cast	Sand cast iron as per IS - 1729	each	329.00
	17.37.1.2	Spun cast	Spun cast iron as per IS - 3989	each	387.00
	17.37.2	75 mm dia	75 mm dia		
	17.37.2.1	Sand cast	Sand cast iron as per IS - 1729	each	288.00
	17.37.2.2	Spun cast	Spun cast iron as per IS - 3989	each	329.00
17.38		Double equal junction with access door	Providing and fixing double equal junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete :		
	17.38.1.1	150 mm dia	150X150X150X150		
	17.38.1.2	Sand cast	Sand cast iron as per IS - 3989	each	1080.00
	17.38.2	100mm dia	100x100x100x100mm		
	17.38.2.1	Sand cast	Sand cast iron as per IS - 1729	each	744.00
	17.38.2.2	Spun cast	Spun cast iron as per IS - 3989	each	820.00
	17.38.3	75mm dia	75x75x75x75mm		
	17.38.3.1	Sand cast	Sand cast iron as per IS - 1729	each	590.00
	17.38.3.2	Spun cast	Spun cast iron as per IS - 3989	each	654.00
17.39		Double equal plain junction	Providing and fixing double equal plain junction of required degree.		
	17.39.1	150 mm dia	150X150X150X150 mm		
	17.39.1.1	Sand cast	Sand cast iron as per IS - 3989	each	1106.00
	17.39.2	100mm dia	100x100x100x100mm		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.39.2.1	Sand cast	Sand cast iron as per IS – 1729	each	666.00
	17.39.2.2	Spun cast	Spun cast iron as per IS – 3989	each	782.00
	17.39.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	600.00
	17.39.3	75mm dia	75x75x75x75 mm		
	17.39.3.1	Sand cast	Sand cast iron as per IS – 1729	each	434.00
	17.39.3.2	Spun cast	Spun cast iron as per IS – 3989	each	573.00
	17.39.3.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	362.00
17.40		Single equal junction with access door	Providing and fixing single equal junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete.		
	17.40.1	150 mm	150X150X150 mm		
	17.40.1.1	Spun cast	Spun cast iron as per IS - 3989	each	1499.00
	17.40.2	100mm	100x100x100 mm		
	17.40.2.1	Sand cast	Sand cast iron as per IS - 1729	each	495.00
	17.40.2.2	Spun cast	Spun cast iron as per IS - 3989	each	640.00
	17.40.3	75mm	75x75x75 mm		
	17.40.3.1	Sand cast	Sand cast iron as per IS - 1729	each	387.00
	17.40.3.2	Spun cast	Spun cast iron as per IS - 3989	each	533.00
17.41		Single equal plain junction	Providing and fixing single equal plain junction of required degree :		
	17.41.1	150 mm	150X150X150 mm		
	17.41.1.1	Spun cast	Spun cast iron as per IS - 3989	each	891.00
	17.41.2	100mm	100x100x100 mm		
	17.41.2.1	Sand cast	Sand cast iron as per IS – 1729	each	504.00
	17.41.2.2	Spun cast	Spun cast iron as per IS – 3989	each	607.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.41.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	450.00
	17.41.3	75mm	75x75x75 mm		
	17.41.3.1	Sand cast	Sand cast iron as per IS – 1729	each	352.00
	17.41.3.2	Spun cast	Spun cast iron as per IS – 3989	each	428.00
	17.41.3.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	290.00
17.42		Double unequal junction with access door (100X75mm dia)	Providing and fixing double unequal junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete :100x100x75x75 mm		
	17.42.1	Sand cast	Sand cast iron as per IS - 1729	each	745.00
	17.42.2	Spun cast	Spun cast iron as per IS - 3989	each	1093.00
17.43		Double unequal plain junction of cast iron (100X75mm dia)	Providing and fixing double unequal plain junction of required degree: 100x100x75x75 mm		
	17.43.1	Sand cast	Sand cast iron as per IS – 1729	each	724.00
	17.43.2	Spun cast	Spun cast iron as per IS – 3989	each	1014.00
	17.43.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	535.00
17.44		Single unequal junction with access door (100X75mm )	Providing and fixing single unequal junction of required degree with access door, insertion rubber washer 3 mm thick, bolts and nuts complete : 100x100x75 mm		
	17.44.1	Sand cast	Sand cast iron as per IS - 1729	each	541.00
	17.44.2	Spun cast	Spun cast iron as per IS - 3989	each	832.00
17.45		Single unequal plain junction (100X75mm )	Providing and fixing single unequal plain junction of required degree : 100x100x75 mm		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.45.1	Sand cast	Sand cast iron as per IS – 1729	each	491.00
	17.45.2	Spun cast	Spun cast iron as per IS – 3989	each	724.00
	17.45.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	490.00
17.46		Double equal plain invert branch	Providing and fixing double equal plain invert branch of required degree:		
	17.46.1	100mm	100x100x100x100 mm		
	17.46.1.1	Sand cast	Sand cast iron as per IS - 1729	each	724.00
	17.46.1.2	Spun cast	Sand cast iron as per IS - 3989	each	700.00
	17.46.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	803.00
	17.46.2	75mm	75x75x75x75 mm		
	17.46.2.1	Sand cast	Sand cast iron as per IS - 1729	each	544.00
	17.46.2.2	Spun cast	Spun cast iron as per IS - 3989	each	573.00
17.47		Single equal plain invert branch	Providing and fixing single equal plain invert branch of required degree:		
	17.47.1	100mm	100x100x100 mm		
	17.47.1.1	Sand cast	Sand cast iron as per IS - 1729	each	549.00
	17.47.1.2	Spun cast	Sand cast iron as per IS - 3989	each	570.00
	17.47.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	512.00
	17.47.2	75mm	75x75x75 mm		
	17.47.2.1	Sand cast	Sand cast iron as per IS - 1729	each	428.00
	17.47.2.2	Spun cast	Sand cast iron as per IS - 3989	each	434.00
	17.47.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	345.00
17.48		Double unequal invert branch (100X75mm)	Providing and fixing double unequal invert branch of required degree : 100x100x75x75 mm		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.48.1	Sand cast	Sand cast iron as per IS - 1729	each	724.00
	17.48.2	Spun cast	Spun cast iron as per IS - 3989	each	927.00
17.49		Unequal plain invert branch	Providing and fixing single unequal plain invert branch of required degree : 100x100x75 mm		
	17.49.1	Sand cast	Sand cast iron as per IS - 1729	each	636.00
	17.49.2	Spun cast	Spun cast iron as per IS - 3989	each	695.00
	17.49.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905 minimum wall thickness	each	575.00
17.50		Off sets (Sand cast)	Providing and fixing sand cast iron S&S off sets as per IS: 1729		
	17.50.1	76 mm off sets	76 mm off sets		
	17.50.1.1	75 mm dia	With 75 mm dia pipe	each	300.00
	17.50.1.2	100 mm dia	With 100 mm dia pipe	each	474.00
	17.50.2	114 mm off sets	114 mm off sets		
	17.50.2.1	75 mm dia	With 75 mm dia pipe	each	410.00
	17.50.2.2	100 mm dia	With 100 mm dia pipe	each	503.00
	17.50.3	152 mm off sets	152 mm off sets		
	17.50.3.1	75 mm dia	With 75 mm dia pipe	each	477.00
	17.50.3.2	100 mm dia	With 100 mm dia pipe	each	605.00
17.51		Off sets Sand cast iron	Providing and fixing sand cast iron S&S off sets as per IS: 3989.		
	17.51.1	75 mm off sets	75 mm off sets		
	17.51.1.1	75 mm dia	With 75 mm dia pipe	each	312.00
	17.51.1.2	100 mm dia	With 100 mm dia pipe	each	370.00
	17.51.1.3	150 mm dia	With 150 mm dia pipe	each	410.00
	17.51.2	150 mm off sets	150 mm off sets		
	17.51.2.1	75 mm dia	With 75 mm dia pipe	each	392.00
	17.51.2.2	100 mm dia	With 100 mm dia pipe	each	508.00
	17.51.2.3	150 mm dia	With 150 mm dia pipe	each	625.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.52		Fixing door piece, C.I. pipe fittings	Providing and fixing door piece, insertion rubber washer 3mm thick, bolts and nuts complete :		
	17.52.1	100mm dia	100 mm		
	17.52.1.1	Sand cast	Sand cast iron as per IS - 1729	each	541.00
	17.52.1.2	Spun cast	Spun cast iron as per IS - 3989	each	547.00
	17.52.2	75 mm dia	75 mm		
	17.52.2.1	Sand cast	Sand cast iron as per IS - 1729	each	387.00
	17.52.2.2	Spun cast	Spun cast iron as per IS - 3989	each	387.00
17.53		Terminal guard	Providing and fixing terminal guard:		
	17.53.1	150mm	150mm		
	17.53.1.1	Sand cast	Sand cast iron as per IS - 1729	each	322.00
	17.53.1.2	Spun cast	Spun cast iron as per IS - 3989	each	380.00
	17.53.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	410.00
	17.53.2	100 mm	100 mm		
	17.53.2.1	Sand cast	Sand cast iron as per IS - 1729	each	259.00
	17.53.2.2	Spun cast	Spun cast iron as per IS - 3989	each	300.00
	17.35.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	320.00
	17.53.3	75 mm	75 mm		
	17.53.3.1	Sand cast	Sand cast iron as per IS - 1729	each	196.00
	17.53.3.2	Spun cast	Spun cast iron as per IS - 3989	each	210.00
	17.53.3.3	Hubless C.I.	Hubless cast(spun) iron as per IS-15905	each	250.00
17.54		Collar	Providing and fixing collar:		
	17.54.1	100 mm	100 mm		
	17.54.1.1	Sand cast	Sand cast iron S & S as per IS - 1729	each	201.00
	17.54.1.2	Spun cast	Sand cast iron S & S as per IS - 3989	each	317.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.54.2	75 mm	75 mm		
	17.54.2.1	Sand cast	Sand cast iron S & S as per IS - 1729	each	149.00
	17.54.2.2	Spun cast	Sand cast iron S & S as per IS- 3989	each	219.00
17.55		Lead caulked joints to C.I. pipes & fittings	Providing lead caulked joints to sand cast iron/ centrifugally cast (spun) iron pipes and fittings of diameter:		
	17.55.1	150mm	150mm	each	488.00
	17.55.2	100 mm	100 mm	each	234.00
	17.55.3	75 mm	75 mm	each	201.00
17.56		M.S. stays and clamps for C.I. pipes	Providing and fixing M.S. stays and clamps for sand cast iron/ centrifugally cast (spun) iron pipes of diameter :		
	17.56.1	100 mm dia	100 mm dia	each	62.00
	17.56.2	75 mm dia	75 mm dia	each	50.00
17.57		Trap of self cleansing design	Providing and fixing trap 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 :		
	17.57.1	100X100mm	100 mm inlet and 100 mm outlet		
	17.57.1.1	Spun cast	Spun cast iron S & S as per IS: 3989.	each	825.00
	17.57.1.2	Sand cast	Sand Cast iron S & S as per IS: 1729.	each	610.00
	17.57.1.3	Hubless C.I.	Hubless cast(spun) iron as per IS- 15905	each	310.00
	17.57.2	100X75mm	100 mm inlet and 75 mm outlet		
	17.57.2.1	Sand cast	Sand cast iron S & S as per IS - 3989	each	854.00
	17.57.2.2	Spun cast	Spun Cast iron S & S as per IS- 1729.	each	540.00
	17.57.2.3	Hubless C.I.	Hubless cast(spun) iron as per IS- 15905	each	260.00
17.58		Unplasticised rigid PVC soil and waste pipes	Providing and fixing unplasticised Rigid PVC soil and waste pipes conforming to IS: 13592 Type B including jointing with seal ring conforming to IS : 5382 leaving 10		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			mm gap for thermal expansion. Single socketed pipes for working pressure of 4 kg/sqcm. (minimum wall thickness 3.2mm)		
	17.58.1	75mm dia	75 mm diameter		136.00
	17.58.2	110mm dia	110 mm diameter		238.00
17.59		Unplasticised PVC pipe fittings	Providing and fixing unplasticised PVC moulded fittings/ accessories for unplasticised Rigid PVC soil and waste pipes conforming to IS: 13592 Type A including jointing with seal ring conforming to IS : 5382 leaving 10 mm gap for thermal expansion.		
	17.59.1	Coupler	Coupler		
	17.59.1.1	75 mm	75 mm	each	117.00
	17.59.1.2	110 mm	110 mm	each	154.00
	17.59.2	Pushfit Coupler	Single pushfit Coupler		
	17.59.2.1	75 mm	75 mm	each	140.00
	17.59.2.2	110 mm	110 mm	each	195.00
	17.59.3	T with door	Single tee with door		
	17.59.3.1	75 mm	75x75x75 mm	each	219.00
	17.59.3.2	110 mm	110x110x110 mm	each	346.00
	17.59.4	T without door	Single tee without door		
	17.59.4.1	75 mm	75x75x75 mm	each	201.00
	17.59.4.2	110 mm	110x110x110 mm	each	266.00
	17.59.5	Bend	Bend 87.50		
	17.59.5.1	75 mm	75 mm bend	each	117.00
	17.59.5.2	110 mm	110 mm bend	each	172.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.60		Unplasticised - PVC pipe clips	Providing and fixing Unplasticised - PVC pipe clips of approved design to Unplasticised - PVC soil and waste pipes by means of bombay nail of required length including and making good the wall etc. complete.		
	17.60.1	75 mm	75 mm	each	33.00
	17.60.2	110 mm	110 mm	each	50.00
17.61		UPVC trap of self cleaning design	Providing and fixing UPVC trap of self cleaning design complete. Including cost of cutting and making good the wall and floors. 100 mm inlet and 75 mm outlet	each	517.00
17.62		M.S. holder bat clamp to C.I. Pipes	Providing and fixing M.S. holder bat clamp of approved design to sand cast iron/ cast iron (spun) pipes comprising of M.S. flat brackets made of 50x5mm flat of specified shape, projecting 75mm outside the wall surface and fixed on wall with 4nos, 6mm dia expansion hold fasteners including drilling necessary holes in brick wall/ CC/ RCC surface and the cost of bolts etc. The pipes shall be fixed to the already fixed brackets with the help of 30mm x1.6mm galvanised M.S. flats of specified shape and of total length 420mm and shall be fixed with M.S. nuts, bolts, and washers of size 25x6mm, one bolts on each side of the pipe.		
	17.62.1	580 mm	Total bracket length 580mm of approved shape and design (for single, 100mm dia pipe).	each	180.00
	17.62.2	810mm	Total bracket length 810mm of approved shape and design (for two, 100mm dia pipes).	each	224.00
	17.62.3	1040mm	Total bracket length 1040mm of approved shape and design (for three, 100mm dia pipes).	each	265.00
17.63		Chases in brick masonry walls	Cutting chases in brick masonry walls (clay brick/flyash brick/AAC blocks) for following diameter sand cast iron/		

Item	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			centrifugally cast (spun) iron pipes and making good the same with cement concrete 1:3:6 (1 cement : 3 sand :6 graded stone aggregate 12.5 mm nominal size) including necessary plaster and pointing in cement mortar 1:4 (1 cement : 4 sand) :		
	17.63.1	100 mm	100 mm dia	meter	222.00
	17.63.2	75 mm	75 mm dia	meter	159.00
	17.63.3	50 mm	50 mm dia	meter	101.00
17.64		P.V.C. waste pipe for sink or wash basin	Providing and fixing P.V.C. waste pipe for sink or wash basin including P.V.C. waste fittings complete.		
	17.64.1	Rigid	Semi rigid pipe		
	17.64.1.1	32 mm	32 mm dia	each	87.00
	17.64.1.2	40 mm	40 mm dia	each	98.00
	17.64.2	Flexible	Flexible pipe (only in residential & complexes)		
	17.64.2.1	32 mm	32 mm dia	each	87.00
	17.64.2.2	40mm	40 mm dia	each	98.00
17.65		Sand cast Iron grating for gully trap.	Providing and fixing 100 mm sand cast Iron grating for gully trap.	each	43.00
17.66		Mosquito proof coupling	Providing and fixing in position 25mm diameter mosquito proof coupling of approved municipal design.	each	44.00
17.67		Mirror (open edges)	Providing and fixing bevelled edge mirror of superior glass (of approved quality) complete with 6 mm thick hard board ground fixed to wooden cleats with C.P. brass screws and washers complete.	sq. metre	2440.00
17.68		Mirror (Plastic Frame)	Providing and fixing mirror of superior glass (of approved quality) and of required shape and size with plastic moulded frame of approved make and shape with 6 mm thick hard board backing.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.68.1	450mm dia	Circular shape 450mm dia.	each	806.00
	17.68.2	453x357mm	Rectangular shape 453x357mm	each	642.00
	17.68.3	Oval 450x350mm	Oval shape 450x350mm (outer dimensions)	each	697.00
	17.68.4	1500x450 mm	Rectangular shape 1500x450 mm	each	1311.00
17.69		Glass shelf	Providing and fixing glass shelf with edges round of supported on anodised aluminium angle frame with C.P.brass brackets and guard rail completefixed with 40 mm long screws, rawl plugs etc., complete.	sqm	474.00
17.70		Toilet paper holder	Providing and fixing toilet paper holder:		
	17.70.1	C.P. brass	C.P. brass	each	340.00
	17.70.2	Vitreous china	Vitreous china	each	324.00
17.71		Waste coupling CP brass	Providing and fixing CP brass waste coupling of approved quality and make for sink and wash basin.		
	17.71.1	31mm dia	Waste coupling 31mm of 79mm length and 62mm breadth	each	330.00
	17.71.2	38 mm dia	Waste coupling 38mm of 83mm length and 77mm breadth	each	348.00
17.72		Bottle trap CP brass	Providing and fixing CP brass bottle trap of approved quality and make for sink and wash basin.	each	853.00
17.73		Towel rail CP brass	Providing and fixing CP brass towel rail of approved quality and make		
	17.73.1	600mm	600x20mm	each	952.00
	17.73.2	450mm	450x20mm	each	836.00
17.74		Towel ring CP brass	Providing and fixing CP brass towel ring of approved quality and make 200mm dia ring	each	679.00
17.75		Soap dish CP brass	Providing and fixing CP brass soap dish of approved quality and make	each	422.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.76		Urinal spreader CP brass	Providing and fixing CP brass Urinal spreader of approved quality and make	each	304.00
17.77		Soap container C.P. brass	Providing and fixing C.P. brass soap container 109 mm wide, 125 high and 112 mm distance from wall of standard shape with bracket of the same material with all fittings etc. of approved quality and conforming to IS: specification.	each	1175.00
17.78		Grating C.P. brass	Providing and fixing C.P. brass grating of approved quality and make conforming to IS: specification.		
	17.78.1	100 mm dia	100 mm dia.	each	74.00
17.79		Waste Coupling PTMT	Providing and fixing PTMT Waste Coupling for wash basin and sink, of approved quality and colour.		
	17.79.1	31mm dia	Waste coupling 31mm dia of 79mm length and 62mm breadth weighing not less than 45gms.	each	113.00
	17.79.2	38mm dia	Waste coupling 38mm dia of 83mm length and 77mm breadth, weighing not less than 60gms.	each	131.00
17.80		Bottle Trap PTMT	Providing and fixing PTMT Bottle Trap for Wash basin and sink.		
	17.80.1	31mm dia	Bottle trap 31mm single piece moulded with height of 270mm, effective length of tail pipe 260mm from the centre of the waste coupling 77mm breadth with 25mm minimum water seal, weighing not less than 260gms.	each	499.00
	17.80.2	38mm dia	Bottle trap 38mm single piece moulded with height of 270mm, effective length of tail pipe 260mm from the centre of the waste coupling 77mm breadth with 25mm minimum water seal, weighing not less than 263gms.	each	522.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.81		Liquid soap container PTMT	Providing and fixing PTMT liquid soap container 109mm wide, 125mm high and 112mm distance from wall of standard shape with bracket of the same materials with snap fittings of approved quality and colour. Weighing not less than 105 gms.	each	217.00
17.82		Towel ring PTMT	Providing and fixing PTMT towel ring trapezoidal shape 215mm long,200mm wide with a minimum distances of 37mm from wall face with concealed fittings arrangement of approved quality and colour. Weighing not less than 88 gms.	each	203.00
17.83		Towel rail PTMT	Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fitting arrangement of approved quality and colour.		
	17.83.1	450mm	450mm long towel rail with total length of 495mm, 78mm wide and effective height of 88mm, weighing not less than 170gms.	each	412.00
	17.83.2	600mm	600mm long towel rail with total length of 645mm, width 78mm and effective height of 88mm, weighing not less than 190gms.	each	459.00
17.84		Shelf PTMT	Providing and fixing PTMT shelf 440 mm long, 124 mm width and 36 mm height of approved quality and colour. Weighing not less than 300 gms.	each	511.00
17.85		Urinal spreader PTMT	Providing and fixing PTMT 15 mm Urinal spreader size 95x69x100 mm with 1/2" BSP thread and shapes. Weighing not less than 60 gms.	each	176.00
17.86		Urinal cock PTMT	Providing and fixing PTMT urinal cock of approved quality and colour. 15 mm nominal bore, 80mm long. 42 mm high and 30mm wide with BSP female threads weighing not less than 48 gms.	each	144.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
17.87		Soap Dish Holder PTMT	Providing and fixing PTMT soap Dish Holder having length of 138mm, breadth 102mm, height of 75mm with concealed fitting arrangements. Weighing not less than 106 gms.	each	119.00
17.88		Painting C.I. cistern with bitumastic	Painting C.I. cistern with bitumastic or any other anti-corrosive paint inside and white paint over a coat of zinc chromate yellow primer (of approved quality) on the outside surface of the cistern, flush pipe, other fittings, etc. complete for new work.	each	327.00
17.89		Re-painting C.I. cistern with bitumastic	Re-painting C.I. cistern with bitumastic or any other anti-corrosive paint inside and white paint on the outside surface of the cistern, flush pipe, other fittings, etc. complete including polishing of wooden seat and lid and cleaning of W.C. pan with acid wherever necessary.	each	235.00
17.90		Repainting C.I. cistern with synthetic enamel paint	Repainting C.I. cistern with synthetic enamel paint of approved colour brand and manufacture on the outside surface of cistern flush pipe, other fittings etc. complete.	each	98.00
17.91		Painting C.I. waste vent pipes and fittings with synthetic enamel paint	Painting sand cast iron/ centrifugally cast (spun) iron soil, waste vent pipes and fittings with two coats of synthetic enamel paint of any colour such as chocolate grey, or buff etc. over a coat of primer (of approved quality) for new work :		
	17.91.1	75 mm dia	75 mm diameter pipe	meter	22.00
	17.91.2	100 mm dia	100 mm diameter pipe	meter	29.00
	17.91.3	150mm dia	150 mm diameter pipe	meter	36.00
17.92		Re-painting C.I. waste, vent pipes and fittings	Repainting sand cast iron/ centrifugally cast iron (spun) iron, soil, waste, vent pipes and fittings with one coat of synthetic enamel paint of any colour such as chocolate, grey or buff etc :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.92.1	75mm dia	75 mm diameter pipe	meter	11.00
	17.92.2	100mm dia	100 mm diameter pipe	meter	14.00
	17.92.3	150mm dia	150 mm diameter pipe	meter	302.00
17.93		Repainting bath tub	Repainting bath tub of size 1700x730x430mm with enamel paint.	each	302.00
17.94		Ceramic glazed half round pipe drain	Providing and laying Ceramic glazed half round pipe drain (having thickness 9 to 10mm) of approved make in colours such as White, Ivory, Grey, or any other colour, laid on 20 mm thick Cement Mortar 1:4 (1 Cement : 4 sand) including pointing the joints with white cement and matching pigment etc., complete.		
	17.94.1	100mm dia	100 mm dia half round pipe	metre	195.00
	17.94.2	150mm dia	150 mm dia half round pipe	metre	260.00
	17.94.3	200mm dia	200mm dia half round pipe	metre	378.00
17.95		Coupler for PVC pipes & fittings (40mm diameter)	Providing and fixing coupler for PVC pipes & fittings waste/rain water/drainage disposal of superior Indian make (as approved by Engineer incharge) i/c jointing with rubber rings, adhesive, lubricant, solvent cement PVC clips or burried underground i/c making necessary chases and holes in walls, floors or trenching complete with making good or i/c excavation and refilling as per site requirement with testing etc. complete. FOR WASH BASIN CONNECTION (40mm diameter)	each	25.00
17.96		Wash basin pipe (40 mm diameter)	Providing and fixing PVC pipes & fittings waste/rain water/drainage disposal of superior Indian make (as approved by Engineer incharge) i/c jointing with rubber rings, adhesive, lubricant, solvent cement PVC clips or burried underground i/c making necessary chases and holes in walls, floors or trenching complete with making good or i/c excavation and refilling as per site requirement with testing etc. complete. FOR WASH BASIN CONNECTION (40mm diameter)	each	62.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
17.97		90 degree bend (40mm diameter)	Providing and fixing 90 degree bend PVC pipes & fittings waste/rain water/drainage disposal of superior Indian make (as approved by Engineer incharge) i/c jointing with rubber rings, adhesive, lubricant,solvent cement PVC clips or burried underground i/c making necessary chases and holes in walls, floors or trenching complete with making good or i/c excavation and refilling as per site requirement with testing etc.complete. FOR WASH BASIN CONNECTION (40mm diameter)	each	22.00
17.98		45 degree bend (40mm diameter)	Providing and fixing 45 degree bend PVC pipes & fittings waste/rain water/drainage disposal of superior Indian make (as approved by Engineer incharge) i/c jointing with rubber rings, adhesive, lubricant,solvent cement PVC clips or burried underground i/c making necessary chases and holes in walls, floors or trenching complete with making good or i/c excavation and refilling as per site requirement with testing etc.complete. FOR WASH BASIN CONNECTION (40mm diameter)	each	30.00
17.99		Incinerator for girls-toilet	Construction of manually operated fire based incinerator for girls-toileti/c (i) Fire and ash collection chamber 0.60x0.60 m, made of calcium silicate bricks, having 12mm dia steel bars grating @10 cm c/c, i/c MS mesh weldedon top including 300 mm x 450 mm MS openable door of half grill and half MS plate (3mm thick ). (ii) 0.80 m X 0.80 m incinerator chamber made of calcium silicate bricks with R.C.C.top having opening of size 0.40m X 0.40 m, for stacking of sanitary napkins. (iii) 0.40 m X 0.40 m duct made of 1.6 mm thick MS sheet for dropping napkins from the toilet opening. (iv) 150mm dia Class 'C' heavy duty MS pipe conforming to IS3589/1239 for gas emission with		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			cowel, up to 2.10 meter height above terrace level. (v) Opening in wall having MS flap (1.6mm thick) of size 0.25X 0.25 m, finished with granite. etc complete as per standard drawing no. 5313-B-NB4-9919-R1 dated 21.02.2017		
	17.99.1	G.F only	For ground floor buildings.	nos	24946.00
	17.99.2	G.F. & Ist floor	For Ground floor & Ist floor buildings.	nos	32115.00
	17.99.3	Additional floor	Add extra for every additional floor above Ist floor.	nos	8552.00
17.100		Bio Digester	Providing and Installing bio digester unit based on DRDO technology made of fiber reinforced plastic having composition and the technical specifications such as: Parentage of fiber glass (glass content in fiber glass should be minimum 30%) :- 33.33% Water absorption (as per ASTM) :- 0.30% Flammability :- as per ASTM Tensile strength :-115 MPA Specific gravity at 25 degree centigrade :-1.45 IZOD impact strength :- 65 KJ/M2 Heat defection/distort temperature :- 65 deg C Corrosion resistance (non corrosive) fitted with Inlet pipe size rigid PVC :-100mm Outlet pipe size rigid PVC :-80mm Gas outlet rigid PVC with valve :- 20mm Bacteria immobilization PVC matrix (on all partition) and capacity :-		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17. 100.1	UPTO 10 USER	UPTO 10 USER SIZE (1.0m X 1.0m X 0.70m) Capacity of bio-digester :- 700 liters Area of top, bottom and side walls 4.80 sq.m Area of partition walls : 1.40 sq.m Total weight of FRP: 33.48 kg Bacteria inoculums quantity:- 200 liters Minimum thickness of side walls/top and bottom:- 3mm Number of inside partitions :- 2 Minimum thickness of partition wall :- 3mm	each	40565.00
	17. 100.2	UPTO 15 USER	UPTO 15 USER SIZE (1.0m X 1.0m X 0.10m) Capacity of bio-digester :- 1000 liters Area of top, bottom and side walls 6.00 sq.m. Area of partition walls : 2.00 sq.m Total weight of FRP: 54.00 kg Bacteria inoculums quantity:- 400 liters Minimum thickness of side walls/top and bottom :- 4mm Number of inside partitions :- 2 Minimum thickness of partition wall :- 3mm	each	68345.00
	17. 100.3	UPTO 25 USER	UPTO 25 USER SIZE (1.5m X 1.0m X 1.0m) Capacity of bio-digester :- 1500 liters Area of top, bottom and side walls 8.00 sq.m. Area of partition walls : 2.00 sq.m Total weight of FRP: 82.80 kg Bacteria inoculums quantity :- 400 liters Minimum thickness of side walls/top and bottom :-5mm Number of inside partitions:- 2 Minimum thickness of partition wall:- 3mm	each	93175.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17. 100.4	UPTO 40 USER	UPTO 40 USER SIZE (2.0m X 1.0m X 1.0m) Capacity of bio-digester :- 2000 liters Area of top, bottom and side walls 10.00 sq.m. Area of partition walls : 3.00 sq.m Total weight of FRP: 106.20 kg Bacteria inoculums quantity :- 600 liters Minimum thickness of side walls/top and bottom :- 5mm Number of inside partitions:- 3 Minimum thickness of partition wall :- 3mm	each	123978.00
	17. 100.5	UPTO 60 USER	UPTO 60 USER SIZE (2.4m X 1.25m X 1.0m) Capacity of bio-digester :- 3000 liters Area of top, bottom and side walls 13.30 sq.m. Area of partition walls : 3.75 sq.m Total weight of FRP: 139.95 kg Bacteria inoculums quantity :- 800litres Minimum thickness of side walls/top and bottom :- 5mm Number of inside partitions :- 3 Minimum thickness of partition wall :- 3mm	each	163261.00
	17. 100.6	UPTO 80 USER	UPTO 80 USER SIZE (2.7m X 1.5m X 1.0m) Capacity of bio-digester :- 4000 liters Area of top, bottom and side walls 16.50sq.m Area of partition walls : 4.50 sq.m Total weight of FRP: 202.50 kg Bacteria inoculums quantity :- 1200litres Minimum thickness of side walls/top and bottom :- 6mm Number of inside partitions :-4 Minimum thickness of partition wall:- 3mm	each	236232.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17. 100.7	UPTO 100 USER	UPTO 100 USER SIZE (2.5m X 2.0m X 1.0m) Capacity of bio-digester :- 5000 liters Area of top, bottom and side walls:- 19.00 sq.m. Area of partition walls :- 8.00 sq.m Total weight of FRP:- 248.40 kg Bacteria inoculums quantity :- 1400 liters Minimum thickness of side walls/top and bottom :- 6mm Number of inside partitions :- 4 Minimum thickness of partition wall:- 3mm	each	290862.00
	17. 100.8	UPTO 150 USER	UPTO 150 USER SIZE (3.2m X 2.0m X 1.25m) Capacity of bio-digester :- 8000 liters Area of top, bottom and side walls:- 25.80 sq.m. Area of partition walls :- 10.00 sq.m Total weight of FRP:- 397.08 kg Bacteria inoculums quantity :- 2400 liters Minimum thickness of side walls/top and bottom :- 7mm Number of inside partitions:- 4 Minimum thickness of partition wall:- 4mm	each	466876.00
	17. 100.9	UPTO 200 USER	UPTO 200 USER SIZE (4.0m X 2.0m X 1.25 m) Capacity of bio-digester :- 10,000 liters Area of top, bottom and side walls:- 31.00 sq.m. Area of partition walls :- 10.00 sq.m Total weight of FRP:- 462.60 kg Bacteria inoculums quantity :- 3000 liters Minimum thickness of side walls/top and bottom :- 7mm Number of inside partitions:- 4 Minimum thickness of partition wall :-4mm	each	549936.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	17.100.10	UPTO 300 USER	UPTO 300 USER SIZE (4.8m X 2.0m X 1.25 m) Capacity of bio-digester :- 12000 liters Area of top, bottom and side walls:- 36.20 sq.m. Area of partition walls : - 10.00 sq.m Total weight of FRP: - 593.28 kg Bacteria inoculums quantity :- 3600 liters Minimum thickness of side walls/top and bottom:- 8mm Number of inside partitions:-4 Minimum thickness of partition wall:- 4mm	each	689174.00
	17.100.11	UPTO 400 USER	UPTO 400 USER SIZE (5.0m X 2.0m X 1.5m) Capacity of bio-digester :- 15000 liters Area of top, bottom and side walls:- 41.00sq.m. Area of partition walls:- 12.00 sq. m Total weight of FRP :- 676.80 kg Bacteria inoculums quantity :- 4400 liters Minimum thickness of side walls/top and bottom:- 8mm Number of inside partitions:- 4 Minimum thickness of partition wall:- 4mm	each	800153.00
	17.100.12	UPTO 500 USER	UPTO 500 USER SIZE (6.0m X 2.0m X 1.67m) Capacity of bio-digester :- 20,000 liters Area of top, bottom and side walls:- 50.72 sq.m. Area of partition walls:- 13.36 sq.m. Total weight of FRP :- 917.86 kg Bacteria inoculums quantity:- 6000 liter Minimum thickness of side walls/top and bottom :- 9mm Number of inside partitions :- 4 Minimum thickness of partition wall:- 4mm	each	1081250.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
17.101		High-performance sound-insulating waste-water piping system	Providing & Fixing Complete item of high-performance sound-insulating waste-water piping system (low Noise Drainage System) pipe having following properties 1. Density of pipe material is 1.9 g/cm <sup>3</sup> 2. Tensile strength of 20n/mm <sup>2</sup> 3. 3 layer of polypropylene with modulus of elasticity 1500 n/mm <sup>2</sup> 4. Single (1) layer of polypropylene with modulus of elasticity 3800 n/mm <sup>2</sup> , 5. Pipe handle the waste liquid with ph value 2 to 12. 6. Hot water resistant - short term 95°c / 203°f and long term 90°c / 194°f. 7. Co-efficient of linear expansion .09 mm/mk.		
	17.101.1	Saddle With Rubber	Heavy Duty Saddle With Rubber		
	17.101.1.1	160mm	160mm	each	138.00
	17.101.1.2	110mm	110mm	each	87.00
	17.101.2	Bend	Bend		
	17.101.2.1	160mm	160mm	each	730.00
	17.101.2.2	110mm	110mm	each	440.00
	17.101.2.3	40 mm	40 mm	each	81.00
	17.101.3	Pipe	Pipe		
	17.101.3.1	160mm	160mm	metre	1270.00
	17.101.3.2	110mm	110mm	metre	802.00
	17.101.3.3	75 mm	75 mm	each	429.00
	17.101.3.4	40 mm	40 mm	each	275.00
	17.101.4	160mm door bend	160 mm door bend	each	1369.00
	17.101.5	110 mm Door Tee	110 mm Door Tee	each	846.00
	17.101.6	Y 110 mm	Y 110 mm	each	672.00
	17.101.7	Double Y 110mm	Double Y 110 mm	each	637.00
	17.101.8	Coupler 75 mm	Coupler 75 mm	each	247.00
	17.101.9	40 mm Tee	40 mm Tee	each	215.00

**CHAPTER – 18.0**  
**WATER SUPPLY**



## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	2	3
1	IS 554	Pipe threads where pressure tight joints are required on the threads- Dimensions, tolerances and designation.
2	IS 778	Specification for copper alloy gate, and check valves for water works purposes
3	IS 779	Water meters (domestic type) -Specification
4	IS 780	Specification for sluice valves for water works purposes (50 to 300 mm)
5	IS 781	Specification for cast copper alloy screw down bib taps and stop valves for water services
6	IS 782	Specification for caulking lead
7	IS 909	Underground fire hydrant, sluice valve type-Specification
8	IS 1239 (Part-1)	Steel tubes tubular and other wrought steel fittings, Part 1- Steel tubes- Specification
9	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
10	IS 1536	Centrifugally cast (spun) iron pressure pipes for water gas and sewage- Specification
11	IS 1537	Specification for vertically cast iron pressure pipes for water, gas and sewage
12	IS 1538	Cast iron fittings for pressure pipes for water, gas and sewage - Specification
13	IS 1703	Water fittings - copper alloy float valves (horizontal plunger type) Specification
14	IS 2692	Ferrules for water services- Specification
15	IS 3950	Specification for surface boxes for sluice valves
16	IS 4736	Specification for Hot-dip Zinc Coatings on mild steel tubes
17	IS 5312 (Part-1)	Swing type reflex (non return) valves for water works purposes. Part 1-Single door pattern
18	IS 5312 (Part-2)	Swing type reflex (non return) valves for water works purposes. Part 2- Multi door pattern
19	IS 5382	Rubber sealing rings for gas mains, water mains and sewers
20	IS 9762	Specification for polyethylene floats (spherical) for float valves
21	IS 9763	Plastic Bib taps and stop valves (rising spindle) for cold water services-specifications
22	IS 15450	PE-AL-PE Pipes for hot and cold water supplies-Specifications
23	IS 15778	Chlorinated Polyvinyl Chloride (CPVC) pipes for potable hot and cold water distribution supplies-specifications.
24	IS 15801	Polypropylene- Random Copolymer Pipes for hot and cold water supplies-Specifications

**PREAMBLE**  
**WATER SUPPLY**  
**(CHAPTER: 18.0)**

**18.1 GENERAL REQUIREMENTS**

- 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 installations shall be restored to its original condition by the contractor. Nothing extra shall be paid for it, except where otherwise specified.
- All water supply installation work shall be carried out through licensed plumbers.
- It is most important to ensure that wholesome water supply provided for drinking and culinary purposes, is in no way liable to contamination from any less satisfactory water. There shall, therefore, be no cross connection whatsoever between a pipe or fitting for conveying or containing wholesome water and a pipe or fitting for conveying or containing impure water or water liable to contamination or of uncertain quality of water which has been used for any purpose. The provision of reflux or non-return valves or closed and sealed valves shall not be construed a permissible substitute for complete absence of cross- connection.
- Where a supply of wholesome water is required as an alternative or standby to supply of less satisfactory water or is required to be mixed with the latter, it shall be delivered only into a cistern, and by a pipe or fitting discharging into the air gap at a height above the top edge of the cistern equal to twice its nominal bore, and in no case less than 15 cm.
- No piping shall be laid or fixed so as to pass into, through or adjoining any sewer, scour outlet or drain or any manhole connected therewith nor through any ash pit or manure-pit or any material of such nature that can cause undue deterioration of the pipe.
- Where the laying of any pipe through fouled soil or previous material is unavoidable, the piping shall be properly protected from contact with such soil or material by being carried through an exterior cast iron tube or by some other suitable means. Any piping or fitting laid or fixed which does not comply with the above requirements, shall be removed and re- laid in conformity with the above requirements.
- The design of the pipe work shall be such that there is no possibility of backflow towards the source of supply from any cistern or appliance whether by siphonage or otherwise, and reflux or nonreturn valves shall not be relied upon to prevent such back flow.
- All pipe work shall be so designed, laid or fixed, and maintained so that it remains completely watertight, thereby avoiding wastage of water, damage to property and the risk of contamination of the water conveyed.
- In designing and planning the layout of the pipe work, due attention shall be given to the maximum rate of discharge, required economy in labour and materials, protection against damage and corrosion, protection from frost, if required, and to avoidance of airlocks, noise transmission and unsightly arrangement.
- To reduce frictional losses, piping shall be as smooth as possible inside. Methods of jointing shall be such as to avoid internal roughness and projection at the joints, whether of the jointing materials or otherwise.

- Change in diameter and in direction shall preferably be gradual rather than abrupt to avoid undue loss of head. No bend or curve in piping shall be made so as to materially reduce or alter the cross-section.
- Underground piping shall be laid at such a depth that it is unlikely to be damaged by frost or traffic loads and vibrations. It shall not be laid in ground liable to subsidence, but where such ground cannot be avoided; special precautions shall be taken to avoid damage to the piping. Where piping has to be laid across recently disturbed ground, the ground shall be thoroughly consolidated so as to provide a continuous and even support.
- Where the service pipe is of diameter less than 50 mm the stop valves shall be of the screwdown type and shall have loose washer plates to act as non-return valves. Other stop valves in the service line may be of the gate type.
- In flats and tenements supplied by a common service pipe a stop valve shall be fixed to control the each branch separately. In large buildings a sufficient number of stop valves shall be fixed on branch pipes, and to control groups of ball valves and draw off taps, so as to minimize interruption of the supply during repairs, all such stop valves shall be fixed in accessible positions and properly protected from being tampered with, they may be of the gate type to minimize loss of head by friction.
- Water for drinking or for culinary purposes as far as possible shall be on branch pipes connected directly to the service pipe.
- Pumps shall not be allowed on the service pipe as they cause a drop of pressure on the suction side thereby affecting the supply to the adjoining properties. In cases where pumping is required, a properly protected storage tank of adequate capacity shall be provided to feed the pump.
- Service pipes shall be so designed and constructed as to avoid air-locks, so that all piping and fittings above ground can be completely emptied of water to facilitate repairs. There shall be draining taps or draw-off taps (not underground) at the lowest points, from which the piping shall rise continuously to draw-off taps, ball valves, cisterns, or vents (where provided at the high points).
- Service pipes shall be designed so as to reduce the production and transmission of noise as much as possible. Appliances which create noise shall be installed as far distant as possible from the living rooms of the house. High velocity of water in piping and fittings shall be avoided. Piping shall be confined, as far as possible, to rooms where appliances are fixed, it shall have easy bends, and where quietness is particularly desired, holder bats or clamps shall be insulated from the piping by suitable pads.
- The rising pipe to the storage cistern, if any, or to any feed cistern shall be taken as directly as possible to the cistern and shall be fixed away from windows or ventilators.
- All pipe work shall be planned so that the piping is accessible for inspection, replacement and repair. To avoid its being unsightly, it is usually possible to arrange it in or adjacent to cupboards, recesses, etc. provided there is sufficient space to work on the piping with the usual tools. Piping shall not be buried in walls or solid floors. Where unavoidable, piping may be buried for short distances provided that adequate protection is given against damage and that no joints are buried. If piping is laid in ducts or chases, these shall be roomy enough to facilitate repairs and shall be so constructed as to prevent the entry of vermin. To facilitate removal of pipe casing, floor boards covering piping shall be fixed with screws or bolts.

- When it is necessary for a pipe to pass through a wall or floor, a sleeve shall be fixed therein for insertion of the pipe and to allow freedom for expansion, contraction and other movement. Piping laid in wood floors shall, where possible, be parallel with the joists.
- Where storage tanks are provided to meet overall requirements of water connection of service pipe with any distributing pipe shall not be permitted except one direct connection for culinary or drinking requirements.
- No service pipe shall be connected to any water closet or urinal. All such supplies shall be from flushing cisterns which shall have supply from storage tank.
- No service or supply pipe shall be connected directly to any hot-water system or to any apparatus used for heating other than through a feed cistern thereof.

## 18.2 Pipes and Specials

- (i) Pipes and specials may be of any of the following types as specified:
- (ii) Galvanised steel – IS 1239 and IS 4736
- (iii) PE-AL-PE Pipes – IS 15450
- (iv) PP-R Pipes – IS 15801
- (v) CPVC pipes – IS 15778

In choosing the material for piping and fittings, account shall be taken of the character of the water to be conveyed through it, the nature of the ground in which the pipes are to be laid and the relative economics. The lengths shall be measured in running metre correct to a cm for the finished work, which shall include pipe and fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts, but exclude brass or gun metal taps (cocks), valves, unions, lead connection pipes and shower roses. Unions shall be paid for separately in external work as well as in internal work. For pipes 15 mm diameter, the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However, for bigger dimension pipes the holes shall be carefully made of the smallest size as directed by the Engineer-in-Charge. After fixing the pipes the holes shall be made good with cement mortar 1:3 (1 cement: 3 sand) and properly finished to match the adjacent surface.

## 18.3 Concealed Piping:

Pipes can be concealed in chases. The pipes and fittings 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.

## 18.4 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.

## 18.5 Rate

**External Work:** The rate shall include the cost of labour and materials involved in all the operations described above. The rate shall not include excavation in trenches, painting of pipes and sand filling all around the pipe unless otherwise specified for G.I pipe line however for other categories of pipes rates are inclusive of excavation in trenches and backfilling of same.

## **18.6 Internal Work**

The rate shall also include the cost of labour and material involved in all the operations described above. The rate shall include the cost of cutting holes in walls and floors and making good the same. This shall not however, include concealed pipe work in which case cutting of chase and making good shall be paid separately. It shall not include painting of pipes and providing sleeves, unless specified otherwise. It will also not include union which shall be paid for separately. However for other categories of pipes rates are inclusive of cost for cutting of chase and making good the same...

## **CUTTING CHASES IN MASONRY WALLS**

### **18.7 Making Chases**

Chases are made in the walls for housing G.I. Pipes etc.

### **18.8 Cutting of Chases in One Brick Thick and Above Load Bearing Walls:**

- (i) As far as possible services should be planned with the help of vertical chases. Horizontal chases should be avoided.
- (i) The depths of vertical chases and horizontal chases shall not exceed one third and one sixth of the thickness of the masonry respectively.
- (ii) When narrow stretches of masonry (or short lengths of walls) such as between doors and windows, cannot be avoided, they should not be pierced with openings for soil pipes or waste pipes or timber joints, etc. Where there is a possibility of load concentration, such narrow lengths of walls shall be checked for stresses and high strength bricks mortar or concrete walls provided, if required.
- (iii) Horizontal chases when unavoidable should be located in the upper or lower one third of height of storey and not more than three chases should be permitted in any stretch of a wall. No continuous horizontal chase shall exceed one metre in length. Where unavoidable, stresses in the affected area should be checked and kept within the permissible limits.
- (iv) Vertical chases should not be closer than 2 m in any stretch of a wall. These shall be kept away from bearings of beams and lintels. If unavoidable, stresses in the affected area should be checked and kept within permissible limits.
- (v) Masonry directly above a recess, if under than 30 cm (Horizontal dimension) should be supported on lintel. Holes in masonry may be provided up to 30 cm width x 30 cm height without any lintel. In the case of circular holes in masonry, no lintel should be provided up to 40 cm in diameter.

### **18.9 Cutting of chases in half brick load bearing walls**

No chase shall be permitted in a half brick load bearing wall and as such no recessed conduits and concealed pipes shall be provided in half brick thick load bearing walls.

### **18.10 Cutting of chases in half brick non-loading bearing walls**

In case of non load bearing half brick walls services should be planned with the help of vertical chases. Horizontal chases should be provided only when unavoidable.

### **18.11 Cutting of chases in stone masonry walls**

The provision (i) to (v) described for chasing in brick work are equally applicable to stone masonry walls also.

**Note:**

- (i) No inclined chase shall be permitted in brick masonry or stone masonry walls. In case inclined chases are unavoidable these shall be cut with written approval of the Engineer-in-Charge, and shall be repaired properly to his satisfaction. However, in half brick masonry wall, no inclined chase will be permitted.
- (ii) Chases shall be made by chiseling out the masonry to proper line and depth. Any damage to the adjoining portion or to any other item shall be made good, as decided by the Engineer-in-Charge, for which no extra payment shall be made. All dismantled material shall be removed from site.

**18.12 Filling Chases**

After G.I. Pipes etc. are fixed in chases, the chases shall be filled with cement concrete 1:3:6 (1 cement: 3 sand: 6 graded stone aggregate 20 mm nominal size) or cement mortar 1:4 (1 cement: 4 sand) as may be specified or otherwise directed by the Engineer-in-Charge and made flush with the masonry surface. The concrete surface shall be roughened with wire brushes to provide a key for plastering.

**18.13 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.

**TABLE 18.1**  
**For Water Storage Tank**

Sl. No.	Capacity litres	Minimum Wall Thickness mm	Minimum Weight of Empty Tank kg
1	2	3	4
1.	200	4.4	7.8
2.	300	4.4	9.0
3.	400	5.5	15.0
4.	500	6.0	18.0
5.	700	6.6	23.5
6.	1000	7.0	33.0
7.	1250	7.0	40.0
8.	1500	7.0	47.0
9.	1700	7.0	54.0
10.	2000	8.2	64.0
11.	2500	8.2	81.0
12.	3000	8.8	96.0
13.	4000	10.4	138.0
14.	5000	10.7	191.0
15.	6000	10.7	209.0
16.	7500	10.7	250.0
17.	10000	11.5	363.0
18.	15000	11.5	550.0
19.	20000	13.2	814.0

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.1		PolyetheleneAluminium-Polyethelene Composite pressure pipes (PE-AL-PE) internal work	Providing and fixing Polyethelene-Aluminium-Polyethelene (PE-AL-PE) Composite Pressure Pipes conforming to IS - 15450 U.V. stabilised with carbon black having thermal stability for hot and cold water supply, capable to withstand temperature up to 80° C including all special fittings of composite material (engineering plastic blend and brass inserts wherever required) e.g. elbows, tees, reducers, couplers and connectors etc. with clamps at 1.00 metre spacing. This includes testing of joints complete as per direction of the Engineer-in-Charge.		
18.1.1		Exposed on wall	Internal work - Exposed on wall		
	18.1.1.1	16 mm	1216 (16 mm OD) pipe (minimum wall thickness 1.75mm)	metre	193.00
	18.1.1.2	20 mm	1620 (20 mm OD) pipe (minimum wall thickness 2mm)	metre	242.00
	18.1.1.3	25 mm	2025 (25 mm OD) pipe (minimum wall thickness 2.45mm)	metre	307.00
	18.1.1.4	32 mm	2532 (32 mm OD) pipe (minimum wall thickness 2.8mm)	metre	398.00
	18.1.1.5	40 mm	3240 (40 mm OD) pipe (minimum wall thickness 3.4mm)	metre	618.00
	18.1.1.6	50 mm	4050 (50 mm OD) pipe (minimum wall thickness 4mm)	metre	679.00



Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.1.2		Concealed	Concealed work including cutting chases and making good the wall etc.		
	18.1.2.1	16 mm	1216 (16 mm OD) pipe (minimum wall thickness 1.75mm)	metre	299.00
	18.1.2.2	20 mm	1620 (20 mm OD) pipe (minimum wall thickness 2mm)	metre	360.00
	18.1.2.3	25 mm	2025 (25 mm OD) pipe (minimum wall thickness 2.45mm)	metre	441.00
	18.1.2.4	32 mm	2532 (32 mm OD) pipe (minimum wall thickness 2.8mm)	metre	553.00
18.2		PolyetheleneAluminium- PolyetheleneComposite Pressure Pipes External work	Providing and fixing Polyethelene-Aluminium- Polyethelene (PE-AL-PE) Composite Pressure Pipes conforming to IS - 15450 U.V. stabilized with carbon black having thermal stability for hot and cold water supply, capable to withstand temperature up to 80° C including all special fittings of composite material (engineering plastic blend and brass inserts wherever required) e.g. elbows ,tees ,reducers, couplers and connectors etc. with trenching, refilling and testing of joints complete as per direction of the engineer in charge. External work		



Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.2.1	16 mm	1216 (16 mm OD) pipe (minimum wall thickness 1.75mm)	metre	190.00
	18.2.2	20 mm	1620 (20 mm OD) pipe (minimum wall thickness 2mm)	metre	235.00
	18.2.3	25 mm	2025 (25 mm OD) pipe (minimum wall thickness 2.45mm)	metre	295.00
	18.2.4	32 mm	2532 (32 mm OD) pipe (minimum wall thickness 2.8mm)	metre	378.00
	18.2.5	40 mm	3240 (40 mm OD) pipe (minimum wall thickness 3.4mm)	metre	588.00
	18.2.6	50 mm	4050 (50 mm OD) pipe (minimum wall thickness 4mm)	metre	649.00
18.3		3 layer PP-R pipes internal work	Providing and fixing 3 layer PP-R (Poly propylene Random copolymer) pipes SDR 7.4 U V stabilized and anti - microbial fusion welded, having thermal stability for hot and cold water supply including allPP - R plain and brass threaded polypropylene random fittings i/c fixing the pipe with clamps at 1.00 m spacing. This includes testing of joints complete as per direction of Engineer in Charge. Internal work - Exposed on wall		
	18.3.1	16 mm	PN - 16 Pipe, 16 mm OD	metre	102.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.3.2	20 mm	PN - 16 Pipe, 20 mm OD	metre	137.00
	18.3.3	25 mm	PN - 16 Pipe, 25 mm OD	metre	186.00
	18.3.4	32 mm	PN - 16 Pipe, 32 mm OD	metre	285.00
	18.3.5	40 mm	PN - 16 Pipe, 40 mm OD	metre	437.00
	18.3.6	50 mm	PN - 16 Pipe, 50 mm OD	metre	596.00
18.4		3 layer PP-R pipes concealed work	Providing and fixing 3 layer PP-R (Poly propylene Random copolymer) pipes SDR 7.4 UV stabilized and anti - microbial fusion welded, having thermal stability for hot and cold water supply including allPP - R plain and brass threaded polypropylene random fittings i/c fixing the pipe with clamps at 1.00 m spacing. This includes the cost of cutting chases and making good the same including testing of joints complete as per direction of Engineer-in- Charge. Concealed work including cutting chases and making good the walls etc.		
	18.4.1	16 mm	PN - 16 Pipe, 16 mm OD	metre	177.00
	18.4.2	20 mm	PN - 16 Pipe, 20 mm OD	metre	217.00
	18.4.3	25 mm	PN - 16 Pipe, 25 mm OD	metre	278.00
	18.4.4	32 mm	PN - 16 Pipe, 32 mm OD	metre	400.00
18.5		3 layer PP-R pipes external work	Providing and fixing 3 layer PP-R (Poly propylene Random copolymer) pipes U V stabilized and anti - microbial fusion welded, having thermal stability for hot and cold water supply		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			including all PP - R plain and brass threaded polypropylene random fittings i/c trenching, refilling and testing of joints complete as per direction of Engineer-in-Charge. External work		
	18.5.1	16 mm	PN - 16 Pipe, 16 mm OD (SDR 7.4)	metre	99.00
	18.5.2	20 mm	PN - 16 Pipe, 20 mm OD (SDR 7.4)	metre	129.00
	18.5.3	25 mm	PN - 16 Pipe, 25 mm OD (SDR 7.4)	metre	178.00
	18.5.4	32 mm	PN - 16 Pipe, 32 mm OD (SDR 7.4)	metre	268.00
	18.5.5	40 mm	PN - 16 Pipe, 40 mm OD (SDR 7.4)	metre	407.00
	18.5.6	50 mm	PN - 16 Pipe, 50 mm OD (SDR 7.4)	metre	566.00
	18.5.7	63mm	PN - 16 Pipe, 63mm OD (SDR 7.4)	metre	863.00
	18.5.8	75 mm	PN - 16 Pipe, 75 mm OD (SDR 7.4)	metre	1225.00
	18.5.9	90 mm	PN - 16 Pipe, 90 mm OD (SDR 7.4)	metre	1960.00
	18.5.10	110 mm	PN - 10 Pipe, 110 mm OD (SDR - 11)	metre	2066.00
	18.5.11	160 mm	PN - 10 Pipe, 160 mm OD (SDR - 11)	metre	4264.00
18.6		CPVC pipes internal work	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			i/c fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes and fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer-in-Charge.		
	18.6.1	Exposed on wall	Internal work - Exposed on wall		
	18.6.1.1	15 mm	15 mm nominal outer dia .Pipes.	metre	129.00
	18.6.1.2	20 mm	20 mm nominal outer dia .Pipes.	metre	153.00
	18.6.1.3	25 mm	25 mm nominal outer dia .Pipes.	metre	177.00
	18.6.1.4	32 mm	32 mm nominal outer dia .Pipes.	metre	254.00
	18.6.1.5	40 mm	40 mm nominal outer dia .Pipes.	metre	354.00
	18.6.1.6	50 mm	50 mm nominal outer dia .Pipes.	metre	528.00
	18.6.2	Concealed	Concealed work including cutting chases and making good the walls etc.		
	18.6.2.1	15 mm	15 mm nominal outer dia .Pipes.	metre	207.00
	18.6.2.2	20 mm	20 mm nominal outer dia .Pipes.	metre	234.00
	18.6.2.3	25 mm	25 mm nominal outer dia .Pipes.	metre	288.00
	18.6.2.4	32 mm	32 mm nominal outer dia .Pipes.	metre	360.00
18.7		CPVC pipes for external work	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes,		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			having thermal stability for hot and cold water supply including all CPVC plain and brass threaded fittings. This included jointing of pipes and fittings with onestep CPVC solvent cement, trenching, refilling and testing of joints complete as per direction of Engineer-in- Charge. <b>External Work</b>		
	18.7.1	15 mm	15 mm nominal outer dia .Pipes.	metre	122.00
	18.7.2	20 mm	20 mm nominal outer dia .Pipes.	metre	141.00
	18.7.3	25 mm	25 mm nominal outer dia .Pipes.	metre	185.00
	18.7.4	32 mm	32 mm nominal outer dia .Pipes.	metre	238.00
	18.7.5	40 mm	40 mm nominal outer dia .Pipes.	metre	324.00
	18.7.6	50 mm	50 mm nominal outer dia .Pipes.	metre	498.00
	18.7.7	62.50 mm	62.50 mm nominal inner dia Pipes.	metre	1429.00
	18.7.8	75 mm	75 mm nominal inner dia .Pipes.	metre	2018.00
	18.7.9	100mm	100mm nominal inner dia .Pipes.	metre	2791.00
	18.7.10	150 mm	150 mm nominal inner dia .Pipes.	metre	3358.00
18.8		G.I. pipes	Providing and fixing G.I. pipes complete with G.I. fittings and clamps, including cutting and making good the walls etc.		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.8.1	Internal Exposed on wall	Internal work - Exposed on wall		
	18.8.1.1	15 mm	15 mm dia. nominal bore	metre	211.00
	18.8.1.2	20 mm	20 mm dia. nominal bore	metre	255.00
	18.8.1.3	25 mm	25 mm dia. nominal bore	metre	300.00
	18.8.1.4	32 mm	32 mm dia. nominal bore	metre	361.00
	18.8.1.5	40 mm	40 mm dia. nominal bore	metre	479.00
	18.8.1.6	50 mm	50 mm dia. nominal bore	metre	596.00
	18.8.2	Concealed	Concealed pipe including painting with anti corrosive bitumastic paint, cutting chases and making good the wall.		
	18.8.2.1	15 mm	15 mm dia nominal bore	metre	269.00
	18.8.2.2	20 mm	20 mm dia nominal bore	metre	309.00
	18.8.3	External	External work : including trenching and refilling etc.		
	18.8.3.1	15 mm	15 mm dia. nominal bore	metre	188.00
	18.8.3.2	20 mm	20 mm dia. nominal bore	metre	223.00
	18.8.3.3	25 mm	25 mm dia. nominal bore	metre	263.00
	18.8.3.4	32 mm	32 mm dia. nominal bore	metre	310.00
	18.8.3.5	40 mm	40 mm dia. nominal bore	metre	402.00
	18.8.3.6	50 mm	50 mm dia. nominal bore	metre	492.00
	18.8.3.7	65 mm	65 mm dia. nominal bore	metre	533.00
	18.8.3.8	80 mm	80 mm dia. nominal bore	metre	622.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.9		S.S. Pipe Internal	Providing and fixing Stainless Steel pipe and fitting of grade AISI 304 as per JIS standard 3448 complete with press type fitting (fitting shall be paid for separately) i/c fixing of the pipe with clamps at 1.00 m spacing including cutting and making good the walls including testing of joints complete as per direction of Engineer -in-charge. (The pipe length inserted in the fitting shall not be measured for payment)		
	18.9.1	Exposed	Internal work - Exposed on wall		
	18.9.1.1	15.88 mmdia	15.88 mm outer diapipe	metre	243.00
	18.9.1.2	22.22 mm	22.22 mm outer diapipe	metre	375.00
	18.9.1.3	28.58 mm	28.58 mm outer diapipe	metre	467.00
	18.9.1.4	34.00 mm	34.00 mm outer dia Pipe	metre	636.00
	18.9.1.5	42.70 mm	42.70 mm outer dia Pipe	metre	774.00
	18.9.1.6	48.60 mm	48.60 mm outer dia Pipe	metre	896.00
	18.9.2	Concealed	Internal work - Concealed Pipe		
	18.9.2.1	15.88 mm	15.88 mm outer dia .Pipes.	metre	297.00
	18.9.2.2	22.22 mm	22.22 mm Outer diaPipes	metre	428.00
18.10		Stainless Steel Fitting of press fit type	Providing and fixing required Stainless Steel Fitting of press fit design of grade AISI 304 conforming to JWWA G116 standard with V-profile or M-profile and with O-ring sealing gasket of EPDM material of required diaas per dirction of Engineer-in-Charge.		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.10.1	Coupling/Socket	Coupling/Socket		
	18.10.1.1	15.88 mm	For 15.88 mm outer dia Pipe	each	66.00
	18.10.1.2	22.22 mm	For 22.22 mm outer dia Pipe	each	102.00
	18.10.1.3	28.58 mm	For 28.58 mm outer dia Pipe	each	125.00
	18.10.1.4	34.00 mm	For 34.00 mm outer dia Pipe	each	268.00
	18.10.1.5	42.70 mm	For 42.70 mm outer dia Pipe	each	383.00
	18.10.1.6	48.60 mm	For 48.60 mm outer dia Pipe	each	518.00
	18.10.2	Reducer	Reducer		
	18.10.2.1	22.22 mm	For 22.22 mm x 15.88 mm outer dia pipe	each	120.00
	18.10.2.2	28.58 mm	For 28.58 mm x 15.88 mm outer dia pipe	each	164.00
	18.10.2.3	28.58 mm	For 28.58 mm x 22.22 mm outer dia pipe	each	168.00
	18.10.2.4	34.00 mm	For 34.00 mm x 15.88 mm outer dia pipe	each	272.00
	18.10.2.5	34.00 mm	For 34.00 mm x 22.22 mm outer dia pipe	each	275.00
	18.10.2.6	34.00 mm	For 34.00 mm x 28.58 mm outer dia pipe	each	275.00
	18.10.2.7	42.70 mm	For 42.70 mm x 15.88 mm outer dia pipe	each	417.00
	18.10.2.8	42.70 mm	For 42.70 mm x 22.22 mm outer dia pipe	each	420.00
	18.10.2.9	42.70 mm	For 42.70 mm x 28.58 mm outer dia pipe	each	420.00
	18.10.2.10	42.70 mm	For 42.70 mm x 34.00 mm outer dia pipe	each	450.00
	18.10.2.11	48.60 mm	For 48.60 mm x 15.88 mm outer dia pipe	each	544.00
	18.10.2.12	48.60 mm	For 48.60 mm x 22.22 mm outer dia pipe	each	546.00



Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.10.2.13	48.60 mm	For 48.60 mm x 28.58 mm outer dia pipe	each	551.00
	18.10.2.14	48.60 mm	For 48.60 mm x 34.00 mm outer dia pipe	each	556.00
	18.10.2.15	48.60 mm	For 48.60 mm x 42.70 mm outer dia pipe	each	606.00
	18.10.3	Elbow 90°	Elbow 90°		
	18.10.3.1	15.88 mm	For 15.88 mm outer dia pipe	each	100.00
	18.10.3.2	22.22 mm	For 22.22 mm outer dia Pipe	each	178.00
	18.10.3.3	28.58 mm	For 28.58 mm outer dia Pipe	each	245.00
	18.10.3.4	34.00 mm	For 34.00 mm outer dia Pipe	each	498.00
	18.10.3.5	42.70 mm	For 42.70 mm outer dia Pipe	each	763.00
	18.10.3.6	48.60 mm	For 48.60 mm outer dia Pipe	each	938.00
	18.10.4	Reducing Elbow 90°	Reducing Elbow 90°		
	18.10.4.1	22.22mm	For 22.22 mm x 15.88 mm outer dia pipe	each	172.00
	18.10.4.2	28.58 mm 15.88 mm	For 28.58 mm x 15.88 mm outer dia pipe	each	251.00
	18.10.4.3	28.58 mmx 22.22mm	For 28.58 mm x 22.22 mm outer dia pipe	each	257.00
	18.10.4.4	34.00 mm	For 34.00 mm x 22.22 mm outer dia pipe	each	374.00
	18.10.4.5	34.00 mmx 28.58mm	For 34.00 mm x 28.58 mm outer dia pipe	each	460.00
	18.10.4.6	42.70 mmx 34.00mm	For 42.70 mm x 34.00 mm outer dia pipe	each	811.00
	18.10.5	Equal Tee	Equal Tee		
	18.10.5.1	15.88 mm	For 15.88 mm outer dia pipe	each	185.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.5.2	22.22 mm	For 22.22 mm outer dia Pipe	each	268.00
	18.10.5.3	28.58 mm	For 28.58 mm outer dia Pipe	each	344.00
	18.10.5.4	34.00 mm	For 34.00 mm outer dia Pipe	each	717.00
	18.10.5.5	42.70 mm	For 42.70 mm outer dia Pipe	each	1004.00
	18.10.5.6	48.60 mm	For 48.60 mm outer dia Pipe	each	1194.00
	18.10.6	Reducing Tee	Reducing Tee		
	18.10.6.1	22.22 mm x 15.88 mm	For 22.22 mm x 15.88 mm outer dia pipe	each	261.00
	18.10.6.2	28.58 mm x 15.88 mm	For 28.58 mm x 15.88 mm outer dia pipe	each	325.00
	18.10.6.3	28.58 mm x 22.22mm	For 28.58 mm x 22.22 mm outer dia pipe	each	338.00
	18.10.6.4	34.00 mm x 15.88 mm	For 34.00 mm x 15.88 mm outer dia pipe	each	637.00
	18.10.6.5	34.00 mm x 22.22mm	For 34.00 mm x 22.22 mm outer dia pipe	each	648.00
	18.10.6.6	34.00 mm x 28.58mm	For 34.00 mm x 28.58 mm outer dia pipe	each	655.00
	18.10.6.7	42.70 mm x 15.88mm	For 42.70 mm x 15.88 mm outer dia pipe	each	951.00
	18.10.6.8	42.70 mm x 22.22mm	For 42.70 mm x 22.22 mm outer dia pipe	each	954.00
	18.10.6.9	42.70 mm x 28.58mm	For 42.70 mm x 28.58 mm outer dia pipe	each	955.00
	18.10.6.10	42.70 mm x 34.00mm	For 42.70 mm x 34.00 mm outer dia pipe	each	964.00
	18.10.6.11	48.60 mm x 15.88mm	For 48.60 mm x 15.88 mm outer dia pipe	each	1038.00
	18.10.6.12	48.60 mm x 22.22mm	For 48.60 mm x 22.22 mm outer dia pipe	each	1060.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.6.13	48.60 mm x 28.58mm	For 48.60 mm x 28.58 mm outer dia pipe	each	1069.00
	18.10.6.14	48.60 mm x 34.00mm	For 48.60 mm x 34.00 mm outer dia pipe	each	1113.00
	18.10.6.15	48.60 mm x 42.70mm	For 48.60 mm x 42.70 mm outer dia pipe	each	1153.00
	18.10.7	Male Thread Tee	Male Thread Tee		
	18.10.7.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	332.00
	18.10.7.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	400.00
	18.10.7.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	427.00
	18.10.7.4	28.58 mm x 15 mm	For 28.58 mm outer dia x 15 mm nominal dia threaded	each	481.00
	18.10.7.5	28.58 mm x 20 mm	For 28.58 mm outer dia x 20 mm nominal dia threaded	each	502.00
	18.10.7.6	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	561.00
	18.10.7.7	34.00 mm x 15 mm	For 34.00 mm outer dia x 15 mm nominal dia threaded	each	699.00
	18.10.7.8	34.00 mm x 20 mm	For 34.00 mm outer dia x 20 mm nominal dia threaded	each	756.00
	18.10.7.9	34.00 mm x 25 mm	For 34.00 mm outer dia x 25 mm nominal dia threaded	each	902.00
	18.10.7.10	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	1139.00
	18.10.7.11	42.70 mm x 15 mm	For 42.70 mm outer dia x 15 mm nominal dia threaded	each	1067.00
	18.10.7.12	42.70 mm x 20 mm	For 42.70 mm outer dia x 20 mm nominal dia threaded	each	1092.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.7.13	42.70 mm x 25 mm	For 42.70 mm outer dia x 25 mm nominal dia threaded	each	1189.00
	18.10.7.14	42.70 mm 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	1321.00
	18.10.7.15	42.70 mm 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	1604.00
	18.10.7.16	48.60 mm x 15 mm	For 48.60 mm outer dia x 15 mm nominal dia threaded	each	1162.00
	18.10.7.17	48.60 mm x 20 mm	For 48.60 mm outer dia x 20 mm nominal dia threaded	each	1196.00
	18.10.7.18	48.60 mm x 25 mm	For 48.60 mm outer dia x 25 mm nominal dia threaded	each	1247.00
	18.10.7.19	48.60 mm x 32 mm	For 48.60 mm outer dia x 32 mm nominal dia threaded	each	1498.00
	18.10.7.20	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	1662.00
	18.10.7.21	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	2031.00
	18.10.8	Female Thread Tee	Female Thread Tee		
	18.10.8.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	339.00
	18.10.8.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	400.00
	18.10.8.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	413.00
	18.10.8.4	28.58 mm x 15 mm	For 28.58 mm outer dia x 15 mm nominal dia threaded	each	517.00
	18.10.8.5	28.58 mm x 20 mm	For 28.58 mm outer dia x 20 mm nominal dia threaded	each	528.00
	18.10.8.6	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	578.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.8.7	34.00 mm x 15 mm	For 34.00 mm outer dia x 15 mm nominal dia threaded	each	776.00
	18.10.8.8	34.00 mm x 20 mm	For 34.00 mm outer dia x 20 mm nominal dia threaded	each	789.00
	18.10.8.9	34.00 mm x 25 mm	For 34.00 mm outer dia x 25 mm nominal dia threaded	each	890.00
	18.10.8.10	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	1057.00
	18.10.8.11	42.70 mm x 15 mm	For 42.70 mm outer dia x 15 mm nominal dia threaded	each	1038.00
	18.10.8.12	42.70 mm x 20 mm	For 42.70 mm outer dia x 20 mm nominal dia threaded	each	1057.00
	18.10.8.13	42.70 mm x 25 mm	For 42.70 mm outer dia x 25 mm nominal dia threaded	each	1187.00
	18.10.8.14	42.70 mm x 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	1239.00
	18.10.8.15	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	1350.00
	18.10.8.16	48.60 mm x 15 mm	For 48.60 mm outer dia x 15 mm nominal dia threaded	each	1237.00
	18.10.8.17	48.60 mm x 20 mm	For 48.60 mm outer dia x 20 mm nominal dia threaded	each	1250.00
	18.10.8.18	48.60 mm x 25 mm	For 48.60 mm outer dia x 25 mm nominal dia threaded	each	1295.00
	18.10.8.19	48.60 mm x 32 mm	For 48.60 mm outer dia x 32 mm nominal dia threaded	each	1375.00
	18.10.8.20	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	1432.00
	18.10.8.21	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	1432.00
	18.10.9	Female Connector/ Adapter	Female Thread Connector/ Adapter		

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.9.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	221.00
	18.10.9.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	267.00
	18.10.9.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	275.00
	18.10.9.4	28.58 mm x 15 mm	For 28.58 mm outer dia x 15 mm nominal dia threaded	each	322.00
	18.10.9.5	28.58 mm x 20 mm	For 28.58 mm outer dia x 20 mm nominal dia threaded	each	332.00
	18.10.9.6	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	391.00
	18.10.9.7	34.00 mm x 25 mm	For 34.00 mm outer dia x 25 mm nominal dia threaded	each	475.00
	18.10.9.8	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	625.00
	18.10.9.9	42.70 mm x 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	669.00
	18.10.9.10	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	791.00
	18.10.9.11	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	973.00
	18.10.9.12	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	973.00
	18.10.10	Male Thread Connector/ Adapter	Male Thread Connector/ Adapter		
	18.10.10.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	224.00
	18.10.10.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	264.00
	18.10.10.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	288.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	18.10.10.4	28.58 mm x 20 mm	For 28.58 mm outer dia x 20 mm nominal dia threaded	each	364.00
	18.10.10.5	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	372.00
	18.10.10.6	34.00 mm x 25 mm	For 34.00 mm outer dia x 25 mm nominal dia threaded	each	535.00
	18.10.10.7	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	656.00
	18.10.10.8	42.70 mm x 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	754.00
	18.10.10.9	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	843.00
	18.10.10.10	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	976.00
	18.10.10.11	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	1322.00
	18.10.11	Valve Connector	Valve Connector		
	18.10.11.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	272.00
	18.10.11.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	321.00
	18.10.11.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	343.00
	18.10.11.4	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	492.00
	18.10.11.5	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	731.00
	18.10.11.6	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	1016.00
	18.10.11.7	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	1366.00
	18.10.12	Female Elbow 90°	Female Threaded Elbow 90°		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.10.12.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	238.00
	18.10.12.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	319.00
	18.10.12.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	330.00
	18.10.12.4	28.58 mm x 25 mm	For 25.58 mm outer dia x 25 mm nominal dia threaded	each	489.00
	18.10.12.5	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	851.00
	18.10.12.6	42.70 mm x 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	1069.00
	18.10.12.7	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	1156.00
	18.10.12.8	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	1281.00
	18.10.12.9	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	1494.00
	18.10.13	Male Threaded Elbow 90°	Male Threaded Elbow 90°		
	18.10.13.1	15.88 mm x 15 mm	For 15.88 mm outer dia x 15 mm nominal dia threaded	each	251.00
	18.10.13.2	22.22 mm x 15 mm	For 22.22 mm outer dia x 15 mm nominal dia threaded	each	317.00
	18.10.13.3	22.22 mm x 20 mm	For 22.22 mm outer dia x 20 mm nominal dia threaded	each	335.00
	18.10.13.4	28.58 mm x 25 mm	For 28.58 mm outer dia x 25 mm nominal dia threaded	each	438.00
	18.10.13.5	34.00 mm x 25 mm	For 34.00 mm outer dia x 25 mm nominal dia threaded	each	703.00
	18.10.13.6	34.00 mm x 32 mm	For 34.00 mm outer dia x 32 mm nominal dia threaded	each	855.00
	18.10.13.7	42.70 mm x 32 mm	For 42.70 mm outer dia x 32 mm nominal dia threaded	each	1085.00
	18.10.13.8	42.70 mm x 40 mm	For 42.70 mm outer dia x 40 mm nominal dia threaded	each	1231.00



Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.10.13.9	48.60 mm x 40 mm	For 48.60 mm outer dia x 40 mm nominal dia threaded	each	1382.00
	18.10.13.10	48.60 mm x 50 mm	For 48.60 mm outer dia x 50 mm nominal dia threaded	each	1683.00
	18.10.14	Cap	Cap		
	18.10.14.1	15.88 mm	For 15.88 mm outer dia pipe	each	52.00
	18.10.14.2	22.22 mm	For 22.22 mm outer dia Pipe	each	74.00
	18.10.14.3	28.58 mm	For 28.58 mm outer dia Pipe	each	98.00
	18.10.14.4	34.00 mm	For 34.00 mm outer dia Pipe	each	201.00
	18.10.14.5	42.70 mm	For 42.70 mm outer dia Pipe	each	294.00
	18.10.14.6	48.60 mm	For 48.60 mm outer dia Pipe	each	383.00
	18.10.15	Pipe Bridge	Pipe Bridge		
	18.10.15.1	15.88 mm	For 15.88 mm outer dia pipe	each	249.00
	18.10.15.2	22.22 mm	For 22.22 mm outer dia Pipe	each	315.00
	18.10.15.3	28.58 mm	For 28.58 mm outer dia Pipe	each	473.00
	18.10.16	Slip Coupling	Slip Coupling/ Socket		
	18.10.16.1	15.88 mm	For 15.88 mm outer dia pipe	each	131.00
	18.10.16.2	22.22 mm	For 22.22 mm outer dia pipe	each	214.00
	18.10.16.3	28.58 mm	For 28.58 mm outer dia pipe	each	274.00
	18.10.16.4	34.00 mm	For 34.00 mm outer dia pipe	each	405.00
	18.10.16.5	42.70 mm	For 42.70 mm outer dia pipe	each	569.00
	18.10.16.6	48.60 mm	For 48.60 mm outer dia pipe	each	707.00
18.11		Fixing water meter & stop cock in GI pipe	Fixing water meter and stop cock in G.I. pipe line including cutting and threading the pipe and making long screws etc.	each	189.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			complete (cost of water meter and stop cock to be paid separately).		
18.12		Gun metal gate valve	Providing and fixing gun metal gate valve with C.I. wheel of approved quality (screwed end) :		
	18.12.1	With CI wheel	With C.I. wheel of approved quality (screwed end)		
	18.12.1.1	25 mm dia	25 mm nominal bore	each	486.00
	18.12.1.2	32 mm dia	32 mm nominal bore.	each	558.00
	18.12.1.3	40 mm dia	40 mm nominal bore	each	677.00
	18.12.1.4	50 mm dia	50 mm nominal bore	each	976.00
	18.12.1.5	65 mm dia	65 mm nominal bore	each	1339.00
	18.12.1.6	80 mm dia	80 mm nominal bore	each	2302.00
	18.12.2	With brass lever handle	With brass lever handle of approved quality.		
	18.12.2.1	25 mm dia	25 mm nominal bore	each	341.00
	18.12.2.2	32 mm dia	32 mm nominal bore.	each	419.00
	18.12.2.3	40 mm dia	40 mm nominal bore	each	491.00
	18.12.2.4	50 mm dia	50 mm nominal bore	each	639.00
18.13		CPVC gate valve	Providing and fixing CPVC gate valve with knob of approved quality.		
	18.13.1	25 mm dia	25 mm nominal bore	each	428.00
	18.13.2	32 mm dia	32 mm nominal bore.	each	500.00
	18.13.3	40 mm dia	40 mm nominal bore	each	584.00
	18.13.4	50 mm dia	50 mm nominal bore	each	749.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.14		Ball float valve brass	Providing and fixing ball valve (brass) of approved quality, High or low pressure, with plastic floats complete :		
	18.14.1	15 mm dia	15 mm nominal bore	each	316.00
	18.14.2	20 mm dia	20 mm nominal bore	each	431.00
	18.14.3	25 mm dia	25 mm nominal bore	each	499.00
18.15		Gun metal non- return valve	Providing and fixing gun metal non- return valve of approved quality (screwed end) :		
	18.15.1	25 mmdia	25 mm nominal bore		
	18.15.1.1	Horizontal	Horizontal	each	462.00
	18.15.1.2	Vertical	Vertical	each	474.00
	18.15.2	32 mmdia	32 mm nominal bore		
	18.15.2.1	Horizontal	Horizontal	each	587.00
	18.15.2.2	Vertical	Vertical	each	715.00
	18.15.3	40 mmdia	40 mm nominal bore		
	18.15.3.1	Horizontal	Horizontal	each	746.00
	18.15.3.2	Vertical	Vertical	each	990.00
	18.15.4	50 mmdia	50 mm nominal bore		
	18.15.4.1	Horizontal	Horizontal	each	1138.00
	18.15.4.2	Vertical	Vertical	each	1353.00
	18.15.5	65 mmdia	65 mm nominal bore		
	18.15.5.1	Horizontal	Horizontal	each	2012.00
	18.15.5.2	Vertical	Vertical	each	2360.00
	18.15.6	80 mmdia	80 mm nominal bore		
	18.15.6.1	Horizontal	Horizontal	each	2886.00
	18.15.6.2	Vertical	Vertical	each	3699.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.16		Brass ferrule	Providing and fixing brass ferrule with C.I. mouthcover including boring and tapping the main :		
	18.16.1	15 mm dia	15 mm nominal bore	each	236.00
	18.16.2	20 mm dia	20 mm nominal bore	each	285.00
	18.16.3	25 mm dia	25 mm nominal bore	each	391.00
18.17		Uplasticised PVC connection	Providing and fixing uplasticised PVC connection pipe with brass unions :		
	18.17.1	30 cm length	30 cm length		
	18.17.1.1	15 mm dia	15 mm nominal bore	each	88.00
	18.17.1.2	20 mm dia	20 mm nominal bore	each	129.00
	18.17.2	45 cm length	45 cm length		
	18.17.2.1	15 mm dia	15 mm nominal bore	each	149.00
	18.17.2.2	20 mm dia	20 mm nominal bore	each	184.00
18.18		Masonry Chamber 30x30x50 for stop cock	Constructing masonry Chamber 30x30x50 cm inside, in brick work in cement mortar 1:4 (1 cement :4 sand) for stop cock, with C. I. surface box 100x100 x75 mm (inside) with hinged cover fixed in cement concrete slab 1:2:4 mix (1 cement :2 sand : 4 graded stone aggregate 20 mm nominal size), i/c necessary excavation, foundation concrete 1:5:10 ( 1 cement :5 sand:10 graded stone aggregate 40mm nominal size ) and inside plastering with cement mortar 1:3 (1 cement :3 sand) 12mm thick finished with a floating coat of neat cement complete as per standard design :-		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.18.1	Clay bricks	With common burnt clay bricks of 25 kg /sqcm compressive strength.	each	916.00
	18.18.2	Flyash bricks	With well burnt flyash bricks of 50 kg/sqm compressive strength.	each	870.00
18.19		Masonry Chamber 60x60x75 for sluice valve	Constructing masonry Chamber 60x60x75 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 sand) for sluice valve, with C.I. surface box 100mm. top diameter, 160 mm bottom diameter and 180 mm deep ( inside) with chained lid and RCC top slab 1:2:4 mix (1 cement :2 sand : 4 graded stone aggregate 20mm nominal size ) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 sand : 10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design		
	18.19.1	On clay bricks	With common burnt clay bricks of 25 kg /sqcm compressive strength.	each	5416.00
	18.19.2	On flyash bricks	With flyash bricks of 50 kg/cm <sup>2</sup> strength	each	4995.00
18.20		Masonry Chamber 60x60x75 cm for fire hydrants	Constructing masonry Chamber 60x60x75 cm, inside in brick work in cement mortar 1:4 (1 cement : 4 sand) for fire hydrants, with C.I. surface box 350x350 mm. top and 165 mm deep ( inside) with		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			chained lid and RCC top slab 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 (1 cement : 5 sand:10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design :		
	18.20.1	Of clay bricks	With common burnt clay bricks of 25 kg/cm <sup>2</sup> compressive strength.	each	5168.00
	18.20.2	Of fly ash bricks	With flyash bricks of 50kg/cm <sup>2</sup> strength.	each	4851.00
18.21		Masonry Chamber 60x45x50 cm for water meter	Constructing masonry Chamber 60x45x50 cm inside, in brick work in cement mortar 1:4 (1 cement : 4 sand) for water meter complete with C.I. double flap surface box 400x200x200 mm (inside) with locking arrangement and RCC top slab 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) , i/c necessary excavation, foundation concrete 1:5:10 ( 1 cement : 5 sand:10 graded stone aggregate 40 mm nominal size) and inside plastering with cement mortar 1:3 (1 cement : 3 sand) 12 mm thick finished with a floating coat of neat cement complete as per standard design :		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.21.1	Of clay bricks	With common burnt clay bricks of 25 kg /sqm compressive strength.	each	4870.00
	18.21.2	Of fly ash bricks	With flyash bricks of 50kg/sqm compressive strength.	each	4683.00
18.22		Painting G.I. pipes and fittings	Painting G.I. pipes and fittings with synthetic enamel white paint with two coats over a ready mixed priming coat, both of approved quality for new work :		
	18.22.1	15 mmdia	15 mm diameter pipe.	metre	8.00
	18.22.2	20 mm dia	20 mm diameter pipe.	metre	9.00
	18.22.3	25 mm dia	25 mm diameter pipe.	metre	12.00
	18.22.4	32 mm dia	32 mm diameter pipe.	metre	14.00
	18.22.5	40 mm dia	40 mm diameter pipe.	metre	16.00
	18.22.6	50 mm dia	50 mm diameter pipe.	metre	19.00
18.23		Repainting G.I. pipes and fittings	Repainting G.I. pipes and fittings with synthetic enamel white paint of approved quality :		
	18.23.1	15 mm dia	15 mm diameter pipe.	metre	4.00
	18.23.2	20 mm dia	20 mm diameter pipe.	metre	5.00
	18.23.3	25 mm dia	25 mm diameter pipe	metre	6.00
	18.23.4	32 mm dia	32 mm diameter pipe	metre	7.00
	18.23.5	40 mm dia	40 mm diameter pipe	metre	8.00
	18.23.6	50 mm dia	50 mm diameter pipe	metre	9.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.24		Painting two coats of anti-corrosive bitumastic paint	Painting G.I. pipes and fittings with two coats of anti-corrosive bitumastic paint of approved quality :		
	18.24.1	15 mm dia	15 mm diameter pipe	metre	4.00
	18.24.2	20 mm dia	20 mm diameter pipe	metre	5.00
	18.24.3	25 mm dia	25 mm diameter pipe	metre	7.00
	18.24.4	32 mm dia	32 mm diameter pipe	metre	8.00
	18.24.5	40 mm dia	40 mm diameter pipe	metre	9.00
	18.24.6	50 mm dia	50 mm diameter pipe	metre	10.00
	18.24.7	65 mmdia	65 mm diameter pipe	metre	13.00
	18.24.8	80 mmdia	80 mm diameter pipe	metre	15.00
18.25		Filling sand all-round G.I. pipes	Providing and filling sand all-round the G.I. pipes in external work.		
	18.25.1	15 mmdia	15 mm diameter pipe	metre	107.00
	18.25.2	20 mm dia	20 mm diameter pipe	metre	108.00
	18.25.3	25 mm dia	25 mm diameter pipe	metre	111.00
	18.25.4	32 mm dia	32 mm diameter pipe	metre	114.00
	18.25.5	40 mm dia	40 mm diameter pipe	metre	116.00
	18.25.6	50 mm dia	50 mm diameter pipe	metre	120.00
	18.25.7	65 mmdia	65 mm diameter pipe	metre	189.00
	18.25.8	80 mmdia	80 mm diameter pipe	metre	195.00
18.26		G.I. Union	Providing and fixing G.I. Union in G.I. pipe including cutting and threading the pipe and making long screws etc. complete (New work)		
	18.26.1	15 mm dia	15 mm nominal bore	each	117.00
	18.26.2	20 mm dia	20 mm nominal bore	each	148.00
	18.26.3	25 mm dia	25 mm nominal bore	each	158.00



Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.26.4	32 mm dia	32 mm nominal bore	each	204.00
	18.26.5	40 mm dia	40 mm nominal bore	each	321.00
	18.26.6	50 mm dia	50mm nominal bore	each	428.00
	18.26.7	65 mmdia	65mm nominal bore	each	625.00
	18.26.8	80 mmdia	80 mm nominal bore	each	718.00
18.27		G.I. Union in existing G.I. pipe	Providing and fixing G.I. Union in existing G.I. pipe line, cutting and threading the pipe and making long screws including excavation, refilling the earth or cutting of wall and making good the same complete wherever required :		
	18.27.1	15 mm dia	15 mm nominal bore.	each	228.00
	18.27.2	20 mm dia	20 mm nominal bore.	each	252.00
	18.27.3	25 mm dia	25 mm nominal bore.	each	269.00
	18.27.4	32 mm dia	32 mm nominal bore.	each	316.00
	18.27.5	40 mm dia	40 mm nominal bore.	each	432.00
	18.27.6	50 mm dia	50 mm nominal bore.	each	579.00
	18.27.7	65 mmdia	65 mm nominal bore.	each	777.00
	18.27.8	80 mmdia	80 mm nominal bore.	each	870.00
18.28		Polyethylene water storage tank	Providing and placing on terrace (at all floor levels) polyethylene water storage tank ISI : 12701 marked with cover and suitable locking arrangement and making necessary holes for inlet, outlet and overflowpipes but without fittings and the base support for tank	per litre	7.00
18.29		Brass bib cock	Providing and fixing brass bib cock of approved quality		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.29.1	15 mm dia	15 mm nominal bore	each	306.00
	18.29.2	20 mm dia	20 mm nominal bore	each	338.00
18.30		Brass stop cock	Providing and fixing brass stop cock of approved quality :		
	18.30.1	15 mm dia	15 mm nominal bore	each	318.00
	18.30.2	20 mm dia	20 mm nominal bore	each	344.00
18.31		C.P. brass bib cock 15 mm dia	Providing and fixing C.P. brass bib cock of approved quality conforming to IS: 8931, 15 mm nominal bore.	each	458.00
18.32		C.P. brass long nose bib cock	Providing and fixing C.P. brass long nose bib cock of approved quality conforming to IS standards and weighing not less than 810 gm, 15 mm nominal bore.	each	526 .00
18.33		C.P. brass long body bib cock	Providing and fixing C.P. brass long body bib cock of approved quality conforming to IS standards andweighing not less than 690 gm, 15 mm nominal bore	each	544.00
18.34		C.P. brass stop cock concealed	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved make conforming to IS: 8931. 15 mm nominal bore.	each	778.00
18.35		C.P. brass angle valve for basin	Providing and fixing C.P. brass angle valve for basin mixer and geyser points of approved quality conforming to IS:893115 mm nominal bore	each	516.00
18.36		Sensor operated pillar cock	Providing and fixing chrome plated brass battery based infrared sensor operated pillar cock, having foam flow technology. 15 mm nominal bore.	each	8216.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.37		C.P. brass pillar cock	Providing and fixing C.P. brass pillar cock approved quality and make conforming to IS: specification. 15 mm nominal bore 125 mm long foam flow.	each	829.00
18.38		C.P. brass basin mixer	Providing and fixing C.P. brass basin mixer of approved quality and make conforming to IS: specification. 15 mm nominal bore.	each	1769.00
18.39		C.P. brass wall mixer	Providing and fixing C.P. brass wall mixer of approved quality and make conforming to IS: specification. 15 mm nominal bore.	each	3292.00
18.40		C.P. brass sink mixer	Providing and fixing C.P. brass sink mixer of approved quality and make conforming to IS: specification. 15 mm nominal bore.	each	1724.00
18.41		C.P. brass elbow operated bibcock	Providing and fixing C.P. brass elbow operated bibcock of approved quality and make conforming to IS: specification. 15 mm nominal bore.	each	840.00
18.42		C.P. brass elbow operated pillar cock	Providing and fixing C.P. brass elbow operated pillar cock of approved quality and make conforming to IS: specification. 15 mm nominal bore.	each	1072.00
18.43		C.P. brass shower rose	Providing and fixing C.P. brass shower rose with 15 or 20 mm inlet :		
	18.43.1	100 mmdia	100 mm diameter	each	130.00
	18.43.2	150 mmdia	150 mm diameter	each	155.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.44		PTMT bib cock 15mmdia	Providing and fixing PTMT bib cock of approved quality and colour 15mm nominal bore.		
	18.44.1	86 mm long	86 mm long weighing not less than 88 gm	each	173.00
	18.44.2	122mm long	122 mm long weighing not less than 99 gm	each	208.00
	18.44.3	165mm long	165mm long weighing not less than 110 gm	each	242.00
	18.44.4	90mm long	90mm long weighing not less than 93 gm	each	237.00
18.45		PTMT stop cock	Providing and fixing PTMT stop cock of approved quality and colour.		
	18.45.1	15mmdia	15 mm nominal bore, 86mm long. Weighing not less than 88 gms.	each	173.00
	18.45.2	20mmdia	20mm nominal bore, 89mm long. Weighing not less than 88 gms.	each	213.00
	18.45.3	15mmdia	Concealed stop cock, 15mm nominal bore, 108mm long. Weighing not less than 108 gms.	each	242.00
18.46		PTMT pillar cock	Providing and fixing PTMT pillar cock of approved quality and colour.		
	18.46.1	15mm x 107mm	15mm nominal bore, 107mm long. Weighing not less than 110 gms.	each	251.00
	18.46.2	15mm x 125mm	15mm nominal bore, 125mm long foam flow weighing not less than 120 gms.	each	332.00
18.47		PTMT, push cock	Providing and fixing PTMT, push cock of approved quality and colour.		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.47.1	15mm x 98mm	15 mm nominal bore, 98mm long. Weighing not less than 75 gms.	each	144.00
	18.47.2	15mm x 80mm	15 mm nominal bore, 80mm long weighing not less than 46 gms.	each	126.00
18.48		PTMT grating	Providing and fixing PTMT grating of approved quality and colour.		
	18.48.1	Circular	Circular type.		
	18.48.1.1	100 mmdia	100 mm nominal dia.	each	55.00
	18.48.1.2	125 mmdia	125 mm nominal dia with 25 mm waste hole.	each	60.00
	18.48.2	Rectangular	Rectangular type with openable circular lid.		
	18.48.2.1	150 mmdia	150 mm nominal size square 100 mm diameter of the inner hinged round grating.	each	148.00
18.49		PTMT angle stop cock	Providing and fixing PTMT angle stop cock 15 mm nominal bore. Weighing not less than 85 gms.	each	208.00
18.50		PTMT swivelling shower	Providing and fixing PTMT swivelling shower, 15mm nominal bore. Weighing not less than 40gms.	each	164.00
18.51		PTMT Ball cock	Providing and fixing PTMT Ball cock of approved quality, colour and make complete with Epoxy coated aluminium rod with L.P./ H.P.H.D. plastic ball.		
	18.51.1	15mmdia	15 mm nominal bore, 105 mm long. Weighing not less than 138 gms.	each	234.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	18.51.2	20mmdia	20 mm nominal bore, 120 mm long. Weighing not less than 198 gms.	each	314.00
	18.51.3	25mmdia	25 mm nominal bore, 152mm long. Weighing not less than 440 gms.	each	615.00
	18.51.4	40mmdia	40mm nominal bore, 206mm long. Weighing not less than 690 gms.	each	1016.00
	18.51.5	50mmdia	50mm nominal bore, 242mm long. Weighing not less than 1240 gms.	each	1469.00
18.52		Unplasticised P.V.C. connection pipe	Providing and fixing Unplasticised P.V.C. connection pipe with PTMT Nuts collar and bush of approved quality and colour 15 mm nominal bore		
	18.52.1	30cm	30cm length.	each	61.00
	18.52.2	45cm	45 cm length.	each	79.00
18.53		PTMT extension nipple	Providing and fixing PTMT extension nipple for water tank pipe, fittings of approved quality and colour.		
	18.53.1	15mmdia	15 mm nominal bore. Weighing not less than 32 gms.	each	59.00
	18.53.2	20mmdia	20mm nominal bore. Weighing not less than 40gms.	each	65.00
	18.53.3	25mmdia	25mm nominal bore. Weighing not less than 62 gms.	each	82.00
18.54		Enclosed type water meter bulk type	Providing and fixing enclosed type water meter (bulk type) conforming to IS: 2373 and tested by Municipal Board complete		

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			with bolts, nuts, rubber insertions etc. (The tail pieces if required will be paid separately) :		
	18.54.1	80 mm dia	80 mm nominal bore	each	3548.00
	18.54.2	100 mm dia	100 mm nominal bore	each	5200.00
	18.54.3	150 mm dia	150 mm nominal bore	each	7497.00
	18.54.4	200 mmdia	200 mm nominal bore	each	8472.00
18.55		C.I. dirt box strainer	Providing and fixing C.I. dirt box strainer for bulk type water meter with nuts, bolts, rubber insertions etc. complete conforming to IS : 2373 :		
	18.55.1	80 mm dia	80 mm nominal bore	each	4186.00
	18.55.2	100 mm dia	100 mm nominal bore	each	6562.00
	18.55.3	150 mm dia	150 mm nominal bore	each	8526.00
	18.55.4	200 mmdia	200 mm nominal bore	each	11766.00
18.56		Cutting holes in walls	Cutting holes upto 30x30 cm in walls including making good the same :		
			With common burnt clay bricks of 25 kg /sqcmor flyash bricks of 50 kg/cm <sup>2</sup> compressive strength.	each	154.00
18.57		Cutting holes R.C.C. floors and roofs	Cutting holes upto 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 sand : 4 graded stone aggregate 20 mm nominal size) including finishing complete so as to make it leak proof.	each	129.00

Item No.	Sub Item No.	Sub Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
18.58		Chases in walls	Making chases upto 7.5x7.5 cm in walls including making good and finishing with matching surface after housing G.I. pipe etc.	metre	54.00
18.59		Making hole embedding pipes	Making hole upto 20x20 cm and embedding pipes upto 150 mm diameter in masonry and filling with cement concrete 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) including disposal of malba.	metre	94.00
18.60		Connection GI distribution	Making connection of G.I. distribution branch with G.I. main of following sizes by providing and fixing tee, including cutting and threading the pipe etc. complete :		
	18.60.1	25 to 40 mmdia	25 to 40 mm nominal bore	each	247.00
	18.60.2	50 to 80 mmdia	50 to 80 mm nominal bore	each	644.00
18.61		CP jet assembly	Providing and fixing CP jet assembly to including connection etc complete.	each	375.00
18.62		Ferro-cement water storage tank	Providing and fixing ferro-cement water storage tank with cover, having minimum thickness of 10mm. The wall to be reinforced with two layers of double galvanized annealed square woven wire mesh of 20 gauge wire spaced at 15mm for 300 litre capacity and 12mm for 450 to 2500 litres capacity finish with 3 layers of Cement mortar 1:2 duly modified	litre	7.00



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Sub Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			with polymer based plastizers and hardening chemicals (Burogrout and Buroseal) The tank should conform to the specification prescribed by Structural Engineering Research Centre Roorkee/Gaziabad. The tanks to be painted with drinking water paint inside and aluminium paint outside with provision of outlet, inlet, overflow and cleaning including hoisting and placing in position upto floor two level or 5 M. height.		
18.63		Extra for additional floor	Add extra for additional floor lift beyond 5.0M.height.	litre	0.2

**CHAPTER – 19.0**  
**DRAINAGE**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
<b>1</b>	<b>2</b>	<b>3</b>
1.	IS 458	Pre-cast Concrete Pipes (with and without reinforcement).
2.	IS 651	Specification for Salt Glazed Stoneware Pipes and Fittings.
3.	IS 783	Code of Practice for Laying Concrete Pipes
4.	IS 1726	Specification for Cast Iron Manhole Covers and Frames
5.	IS 1729	Cast Iron /Ductile Iron Drainage Pipes and Pipe Fittings Socket and Spigot Series for Over-ground Non-pressure Pipe Line.
6.	IS 4127	Code of Practice for Laying of Glazed Stone Ware Pipes
7.	IS 4885	Specifications for Sewer Bricks
8.	IS 12592	Pre-cast Concrete Manhole Covers and Frames - Specifications

**PREAMBLE  
DRAINAGE  
(CHAPTER: 19.0)**

**19.1 GENERAL**

The drainage system shall be designed considering that the discharge of water through a domestic drain is intermittent and limited in quantity and therefore, small accumulations of solid matter are liable to form in the drains between the building and the public sewer. There is usually a gradual shifting of these deposits as discharges take place. Gradients shall be sufficient to prevent these temporary accumulations building up and blocking the drains.

Normally, the sewer shall be designed for discharging three times the dry weather flow flowing half-full with a minimum self cleansing velocity of 0.75 metre per second. The approximate gradients which give this velocity for the sizes of pipes likely to be used in building drainage and the corresponding discharges when flowing half-full are given in Table as under. The sizes and slopes shall conform to Local Municipal Bye-laws.

Table  
Gradients for Sewers

Diameter mm	Minimum Gradient		Maximum Gradient	
	Gradients	Discharge cum/Min.	Gradients	Discharge cum/Min.
100	1 in 57	0.18	1 in 5.6	0.59
150	1 in 100	0.42	1 in 9.7	1.32
200	1 in 145	0.73	1 in 14	2.4
230	1 in 175	0.93	1 in 17	2.98
250	1 in 195	1.10	1 in 19	3.60
300	1 in 250	1.70	1 in 24.5	5.30

In cases, where it is practically not possible to conform to the minimum gradients, a flatter gradient may be used but the minimum velocity in such cases shall on no account be less than 0.61 metres per second.

On the other hand, it is undesirable to employ gradients giving velocity of flow greater than 2.4 metres per second.

**PIPES AND SPECIALS**

**19.2 Glazed Stone Ware Pipes and Fittings**

All pipes with spigot and socket ends and fittings shall conform to class SP1 of IS 651. These shall be sound, free from visible defects such as fire cracks or hair cracks. The glaze of the pipes shall be free from crazing. The pipes shall give a sharp clear tone when struck with a light hammer. There shall be no broken blisters.

The length of pipes shall be 60, 75, 90 cm exclusive of the internal depth of the socket. The pipes shall be handled with sufficient care to avoid damage to them.

The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. The pipes shall be laid with socket ends facing upstream. The body of the pipe shall for its entire length rest on an even bed of concrete and places shall be

excavated in the concrete to receive the socket of the pipe. Where pipes are not bedded on concrete, the trench floor shall be left slightly high and carefully bottomed up as pipe laying proceeds, so that the pipe barrels rest on firm and undisturbed ground. If the excavation has been carried too low, the desired levels shall be made up with concrete 1:5:10 (1 cement: 5 sand: 10 graded stone aggregate 40 mm nominal size) for which no extra payment shall be made. If the floor of the trench consists of rock or very hard ground that cannot easily be excavated to smooth surface the pipe shall be laid on a levelling course of concrete as desired.

The rate shall include the cost of materials and labour involved in all the operations described above excluding the cost of, excavation, refilling, shoring and timbering in trenches, and cement concreting wherever required be paid for separately.

### 19.3 Manhole Covers

The covers and frames shall conform to IS 1726 for cast Iron and IS 12592 for pre-cast concrete covers and shall be of the following grades and types.

**TABLE 19.1**  
**Specifications of Manhole covers**

Grades	Grade Designation	Type/shape of cover
1	2	3
Light Duty	LD - 2.5	Rectangular, Square, Circular
Medium Duty Square	MD - 10	Rectangular, Circular and (for pre-cast concrete manhole covers)
Heavy Duty	HD - 20	Circular-Square, Rectangular, (Scraper Manhole)
Extra Heavy Duty	EHD - 35	Circular, Square, Rectangular, (Scraper Manhole)

Manhole covers and frame shall be manufactured from appropriate grade of grey cast iron not inferior than FG150 grade of IS 210.

They shall be cleanly cast and shall be free from air and sand holes, cold shuts and warping.

Covers shall have on its operative top a raised chequered design to provide for an adequate no-slip grip. The rise of chequers shall be not less than 4mm.

Key holes, keys and lifting devices shall be provided in the manhole covers to facilitate their placement in the frames and their operative maintenance.

Manhole covers and frames shall be coated with materials having base with a black bituminous composition. The coating shall be smooth and tenacious. It shall not flow when exposed to temperature of 63°C and shall not be so brittle as to chip off at temperature of 0°C.

Size and shape and performance requirement of manhole covers and frames shall conform to IS 1726.

The cover shall be gas tight and water tight.

The sizes of covers specified shall be taken as the clear internal dimensions of the frame.

The approximate weight of the various type of manhole covers and frames shall be as per IS 1726.

The cover shall be capable of easy opening and closing and it shall be fitted in the frame in workmanship like manner.

## 19.4 Manholes

At every change of alignment, gradient or diameter of a drain, there shall be a manhole or inspection chamber. Bends and junctions in the drains shall be grouped together in manhole as far as possible. The maximum distance between manholes shall be 30 m.

Manholes of different types and sizes as specified shall be constructed in the sewer line at such places and to such levels and dimensions as shown in the drawings or as directed by the Engineer-in-Charge. The size specified shall indicate the inside dimensions between brick faces of the manholes.

Where the diameter of the drain is increased, the crown of the pipe shall be fixed at the same level and necessary slope given in the invert of the manhole chamber. In exceptional cases and where unavoidable, the crown of the branch sewer may be fixed at lower level but in such cases the peak flow level of the two sewers shall be kept the same.

Sewers of unequal sectional area shall not be jointed at the same invert in a manhole. The invert of the smaller sewer at its junction with main shall be at least  $\frac{2}{3}$  the diameter of the main above the invert of the main. The branch sewers shall deliver sewage in the manhole in the direction of main flow and the junction must be made with care so that flow in main is not impeded.

No drain from house fittings, e.g. gully trap or soil pipe, etc. to manhole shall normally exceed a length of 6 m unless it is unavoidable.

Manholes  $90 \times 80$  cm are generally constructed within compound for house drainage only and near the buildings for house drainage. Manholes  $1.2 \text{ m} \times 90$  cm are generally constructed for main drainage work for depths less than 1.5 m.

Manhole  $1.4 \text{ m} \times 90$  cm is of the arched type and is generally constructed for main drainage works where depth is 1.50 m or more. The width of manholes shall be increased more than 90 cm on bends or junctions or pipes with diameter greater than 450 mm and that the benching width on either side of the channel is minimum 20 cm.

Manholes 1.4 m internal diameter are generally constructed for main drainage works where depth is 2.45 m or more as an alternative to manholes of arch type. The diameter shall be increased suitably, for pipes with diameter greater than 450 mm in the same manner as in the case of rectangular manholes.

Before deciding size of manholes, Local Municipal Bye Laws shall be consulted.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
19.1		Glazed stoneware pipes SP-1	Providing, laying and jointing glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 sand) including testing of joints etc. complete : Excavation to be paid seperately		
	19.1.1	100 mm dia	100 mm diameter	metre	195.00
	19.1.2	150 mm dia	150 mm diameter	metre	260.00
	19.1.3	200 mm dia	200 mm diameter	metre	337.00
	19.1.4	230 mm dia	230 mm diameter	metre	461.00
	19.1.5	250 mm dia	250 mm diameter	metre	507.00
	19.1.6	300 mm dia	300 mm diameter	metre	680.00
19.2		Cement concrete 1:5:10 all-round S.W. pipes	Providing and laying cement concrete 1:5:10 (1 cement : 5 sand : 10 graded stone aggregate 40 mm nominal size) all-round S.W. pipes including bed concrete as per standard design:		
	19.2.1	100 mm dia	100 mm diameter S.W. pipe	metre	475.00
	19.2.2	150 mm dia	150 mm diameter S.W. pipe	metre	580.00
	19.2.3	200 mm dia	200 mm diameter S.W. pipe	metre	677.00
	19.2.4	230 mm dia	230 mm diameter S.W. pipe	metre	728.00
	19.2.5	250 mm dia	250 mm diameter S.W. pipe	metre	782.00
	19.2.6	300 mm dia	300 mm diameter S.W. pipe	metre	877.00
19.3		Cement concrete 1:5:10 upto haunches of S.W. pipes	Providing and laying cement concrete 1:5:10 (1 cement : 5 sand : 10 graded stone aggregate 40 mm nominal size) upto haunches of S.W. pipes including bed concrete as per standard design :		
	19.3.1	100 mm dia	100 mm diameter S.W. pipe	metre	226.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	19.3.2	150 mm dia	150 mm diameter S.W. pipe	metre	366.00
	19.3.3	200 mm dia	200 mm diameter S.W. pipe	metre	430.00
	19.3.4	230 mm dia	230 mm diameter S.W. pipe	metre	465.00
	19.3.5	250 mm dia	250 mm diameter S.W. pipe	metre	500.00
	19.3.6	300 mm dia	300 mm diameter S.W. pipe	metre	577.00
19.4		Unplasticised PVC pipe Below ground	Providing and laying below ground unplasticised PVC pipe to with stand working pressure of 4 kg/cm <sup>2</sup> soild waste pipes confirming to IS:13592 and IS:4985 including jointing with seal ring confirming to IS :5282 leaving 10mm gap for thermal expansion all necessary fittings etc. complete. Excavation to be paid seperataly.		
	19.4.1	110 mm dia	110 mm diameter OD (min. wall thickness 3.2mm)	metre	234.00
	19.4.2	160 mm dia	160 mm diameter OD (min. wall thickness 4.0mm)	metre	477.00
	19.4.3	200 mm dia	200 mm diameter OD (min. wall thickness 4.9mm)	metre	751.00
	19.4.4	250 mm dia	250 mm diameter OD (min. wall thickness 6.2mm)	metre	972.00
	19.4.5	300 mm dia	300 mm diameter OD (min. wall thickness 7.7mm)	metre	1232.00
19.5		Cement concrete 1:3:6 all-round unplasticised PVC pipes	Providing and laying cement concrete 1:3:6 (1 cement: 3sand: 6 graded stone aggregate 20 mm nominal size) all-round PVC. pipes including bed concrete as per standard design:		
	19.5.1	110 mm dia	110 mm diameter PVC. pipe	metre	576.00
	19.5.2	160 mm dia	160 mm diameter PVC. pipe	metre	704.00
	19.5.3	200 mm dia	200 mm diameter PVC. pipe	metre	821.00
	19.5.4	250 mm dia	250 mm diameter PVC. pipe	metre	949.00
	19.5.5	300 mm dia	300 mm diameter PVC pipe	metre	1078.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
19.6		Cement concrete 1:3:6 up to haunches of unplasticised PVC pipes or HDPE DWC pipes	Providing and laying cement concrete 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) up to haunches of PVC. pipes including bed concrete as per standard design :		
	19.6.1	110 mm dia	110 mm diameter PVC. pipe	metre	274.00
	19.6.2	160 mm dia	160 mm diameter PVC. pipe	metre	444.00
	19.6.3	200 mm dia	200 mm diameter PVC. pipe	metre	521.00
	19.6.4	250 mm dia	250 mm diameter PVC. Pipe	metre	607.00
	19.6.5	300 mm dia	300 mm diameter PVC pipe	metre	700.00
19.7		S.W. gully trap	Providing and fixing square-mouth S.W. gully trap class SP1 complete with C.I. grating brick masonry chamber with water tight C.I. cover with frame of 300 x300 mm size (inside) the weight of cover to be not less than 4.50 kg and frame to be not less than 2.70kg as per standard design :		
	19.7.1	100X100mm	100x100 mm size P type		
	19.7.1.1	Well burnt bricks	With well burnt bricks	each	1764.00
	19.7.1.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	1668.00
	19.7.2	150 x 100 mm	150 x 100 mm size P type.		
	19.7.2.1	Well burnt bricks	With well burnt bricks	each	1803.00
	19.7.2.2	Sewer bricks	With sewer bricks conforming to IS : 4885	each	1707.00
	19.7.3	180x150 mm	180x150 mm size P type		
	19.7.3.1	Well burnt bricks	With well burnt bricks	each	1913.00
	19.7.3.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	1818.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
19.8		R.C.C. pipes	Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 sand) including testing of joints etc. complete :		
	19.8.1	100 mm dia	100 mm dia. R.C.C. pipe	metre	243.00
	19.8.2	150 mm dia	150 mm dia. R.C.C. pipe	metre	285.00
	19.8.3	250 mm dia	250 mm dia. R.C.C. pipe	metre	385.00
	19.8.4	300 mm dia	300 mm dia. R.C.C. pipe	metre	480.00
	19.8.5	450 mm dia	450 mm dia. R.C.C. pipe	metre	699.00
	19.8.6	500 mm dia	500 mm dia. R.C.C. pipe	metre	826.00
	19.8.7	600 mm dia	600 mm dia. R.C.C. pipe	metre	1278.00
19.9		Rectangular manhole	Constructing brick masonry manhole in cement mortar 1:4 ( 1 cement : 4 sand ) R.C.C. top slab with Cement Concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size), foundation concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) inside plastering 12mm thick with cement mortar 1:3 (1 cement : 3 sand) finished with floating coat of neat cement and making channels in cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement complete as per standard design		
	19.9.1	90X80 cm	Inside size 90x80 cm and 45 cm deep including C.I. cover with frame (light duty) 455x610 mm internal dimensions total weight of cover and frame to be not less than 38 kg (weight of cover 23 kg and weight of frame 15 kg) :		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	19.9.1.1	Well burnt bricks	With well burnt bricks	each	7997.00
	19.9.1.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	7747.00
	19.9.2	120x90 cm	Inside size 120x90 cm and 90 cm deep including C.I. cover with frame (medium duty) 500 mm internal diameter, total weight of cover and frame to be not less than 116 kg (weight of cover 58 kg and weight of frame 58 kg) :		
	19.9.2.1	Well burnt bricks	With well burnt bricks	each	18086.00
	19.9.2.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	17402.00
	19.9.3	120x90 cm	Inside size 120x90 cm and 90 cm deep including C.I. cover with frame (heavy duty) 560 mm internal diameter, total weight of cover and frame to be not less than 208 kg (weight of cover 108 kg and weight of frame 100 kg) :		
	19.9.3.1	Well burnt bricks	With well burnt bricks	each	21816.00
	19.9.3.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	21228.00
19.10		Extra depth for manholes	Extra for depth for manholes		
	19.10.1	90x80 cm	Size 90x80 cm		
	19.10.1.1	Well burnt bricks	With well burnt bricks	metre	6176.00
	19.10.1.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	metre	5448.00
	19.10.2	120x90 cm	Size 120x90 cm		
	19.10.2.1	Well burnt bricks	With well burnt bricks	metre	7380.00
	19.10.2.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	metre	6512.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
19.11		Manhole circular 0.91m deep	Constructing brick masonry circular type manhole 0.91m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement : 4 sand), inside cement plaster 12 mm thick with cement mortar 1:3 (1 cement : 3 sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 mix(1 cement : 3 sand : 6 graded stone aggregate 40mm nominal size), and making necessary channel in cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement all complete as per standard design : 0.91 m deep with S.F.R.C. cover and frame (heavy duty, HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg., fixed in cement concrete 1:2:4 (1cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) including centering shuttering all complete. (Foot rests and 12mm thick cement plaster atthe external surface shall be paid for separately) :		
	19.11.1	Well burnt bricks	With well burnt bricks	each	8418.00
	19.11.2	Sewer bricks	With Sewer bricks conforming to IS : 4885	each	7958.00
19.12		Extra depth beyond 0.9 depth for manhole circular type 0.91m dia	Extra depth for circular type manhole 0.91m internal dia (at bottom) beyond 0.91m to 1.67m		
	19.12.1	Well burnt bricks	With well burnt bricks	metre	5257.00
	19.12.2	Sewer bricks	With Sewer bricks conforming IS : 4885	metre	4648.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
19.13		Brick masonry manhole circular 1.22m dia 1.68 m deep	Constructing brick masonry circular manhole 1.22m internal dia at bottom and 0.56m dia at top in cement mortar 1:4 (1 cement :4 sand) inside cement plaster 12mm thick with cement mortar 1:3 (1 cement :3 sand) finished with a floating coat of neat cement foundationconcrete 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1cement : 2 sand : 4 graded stoneaggregate 20mm nominal size) finished with a floating coat of neat cement all complete as per standard design : 1.68 m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182kg. fixed in cement concrete1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) including centering shuttering all complete. (Foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately)		
	19.13.1	Well burnt bricks	With well burnt bricks	each	15915.00
	19.13.2	Sewer bricks	With Sewer bricks conforming IS : 4885	each	15067.00
19.14		Extra depth beyond 1.68m for circular type manhole 1.22m dia	Extra depth for circular type manhole 1.22m internal dia (at bottom) beyond 1.68 m to 2.29 m :		
	19.14.1	Well burnt bricks	With well burnt bricks	metre	6809.00
	19.14.2	Sewer bricks	With Sewer bricks conforming IS : 4885	metre	6014.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
19.15		Manhole circular 1.52 m dia	Constructing brick masonry circular manhole 1.52 m internal dia at bottom and 0.56 m dia at top in cement mortar 1:4 (1 cement : 4 sand) inside cement plaster 12mm thick with cement mortar 1:3 (1 cement : 3 sand) finished with a floating coat of neat cement, foundation concrete 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 40mm nominal size) and making necessary channel in cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) finished with a floating coat of neat cement all complete as per standard design :		
	19.15.1	2.30m deep	2.30m deep with SFRC Cover and frame (heavy duty HD-20 grade designation) 560mm internal diameter conforming to I.S. 12592, total weight of cover and frame to be not less than 182 kg. fixed in cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20mm nominal size) including centering shuttering all complete. (Foot rests and 12 mm thick cement plaster at the external surface shall be paid for separately) :		
	19.15.1.1	Well burnt bricks	With well burnt bricks	each	35165.00
	19.15.1.2	Sewer bricks	With Sewer bricks conforming IS : 4885	each	32659.00
19.16		Extra depth beyond 2.3m depth for manhole circular type 1.52 m dia	Extra depth for circular type manhole 1.52 m internal dia (at bottom) beyond 2.30 m :		
	19.16.1	Well burnt bricks	With well burnt bricks	metre	16863.00
	19.16.2	Sewer bricks	With Sewer bricks conforming IS : 4885	metre	14806.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
19.17		M.S. foot rests	Providing M.S. foot rests including fixing in manholes with 20x20x10 cm cement concrete blocks 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) as per standard design :		
	19.17.1	20x20 mm MS bar	With 20x20 mm square bar	each	226.00
	19.17.2	20 mm dia MS bar	With 20 mm diameter round bar	each	187.00
19.18		Orange colour safety foot rest	Providing orange colour safety foot rest of minimum 6 mm thick plastic encapsulated as per IS : 10910 on 12mm dia steel bar conforming to IS : 1786 having minimum cross section as 23 mmx25mm and over all minimum length 263 mm and width as 165mm with minimum 112 mm space between protruded legs having 2 mm tread on top surface by ribbing or chequering besides necessary and adequate anchoring projections on tail length on 138 mm as per standard drawing and suitable to withstand the bend test and chemical resistance test as per specifications and having manufacture's permanent identification mark to be visible even after fixing, including fixing in manholes with 30x20x15 cm cement concrete block 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size) complete as per design.	each	266.00
19.19		Replacement of M.S. foot rests	Replacement of M.S. foot rests in manholes including dismantling concrete blocks and fixing with 20x20x10 cm cement concrete blocks 1:3:6 (1 cement : 3 sand : 6 graded stone aggregate 20 mm nominal size):		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	19.19.1	20x20 mm MS sq. bar	With 20x20 mm square bar	each	254.00
	19.19.2	20 mm dia MS round bar	With 20 mm diameter round bar	each	214.00
19.20		C.I. cover without frame	Supplying and fixing C.I. cover without frame for manholes :		
	19.20.1	455x610 mm light duty	455x610 mm rectangular C.I. cover (light duty) the weight of the cover to be not less than 23 kg.	each	1437.00
	19.20.2	500 mm dia medium duty	500 mm diameter C.I. cover (medium duty) the weight of the cover to be not less than 58 kg.	each	3134.00
	19.20.3	560 mm dia heavy duty	560 mm diameter C.I. cover (heavy duty) the weight of the cover to be not less than 108 kg.	each	6333.00
19.21		Precast R.C.C. manhole cover	Providing and fixing in position precast R.C.C. manhole cover and frame of required shape and approved quality		
	19.21.1	Light duty	Light duty D- 2.5		
	19.21.1.1	Rectangular 600x450mm	Rectangular shape 600x450mm internal dimensions	each	1229.00
	19.21.1.2	Square 450mm	Square shape 450mm internal dimensions	each	1045.00
	19.21.1.3	Circular 450mm	Circular shape 450mm internal diameter	each	987.00
	19.21.2	Medium duty	Medium duty - 10		
	19.21.2.1	Square 450mm	Square shape 450mm internal dimension	each	1183.00
	19.21.2.2	Circular 500mm	Circular shape 500mm internal diameter	each	1098.00
	19.21.3	Heavy duty	Heavy duty D - 20		
	19.21.3.1	Circular	Circular shape 560 mm internal diameter	each	1711.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	19.21.4	Extra Heavy Duty	Extra Heavy Duty - 35		
	19.21.4.1	Circuitlar 560mm dia	Circular shape 560 mm internal dia.	each	1885.00
19.22		C.I. cover 300x300 mm	Supplying and fixing C.I. cover 300x300 mm without frame for gully trap (standard pattern) the weight of cover to be not less than 4.5kg.	each	274.00
19.23		Connection of drain with existing manhole	Making connection of drain or sewer line with existing manhole including breaking into and making good the walls, floors with cement concrete 1:2:4 mix (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size) cement plastered on both sides with cement mortar 1:3 (1 cement : 3 sand) finished with a floating coat of neat cement and making necessary channels for the drain etc. complete :		
	19.23.1	100 to 230 mm dia	For pipes 100 to 230 mm diameter	each	238.00
	19.23.2	250 to 300 mm dia	For pipes 250 to 300 mm diameter	each	292.00
	19.23.3	350 to 450 mm dia	For pipes 350 to 450 mm diameter	each	424.00
19.24		Sand cast iron drop connection	Providing sand cast iron drop connection externally for 60 cm drop from branch sewer line to main sewer manhole including inspection and cleaning eye with chain and lid, sand cast iron drop pipe and bend encased all-round with cement concrete 1:5:10 (1 cement : 5 sand : 10 graded stone aggregate 40 mm nominal size) with all centering and shuttering required, cutting holes in walls and making good with brick work in cement		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			mortar 1:4 (1 cement : 4 sand) plastered with cement mortar 1:3 (1 cement : 3 sand) on inside of the manhole wall lead caulked joints between sand cast iron pipes and fittings, stiff cement mortar 1:1 (1 cement : 1 sand) joints between sand cast iron tee and S.W. pipe, making required channels complete as per standard design and specifications :		
	19.24.1	100 mm dia	100 mm dia. sand cast iron drop connection	each	4915.00
	19.24.2	150 mm dia	150 mm dia. sand cast iron drop connection	each	6856.00
19.25		Extra for depths of sand cast iron drop	Extra for depths beyond 60 cm of sand cast iron drop connection complete :		
	19.25.1	100 mm dia	For 100 mm dia. sand cast iron drop connection	metre	2092.00
	19.25.2	150 mm dia	For 150 mm dia. sand cast iron drop connection	metre	2399.00
19.26		Raising manhole cover and frame	Raising manhole cover and frame slab to required level including dismantling existing slab and making good the damage as required (Brick work for Raising depth of manhole to be paid separately) :		
	19.26.1	Rectangular 90x80 cm Light duty	Rectangular manhole 90x80 cm with rectangular cover 600x450 mm of grade LD - 2.5	each	1126.00
	19.26.2	Rectangular 120x90 cm Medium duty	Rectangular manhole 120x90cm with circular cover 500 mm dia of grade MD - 10	each	1758.00
	19.26.3	Rectangular 120x90 cm Heavy duty	Rectangular manhole 120x90cm with circular cover 560 mm dia of grade HD - 20	each	1638.00
	19.26.4	Circular 140 cm dia Extra heavy duty	Circular manhole 140 cm dia with circular cover 600 mm dia of grade Extra heavy duty HD - 35	each	167.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
19.27		Road gully chamber 50x45x60cm	Constructing brick masonry road gully chamber 50x45x60cm with bricks in cement mortar 1:4 (1 cement : 4 sand) including 500x450 mm precast R.C.C. horizontal grating with frame complete as per standard design :		
	19.27.1	Well burnt bricks	With well burnt bricks	each	3941.00
	19.27.2	Fly ash bricks	With fly ash bricks 100 key/cm <sup>2</sup> strength	each	4900.00
19.28		Road gully chamber 45x45x77.5cm	Constructing brick masonry road gully chamber 45x45x77.5cm with bricks in cement mortar 1:4 (1 cement : 4 sand) with precast R.C.C. vertical grating complete as per standard design :		
	19.28.1	Well burnt bricks	With well burnt bricks	each	4910.00
	19.28.2	Fly ash bricks	With fly ash bricks 100 kg/cm <sup>2</sup> strength	each	6983.00
19.29		Road gully chamber 110x50x77.5cm	Constructing brick masonry road gully chamber 110x50x77.5cm with bricks in cement mortar 1:4 (1 cement : 4 sand) including 500x450 mm precast R.C.C. horizontal grating with frame and vertical grating complete as per standard design :		
	19.29.1	Well burnt bricks	With well burnt bricks	each	6285.00
	19.29.2	Fly ash bricks	With fly ash bricks 100 kg/cm <sup>2</sup> strength	each	6485.00
19.30		Soak pit circular	Making soak pit 2.5 m diameter 3.0 metre deep with 45 x 45 cm dry brick honey comb shaft with bricks of class designation 75 and S.W. drain pipe 100 mm diameter, 1.8 m long complete as per standard design.		
	19.30.1	Well burnt bricks	With well burnt bricks	each	20609.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
19.31		Soak pit square	Constructing soak pit 1.20x1.20x1.20m filled with brickbats including S.W. drain pipe 100 mm diameter and 1.20m long complete as per standard design.	each	3172.00
19.32		S.W. intercepting trap	Providing and fixing S.W. intercepting trap in manholes with stiff mixture of cement mortar 1:1 (1 cement : 1 sand) including testing of joints etc. complete :		
	19.32.1	100 mm dia	100 mm dia	each	298.00
	19.32.2	150 mm dia	150 mm dia	each	411.00
19.33		Half round glazed stoneware pipes	Providing, laying and jointing half round glazed stoneware pipes class SP-1 with stiff mixture of cement mortar in the proportion of 1:1 (1 cement : 1 sand) including testing of joints etc. complete : Excavation to be paid seperately		
	19.33.1	100 mm dia	100 mm dia	metre	163.00
	19.33.2	150 mm dia	150 mm dia	metre	221.00
	19.33.3	200 mm dia	200 mm dia	metre	284.00
	19.33.4	230 mm dia	230 mm dia	metre	386.00
	19.33.5	250 mm dia	250 mm dia	metre	422.00
	19.33.6	300 mm dia	300 mm dia	metre	552.00
19.34		Half round RCC pipes	Providing and laying half round RCC pipes class (light duty) with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 sand) including testing of joints etc. complete : Excavation to be paid seperately		
	19.34.1	100 mm dia	100 mm dia. Half round R.C.C. pipe	metre	196.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
	19.34.2	150 mm dia	150 mm dia. Half round R.C.C. pipe	metre	233.00
	19.34.3	250 mm dia	250 mm dia. Half round R.C.C. pipe	metre	315.00
	19.34.4	300 mm dia	300 mm dia. Half round R.C.C. pipe	metre	387.00
19.35		Deduct for not providing C.I. manhole	Deduct for not provide C.I. manhole cover with frame		
	19.35.1	for item No. 19.9.1.1 & 19.9.1.2	for item No. 19.9.1.1 & 19.9.1.2	each	1975.00
	19.35.2	for item No. 19.9.2.1 & 19.9.2.2	for item No. 19.9.2.1 & 19.9.2.2	each	6185.00
	19.35.3	for item No. 19.9.3.1 & 19.9.3.2	for item No. 19.9.3.1 & 19.9.3.2	each	10454.00
19.36		Precast RCC drain cover of size 600x450 x70mm	Providing & Fixing of Precast RCC drain cover of size 600x 450 x70mm (thickness) with 4 holes, manufactured by using M-30 grade of concrete reinforced with 8mm dia Tor Steel @100mm c/c both ways, manufactured by vibro compaction process using joint less FRP moulds, so as to achieve shuttering finish on five faces @top face will have broom finish etc complete.	each	350.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
19.37		Precast RCC drain cover of size 750x600 x70mm	Providing & Fixing of Precast RCC drain cover of size 750x600 x70mm (thickness) with 6 holes, manufactured by using M-30 grade of concrete reinforced with 8mm dia Tor Steel @100mm c/c both ways, manufactured by vibro compaction process using joint less FRP moulds, so at to achieve shuttering finish on five faces @top face will have broom finish etc complete.	each	550.00
19.38		Precast RCC drain cover of size 900x450 x90mm	Providing & Fixing of Precast RCC drain cover of size 900x450 x90mm (thickness) with 8 holes, manufactured by using M-30 grade of concrete reinforced with two layers of 8mm dia Tor Steel @100mm c/c both ways, manufactured by vibro compaction process using joint less FRP moulds, so at to achieve shuttering finish on five faces @ top face will have broom finish etc complete.	each	900.00
19.39		Precast RCC drain cover of size 1150x400 x100mm	Providing & Fixing of Precast RCC drain cover of size 1150x400 x100mm (thickness) with 10 holes, manufactured by using M-30 grade of concrete reinforced with two layers of 8mm dia Tor Steel @100mm c/c both ways, manufactured by vibro compaction process using joint less FRP moulds, so at to achieve shuttering finish on five faces @top face will have broom finish etc complete.	each	1100.00
19.40		FRP/GRP composite manhole cover size 900X450mm	Supplying and fixing of FRP/GRP composite manhole cover with frame of clear opening size 900X450mm rectangular having weight of (complete unit) (weight of frame 11.7 kg + weight of cover 43.76kg ± 10%) (HD/25MT)	each	10130.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
			having load bearing capacity (Point load 25MT) as per testing code BSEN 124:1994. Having lifting arrangements should have an insertion of 5mm double sealed closed key hole and high strength plastic alloy/stainless steel socketed arrangement.		
19.41		FRP/GRP composite manhole cover size 450X600mm	Supplying and fixing of FRP/GRP composite manhole cover with frame of clear opening size 450X600mm rectangular having weight of (complete unit) (weight of frame 1.84kg + weight of cover 14.2kg $\pm$ 10%) (LD/2.5MT) having load bearing capacity (Point load 2.5MT) as per testing code BSEN 124:1994. having lifting arrangement should have an insertion of 5mm double sealed closed key hole and high strength plastic alloy/stainless steel socketed arrangement.	each	3951.00
19.42		FRP/GRP composite manhole cover size 300X300mm	Supplying and fixing of FRP/GRP composite manhole cover with frame of clear opening size 300X300mm (square) having weight of (complete unit) (weight of frame 1.12kg + weight of cover 4.1kg $\pm$ 10%) (LD/2.5MT) having load bearing capacity (Point load 2.5MT) as per testing code BSEN 124:1994. having lifting arrangement should have an insertion of 5mm double sealed closed key hole and high strength plastic alloy/stainless steel socketed arrangement.	each	2035.00
19.43		FRP/GRP composite manhole cover size 600mm round	Supplying and fixing of FRP/GRP composite manhole cover with frame of clear	each	9448.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (inRs.)
1	2	3	4	5	6
			opening size 600mm (round) having weight of (complete unit) (weight of frame 13.6kg + weight of cover 43.1kg + - 10%) (HD/25MT) having load bearing capacity (Point load 25MT) as per testing code BSEN 124:1994. having lifting arrangement should have an insertion of 5 mm double sealed closed key hole and high strength plastic alloy/stainless steel socketed arrangement		
19.44		FRP/GRP composite manhole cover size 500mm round	Supplying and fixing of FRP/GRP composite manhole cover with frame of clear opening size 500mm (round) having weight of (complete unit) (weight of frame 11.2kg + weight of cover 41.78kg ± 10%) (HD/25MT) having load bearing capacity (Point load 25MT) as per testing code BSEN 124:1994. Having lifting arrangement should have an insertion of 5mm double sealed closed key hole and high strength plastic alloy/stainless steel socketed arrangement	each	7744.00
19.45		Deductions for FRP/GRP composit manhole cover	Deduct for not providing and installing FRP/GRP manhole cover size		
	19.45.1	900mmx450mm	900mmx450mm (weight of cover 43.76kg ± 10%)	each	6999.00
	19.45.2	450mmx600mm	450mmx600mm (weight of cover 14.2kg ± 10%)	each	2617.00
	19.45.3	300mmx300mm	300mmx300mm (weight of cover 4.1kg ± 10%)	each	1113.00
	19.45.4	Size 600mm	600mm (weight of cover 41.78kg ± 10%)	each	7533.00
	19.45.5	Size 500mm round	500mm (weight of cover 43.1kg ± 10%)	each	5626.00



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (inRs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
19.46		HDPE DWC pipes below ground	Providind, laying and jointing HDPE Double Wall corrugated (DWC) pipes (excavation to be paid seperately)		
	19.46.1	100 mm dia to 110 mm dia	100 mm dia to 110 mm dia	metre	160.00
	19.46.2	150 mm dia to 160 mm dia	150 mm dia to 160 mm dia	metre	300.00
	19.46.3	200 mm dia	200 mm dia	metre	608.00
	19.46.4	250 mm dia	250 mm dia	metre	802.00
	19.46.5	300 mm dia	300 mm dia	metre	915.00

**CHAPTER – 20.0**  
**PILE WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
<b>1</b>	<b>2</b>	<b>3</b>
1	IS 1200 (Part 23)	Method of measurement of building and Civil Engineering Works
2	IS 2911 (Part 1/Sec. 1)	Code of practice for Design and Construction of pile foundation. Driven cast
3	IS 2911 (Part 1/Sec. 2)	Code of practice of Design and Construction of pile foundation. Bored Cast
4	IS 2911 (Part 1/Sec. 3)	Code of practice for Design and Construction of pile foundation. Driven pre
5	IS 2911 (Part 1/Sec. 4)	Code of practice for Design and Construction of pile foundation. Bored pre-cast concrete piles.
6	IS 2911 (Part 3)	Code of practice for Design and Construction of pile foundation. Under reamed piles.
7	IS 2911 (Part 4)	Code of practice for design and Construction of pile foundation. Load test on piles
8	IS 5112	Safety Code for piling and other deep foundations.
9	IS 6426	Specification for pile driving hammer.
10	IS 6427	Glossary of terms relating to pile driving.
11	IS 6428	Specification for pile frame.
12	IS 9716	Guide for lateral dynamic load test on piles.
13	IS 14362	Pile boring equipments. General requirements

**PREAMBLE**  
**PILE WORK**  
**(CHAPTER: 20.0)**

### 20.1 Pile Driving

**Installation of Piles:** Installation of piles shall be as accurate as possible and as per design and drawings. The vertically or the required batter should be correctly maintained. Particular care shall be taken in respect of installing either single pile or piles in two pile groups.

### 20.2 Deviation /Tolerance

- (i) The deviation/tolerance should be as per IS 2911 (Part 1/Sec.1). The piles should not deviate more than 75 mm or  $D/4$  whichever is less (75 mm or  $D/10$  whichever is more in case of piles having diameter more than 600 mm) from their designed position at the working level.
- (ii) In case of a single pile under a column, the positional deviation should not be more than 50 mm or  $D/4$  whichever is less (100 mm in case of piles having diameter more than 600 mm). Greater tolerance may be prescribed for piles driven over water and for raking piles.

**Sequence of Installation:** Normal sequence of installation of pile group is from the centre to the periphery of the group or from one side to the other. Particular care shall be taken to avoid damaging the already cast pile while driving a fresh tube nearby before the concrete has sufficiently set. The possibility of the pile getting damaged is more in compact soils than in loose soils.

### 20.3 Driving a Group of Friction Piles

- (i) The skin friction increases considerably when the pile bore is driven in the loose sand as the pile tends to compact the sand. Therefore in such cases the order of installation shall be altered so that a compact block is not created where driving further pile bore will not be possible. Similar precaution will have to be taken where stiff clay or compact sand layers will have to be penetrated.
- (ii) However driving the pile bore from centre outwards or commencing at a particular selected edge or even working across the group the problem pointed out in Para (I) above can be avoided.
- (iii) In case of very soft soil it is advisable to start driving the bore hole from outside to inside so that the soil gets restrained from flowing out during operation.

#### **20.4 Workability of Concrete for pile work:**

The minimum slump shall be 100 mm when the concrete for the piles is being vibrated and when the concrete is not vibrated the maximum permitted slump is 150mm. The degree of workability in both the cases is considered as very high

#### **20.5 Bored Cast in Situ Pile**

In case permanent/temporary casing is not used then bored pile is stabilised with drilling fluid. Bentonite supplied to site shall conform to IS 2720 (Part V). A certificate shall be obtained by the contractor from the manufacturer showing properties of each consignment and should be submitted to the Engineer-in-charge. Bentonite shall be mixed thoroughly with fresh clean water to make a suspension which will maintain the stability of the pile excavation for the period necessary to place concrete and complete construction. The temperature of the water used in mixing the bentonite suspension and when supplied to bore hole shall not be lower than 5°C. Consistency of the drilling fluid suspension and when controlled throughout the boring as well as in concreting operations in order to keep the hole stabilized as well as to avoid concrete getting mixed up with thick suspension of mud.

**Note:** - For piles in high ground water table & unstable soil condition, boring & under Reaming shall be carried out with bentonite slurry.

#### **20.6 Defective Pile**

- (i) In case defective piles are formed they shall be removed or left in place whichever is convenient without affecting performance of the adjacent piles or cap as a whole. Additional piles shall be provided to replace them as directed.
- (ii) Any deviation from the designed location alignment or load capacity of any pile shall be noted and adequate measures taken well before concreting of the pile cap and plinth beam, if the deviations are beyond permissible limit.
- (iii) During chipping of the pile, top manual chipping may be permitted after three days of pile casting pneumatic tools for chipping shall not be used before seven days after pile casting.
- (iv) After concreting the actual quantity of concrete shall be compared with average obtained from observations actually made in the case of a few piles initially cast. If the actual quantity is found to be considerably less, special investigations shall be conducted and appropriate measures taken.

#### **20.7 Pile load test**

**Test Pile:** - Pile chosen for pile load test only. It may or may not be a working pile. It can work as a working pile if routine load test is carried out on it is up to half of the safe load.

**Initial Test:** - It is done on test piles to determine the safe load or allowable load or ultimate load bearing capacity.

Trial Pile: - Minimum two initial test should be conducted and half percentage of the total number of piles used in a project must be subjected to routine test. For largely varying strata and for important structure, it is up to 2%.

### 1- Initial Load Tests on Piles

This test is performed to confirm the design load calculations and to provide guidelines for setting up the limits of acceptance for routine tests. It also gives an idea of the suitability of the piling system. Initial Test on piles are to be carried out at one or more locations depending on the number of piles required. Load applied for the initial (cyclic) load test is 2.5 times the safe carrying capacity of the pile. Loading for Initial Tests is conducted as per Appendix 'A' Clause 6.3 of IS-2911 Part IV.

### 2- Routine Load Tests on Piles

Selection of piles for the Routine Test is done based on number of piles required subject to maximum of ½% of total number of piles required. The number of tests may be increased to 2% depending on the nature / type of structure. The test load applied is 1½ times the safe carrying capacity of the pile. The Maintained load method as described in Clause 6.2 of IS-2911 (Part IV) shall be followed for loading for the Routine Tests.

### 3- Different types of pile load test

#### A- Maintained Load Test:

Load is maintained in 10 or 8 steps and maintained for some time to exact settlement.(step load test).To test a single pile at least 3 dial gauges should be used and 4 dial gauges for group piles. Loading rate is 0.1mm/hr. For clay it is 0.02mm/hr. load is maintained for at least 2hrs. safe load is maintained for 24 hrs.

#### B- Constant Rate Of Penetration:

Test generally used for soft clays and penetration is done for constant rate of 0.75mm/min.The degree of expansiveness and consequent damage to the structures with light loading may be qualitatively judged as shown below:

**TABLE 20.1**  
**Degree Of Expansiveness**

Degree of Expensiveness	Differential free swell, percent
Low	Less than 20
Moderate	20 to 35
High	35 to 50
Very high	Greater than 50

Note: In areas of soil showing high or very high differential free swell values, conventional shallow strips footings may not be adequate.

**TABLE 20.2**

**Safe Load for Vertical Bored Cast in Situ Under-Reamed Piles in Sandy and Clayey Soils Including Black Cotton Soils**

Size		Length		Mild Steel			Compression				SAFS Loads IN Uplift Resistance				Lateral Thrust	
Dia metr e of pile	under- reamed diamete r	Single under - reame d	Doubl e under - reame d	Longitudinal Reinforcement		Rings spacin g of 6mm dia rings	Single under - reame d	Doubl e under - reame d	Increas e per 30 cm Length	Decre ase per 30 cm Lengt h	Single under - reame d	Doubl e under - reame d	Increa se per 30 cm length	Decreas e per 3 cm length	Single under- reamed	Double under- reamed
				No.	Dia mm											
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
20	50	3.5	3.5	3	10	18	8	12	0.9	0.7	4	6	0.65	0.55	1.0	1.2
25	62.5	3.5	3.5	4	10	22	12	18	1.15	0.9	6	9	0.85	0.70	1.5	1.8
30	75	3.5	3.5	4	12	25	16	24	1.4	1.1	8	12	1.05	0.85	2.0	2.4
37.5	94	3.5	3.75	5	12	30	24	36	1.8	1.4	12	18	1.35	1.10	3.0	3.6
40	100	3.5	4.0	6	12	30	23	42	1.9	1.5	14	21	1.45	1.15	3.4	4.0
45	112.5	3.5	4.5	7	12	30	35	52.5	2.15	1.7	17.5	25.75	1.60	1.30	4.0	4.8
50	125	3.5	5.0	9	12	30	42	63	2.4	1.9	21	31.5	1.80	1.45	4.5	5.4

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
20.1		R.C.C. piles Driven cast-in-situ plain	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 to the bottom of pile cap) :		
	20.1.1	400 mm dia	400 mm dia piles	metre	1666.00
	20.1.2	450 mm dia	450 mm dia piles	metre	2061.00
	20.1.3	500 mm dia	500 mm dia piles	metre	2503.00
	20.1.4	550 mm dia	550 mm dia piles	metre	2737.00
	20.1.5	750 mm dia	750 mm dia piles.	metre	3519.00
	20.1.6	1000 mm dia	1000 mm dia piles.	metre	7787.00
	20.1.7	1200 mm dia	1200 mm dia piles.	metre	10154.00
	20.1.8	1500 mm dia	1500 mm dia piles.	metre	14472.00
20.2		RCC pile Bored cast-in-situ plain with temporary casing	Boring, providing and installation bored cast-in-situ reinforced cement concrete piles of grade M-25 of specified diameter and length below the pile cap, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and temporary casing of appropriate length for setting out and removal of same and the length of the pile to be embedded in the pile cap etc. by percussion drilling using Direct mud circulation (DMC) or Bailer and chisel technique by tripod and		



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			mechanical Winch Machine all complete, including removal of excavated earth with all its lifts and leads (length of pile for payment shall be measured up to bottom of pile cap). <b>Note:</b> Truck Mounted rotary/TMR/Tubewell boring machine shall not be used.		
	20.2.1	300 mm dia	300 mm dia piles	metre	901.00
	20.2.2	400 mm dia	400 mm dia piles	metre	1209.00
	20.2.3	450 mm dia	450 mm dia piles	metre	1375.00
	20.2.4	500 mm dia	500 mm dia. piles	metre	1617.00
	20.2.5	600 mm dia	600 mm dia piles	metre	2203.00
	20.2.6	750 mm dia	750 mm dia piles.	metre	3395.00
	20.2.7	1000 mm dia	1000 mm dia piles.	metre	6168.00
	20.2.8	1200 mm dia	1200 mm dia piles.	metre	8466.00
	20.2.9	1500 mm dia	1500 mm dia piles.	metre	12725.00
20.3		RCC piles cast in situ single under reamed boring with bentonite	Boring with hydraulic piling rigs with power units, providing and installing cast in situ single under reamed piles of specified diameter and length below pile cap in M-25 cement concrete, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring with bentonite solution and the length of the pile to be embedded in pile cap etc. all complete. (Length of pile for payment shall be measured upto to the bottom of pile cap) :		
	20.3.1	300 mm dia	300 mm dia piles.	metre	1893.00
	20.3.2	400 mm dia	400 mm dia piles	metre	2316.00
	20.3.3	450 mm dia	450 mm dia piles	metre	2568.00
	20.3.4	550 mm dia	550 mm dia piles	metre	2867.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
20.4		R.C.C. piles additional bulb in under reamed piles	Extra over item No. 20.3 for providing additional bulb in under reamed piles, under specified diameter (Only the quantity of extra bulbs are to be paid).		
	20.4.1	300 mm dia	300mm dia piles.	each	1379.00
	20.4.2	400 mm dia	400mm dia piles.	each	1567.00
	20.4.3	450 mm dia	450 mm dia piles.	each	1679.00
	20.4.4	550 mm dia	550 mm dia piles.	each	1849.00
20.5		R.C.C. piles driven Pre-cast	Providing, driving (with vibrating pile driving hammer complete with power units & accessories) and installing driven Pre-cast reinforced cement concrete piles of specified diameter and length below the pile cap in M-25 cement concrete to carry safe working load not less than specified with a central through preformed hole with M.S. black pipe of dia, 40 mm for grouting with cement sand grouting of mix 1:2 (1cement : 2 coarse sand) under sufficient positive pressure to ensure complete filling including centring, shuttering, driving and removing the steel casing pipe and lifting casing etc. complete but excluding the cost of steel reinforcement. (Length of pile for payment shall be measured from top of the shoe to the bottom of pile cap).		
	20.5.1	400 mm dia	400 mm dia piles.	metre	2273.00
	20.5.2	450 mm dia	450 mm dia piles.	metre	2826.00
	20.5.3	500 mm dia	500 mm dia piles.	metre	3031.00
	20.5.4	550 mm dia	550 mm dia piles.	metre	3460.00
	20.5.5	750 mm dia	750 mm dia piles.	metre	6651.00
	20.5.6	1000 mm dia	1000 mm dia piles.	metre	9160.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
20.6		R.C.C. piles vertical load testing	Vertical load testing of piles in accordance with IS 2911 (Part IV) including installation of loading platform and preparation of pile head or construction of test cap and dismantling of test cap after test etc. complete as per specification and the direction of Engineer in-Charge. <b>Note:</b> 1. Initial and Routine Load Test shall not be carried out by Dynamic method of testing. <b>Note:</b> 2. Testing agency shall submit the design of loading platform for the approval of Engineer-in-charge.		
	20.6.1	Single pile (upto 50T)	Single pile upto 50 tonne capacity		
	20.6.1.1	Initial test.	Initial test.	per test	38562.00
	20.6.1.2	Routine test	Routine test	per test	17423.00
	20.6.2	Single pile (> 50T)	Single pile above 50 tonne and upto 100 tonne capacity		
	20.6.2.1	Initial test	Initial test	per test	46808.00
	20.6.2.2	Routine test.	Routine test.	per test	26715.00
	20.6.3	Group pile (upto 50T)	Group of two or more piles upto 50 tonne capacity		
	20.6.3.1	Initial test	Initial test	per test	56333.00
	20.6.3.2	Routine test	Routine test	per test	34264.00
20.7		R.C.C. piles cyclic vertical load testing	Cyclic vertical load testing of pile in accordance with IS Code of practice IS: 2911 (part IV) including preparation of pile head etc for:		
	20.7.1	Single pile.	Single pile.		
	20.7.1.1	Upto 50 T	Upto 50 tonne capacity pile.	per test	17423.00
	20.7.1.2	> 50T	Above 50 tonne and upto 100 tonne capacity pile.	per test	26715.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	20.7.2	Group pile	Group of two piles.		
	20.7.2.1	upto 50 T	Upto 50 tonne capacity each.	per test	34264.00
20.8		R.C.C.Pile lateral load testing of single	Lateral load testing of single pile in accordance with IS Code of practice IS : 2911 (Part IV) for determining safe allowable lateral load on pile :		
	20.8.1	Upto 50 T	Upto 50 tonne capacity pile.	per test	17423.00
	20.8.2	> 50T	Above 50 tonne and upto 100 tonne capacity pile.	per test	26715.00
20.9		R.C.C. pile Integrity testing	Integrity testing of Pile using Low Strain/ Sonic Integrity Test/ Sonic Echo Test method in accordance with IS 14893 including surface preparation of pile top by removing soil, mud, dust and chipping lean concrete lumps etc. and use of computerised equipment and high skill trained personal for conducting the test and submission of results, all complete as per direction of Engineer-in-Charge. <b>Note :-</b> The inclusion of the above item in the schedule of work shall be judiciously decided by the technical sanctioning authority, keeping in view the quality control, type of soil strata & importance of the project	per test	897.00
20.10		Single under reamed piles of specified diameter and length below pile cap	Boring, Providing and installing cast in situ single under reamed piles of specified diameter and length below pile cap in M 25 cement concrete, to carry a safe working load not less than specified, excluding the cost of steel reinforcement but including the cost of boring, cement concrete and the length of the pile to be embedded in pile cap etc. all complete. (Length of pile for payment shall be measured		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			upto to the bottom of pile cap) : <b>Note:</b> - The minimum grade of concrete to be used for piling shall be M-20 and the minimum cement content shall be 400 kg/m <sup>3</sup> in all condition.		
	20.10.1	250 mm dia	250 mm diameter piles	metre	516.00
	20.10.2	300 mm dia	300 mm diameter piles	metre	644.00
	20.10.3	400 mm dia	400 mm diameter piles	metre	941.00
	20.10.4	450 mm dia	450 mm diameter piles	metre	1129.00
	20.10.5	600 mm dia	600 mm diameter piles	metre	1794.00
20.11		Extra for providing blub	Extra for providing bulb for item no.20.10		
	20.11.1	250 mm dia	250 mm diameter	each	419.00
	20.11.2	300 mm dia	300 mm diameter	each	657.00
	20.11.3	400 mm dia	400 mm diameter piles	each	1437.00
	20.11.4	450 mm dia	450 mm diameter piles	each	2076.00
	20.11.5	600 mm dia	600 mm diameter piles	each	4707.00

**CHAPTER – 21.0**  
**ALUMINIUM WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

S.No.	I.S. No.	Subject
1	2	3
1.	IS 733	Wrought Aluminium and Aluminium Alloys, Bars, Rods and Sections (For General Engineering Purposes)
2.	IS 737	Wrought Aluminium and Aluminium alloy sheet and strip for general engineering purposes
3.	IS 1285	Wrought Aluminium and Aluminium Alloy, Extruded Round Tube and Hollow sections (For General Engineering Purposes)
4.	IS 1868	Anodic coating on Aluminium and its Alloys-Specification
5.	IS 1948	Specification for Aluminium Doors, Windows and Ventilators
6.	IS 3908	Specification for Aluminium equal leg angles
7.	IS 3909	Specification for Aluminium unequal leg angles
8.	IS 3965	Dimensions for wrought Aluminium and Aluminium Alloys bars, rods and sections
9.	IS 5523	Method of testing anodic coating on aluminium and its alloys.
10.	IS 6012	Measurement of coating thickness by Eddy Current Method
11.	IS 6315	Floor springs (Hydraulically regulated) for heavy doors-Specifications
12.	IS 6477	Dimensions of extruded hollow section and tolerances
13.	IS 12823	Wood products- Pre-laminated particle board -Specifications
14.	IS 14900	Transparent Float glass- Specifications

**PREAMBLE**  
**ALUMINIUM WORK**  
**(CHAPTER: 21.0)**

### **21.1 Aluminium Sections**

Aluminium sections used for fixed/openable windows, ventilators, partitions, frame work and doors etc. shall be suitable for use to meet architectural designs to relevant works and shall be subject to approval of the Engineer-in-Charge for technical, structural, functional and visual considerations. The aluminium extruded sections shall conform to IS 733 and IS 1285 for chemical composition and mechanical properties. The stainless steel screws shall be of grade AISI 304. The permissible dimensional tolerances of the extruded sections shall be as per IS 6477 and shall be such as not to impair the proper and smooth functioning/operation and appearance of door and windows. Aluminium glazed doors, windows etc. shall be of sizes, sections and details as shown in the drawings. The details shown in the drawings may be varied slightly to suit the standards adopted by the manufacturers of the aluminium work, with the approval of Engineer-in-Charge. Before proceeding with any fabrication work, the contractor shall prepare and submit, complete fabrication and installation drawings for each type of glazing doors, windows, ventilators and partition etc. for the approval of the Engineer-in-Charge. If the sections are varied, the contractor shall obtain prior approval of Engineer-in-Charge and nothing extra shall be paid on this account.

### **21.2 Powder Coating**

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

### **21.3 Performance Requirements for the Finish**

- (i) **Surface appearance:** The finish on significant surfaces shall show no scratches when illuminated and is examined at an oblique angle, no blisters, craters; pinholes or scratches shall be visible from a distance of about 1 m. There shall not be any visible variation in the colour of finished surfaces of different sections and between the colours of different surfaces of same section.
- (ii) **Adhesion:** When a coated test piece is tested using a spacing of 2 mm between each of the six parallel cuts (the cut is made through the full depth of powder coating so that metal surface is visible) and a piece of adhesive tape, approximately 25 mm x 150 mm approved by the Engineer-in-Charge is applied firmly to the cut area and then removed rapidly by pulling at right angles to the test area, no pieces of the finish other than debris from the cutting operation shall be removed from the surface of the finish.

### **21.4 PANELING MATERIAL**

Physical and Mechanical Properties of paneling material are given in the as under:



**TABLE 21.1**  
**Physical and Mechanical Properties**

Sl.No.	Properties	Flat Pressed Three Layer, Multilayer and Graded	
		Grade-I	Grade-II
(i)	Density variation (Max.) Percent	+ 10	+ 10
(ii)	Water absorption (Max )		
	(a) 2 hours	7.0	15.0
	(b) 24 hours	15.0	30.0
(iii)	Thickness swelling (Max.), percent, 2 hours	5.0	8.0
(iv)	Modulus of rupture (Min) N/mm <sup>2</sup>		
	(a) Up to 20 mm thickness	15.0	11.0
	(b) Above 20 mm thickness	12.5	11.0
(v)	Tensile strength perpendicular to surface (Min.) N/m <sup>2</sup>		
	(a) Up to 20 mm thickness	0.45	0.3
	(b) Above 20 mm thickness	0.4	0.3
(vi)	Tensile strength perpendicular to surface (Min.) N/mm <sup>2</sup>		
	(a) After cyclic test*	0.2	-
	(b) After accelerated water resistance test**	0.15	-
(vii)	Screw withdrawal strength (Min.), N:		
	(a) Face	1250	1250
	(b) Edge	850	750
(viii)	Abrasion resistance (Min.) in number of revolutions		
	(a) Type I	450	450
	(b) Type II	250	250
	(c) Type III	80	80

Drying in air at  $27 \pm 2^\circ\text{C}$  for 24 hours and then heating in dry air at  $70^\circ\text{C}$  for 72 hours. Three such cycles are to be followed and then specimens are tested for tensile strength perpendicular to the surface.

**\*\* Accelerated Water Resistance Test:** Specimens are immersed in water at  $27 \pm 2^\circ\text{C}$  and water is brought to boiling and kept at boiling temperature for two hours. Specimens are then cooled in water to  $27 \pm 2^\circ\text{C}$  and tested for tensile strength perpendicular to the surface.

### 21.5 Float Glass

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

**Allowable Defects:** The allowable defects shall be as per Table below

**TABLE 21.2**  
**Specifications for Glass**

S.No.	Defects	Central	Outer	Remarks
1.	Gaseous inclusion. Max size, mm	3.0	6.0	Separated by at least 30.0 cm
2.	Opaque gaseous inclusion. Max size. Mm	3.0	6.0	Separated by at least 60.0 cm
3.	Knots, dirt and stones, Max size. mm	1.0	1.0	Separated by at least 30.0 cm
4.	Scratches, Rubs and Crush	Faint	Light	Separated by at least 30.0 cm
5.	Bow, percent. Max	0.5	0.5	See 21.2.4.3
6.	Reams, Strings and lines	Light	Light	See 21.2.4.4
7.	Waviness	Nil	Nil	See 21.2.4.5
8.	Sulphur stains	Nil		
9.	Corner breakage and chip	Not more than nominal thickness of float glass		

**21.6 Scratches, Rubs and Crush (Float Glass):**

Place the sample of float glass in a vertical position approximately 50 cm from the viewer's position and look through it using either day light without direct sunlight or a background light suitable for observing each type of defect.

**21.7 Bow**

Depending on the side on which bow is present, stand the sample vertically on a wooden plank. Stretch a thread edge to edge. Measure the longest perpendicular. Distance from the thread to the surface of float glass facing the thread and express it as percentage of the length of float glass from edge along the thread.

**21.8 EPDM- Gaskets**

The EPDM gasket shall meet the requirements as given in Table below

**Table - 21.3**  
**Standards : EDPM Gaskets**

S. No.	Description	Standard Follow	Specification
1	Tensile strength Kg.f/cm <sup>2</sup>	ASTM-D 412	70 Min.
2	Elongation at break %	ASTM-D 412	250 Min.
3	Modulus 100% Kgf/cm <sup>2</sup>	ASTM-D 412	22 Min.
4	Compression set % at 0° CC 22 Hrs.	ASTM-D 395	50 Max.
5	Ozone resistance	ASTM-D 1149	No visible cracks

**21.9 Sealant**

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

## 21.10 Method of Application

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

## 21.11 Masking

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

## 21.12 Application

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

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

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
21.1		Aluminium work for doors, windows, ventilators & partitions	Providing and fixing aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular sections/ appropriate Z sections and other sections of approved make conforming to IS: 733 and IS: 1285, fixing with dash fasteners of required dia and size, including necessary filling up the gaps at junctions, i.e. at top,bottom and sides with required EPDM rubber/ neoprene gasket etc. Aluminium sections shall be smooth, rust free, straight, mitred and jointed mechanically wherever required including cleat angle, Aluminium snap beading for glazing / paneling, C.P. brass / stainless steel screws, all complete as per architectural drawings and the directions of Engineer-in-charge. (Glazing, paneling and dash fasteners to be paid for separately) :		
	21.1.1	Fixed	For fixed portion.		
	21.1.1.1	Anodised	Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC15)	kg	299.00
	21.1.1.2	Powder coated	Powder coated aluminium (minimum thickness of powder coating 50 micron)	kg	322.00
	21.1.1.3	Polyester powder coated	Polyester powder coated aluminium (minimum thicknessof polyester powder coating 50 micron)	kg	332.00
	21.1.2	Openable	For shutters of doors, windows and ventilators including providing and fixing hinges/ pivots and making provision for fixing of fittings whereverrequired including the cost of		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			EPDM rubber / neoprene gasket required (Fittings shall be paid for separately).		
	21.1.2.1	Anodised	Anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC15)	kg	322.00
	21.1.2.2	Powder coated	Powder coated aluminium (minimum thickness of powder coating 50 micron)	kg	345.00
	21.1.2.3	Polyester powder coated	Polyester powder coated aluminium (minimum thickness of polyester powder coating 50 micron)	kg	356.00
	21.1.3	Deduct for not providing gasket	Deduct for not providing EPDM rubber/neoprene gasket all around.	kg	80.00
21.2		Partical Board panelling in aluminium doors, windows & shutters	Providing and fixing 12mm thick Pre-laminated particle board flat pressed three layer or graded wood particle board conforming to IS: 12823 Grade 1 Type II, in panelling fixed in aluminium doors, windows shutters and partition frames with C.P. brass / stainless steel screws etc.complete as per architectural drawings and directions of engineer-in-charge.		
	21.2.1	One side decorative lamination	Pre-laminated particle board with decorative lamination on one side and balancing lamination on other side.	sqm	802.00
	21.2.2	Both side decorative lamination	Pre-laminated particle board with decorative lamination on both sides.	sqm	907.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
21.3		Glazing in aluminium door, window, ventilator shutters and partitions	Providing and fixing glazing in aluminium door, window, ventilator shutters and partitions etc. with EPDM rubber/ neoprene gasket etc. complete as per the architectural drawings and the directions of engineer-in-charge. (Cost of aluminium snap beading shall be paid in basic item) :		
	21.3.1	4.0 mm	With float glass panes of 4.0 mm thickness (weight not less than 10 kg/sqm)	sqm	774.00
	21.3.2	5.0 mm	With float glass panes of 5.0 mm thickness (weight not less than 12.50 kg/sqm )	sqm	948.00
	21.3.3	8.0 mm	With float glass panes of 8 mm thickness (weight not less than 20 kg/sqm ).	sqm	1182.00
21.4		Extra for froasted glass	Add extra for providing and fixing froasted glass instead of float glass		
	21.4.1	4.0 mm	With glass panes of 4.0 mm thickness (weight not less than 10 kg/sqm)	sqm	259.00
	21.4.2	5.0 mm	With glass panes of 5.0 mm thickness (weight not less than 12.50 kg/sqm )	sqm	262.00
	21.4.3	8.0 mm	With glass panes of 8 mm thickness (weight not less than 20 kg/sqm ).	sqm	262.00
21.5		Floor spring hydraulic	Providing and fixing double action hydraulic floor spring of approved brand and manufacture conforming to IS : 6315, having brand logo embossed on the body /plate with double spring mechanism and door weight upto 125 kg., for doors, including cost of cutting floors , embedding in		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			floors as required and making good the same matching to the existing floor finishing and cover plates with brass pivot and single piece M.S. sheet outer box with slide plate etc. complete as per the direction of Engineer-in-charge :		
	21.5.1	With SS cover plate	With stainless steel cover plate - minimum 1.25 mm thickness	each	1890.00
	21.5.2	With barss cover plate	With brass cover plate - minimum 1.25 mm thickness.	each	2072.00
21.6		Aluminium work powder coated in false ceiling frame	Providing and fixing powder coated aluminium work (minimum thickness of powder coating 50 micron) consisting of tee/ angle sections, of approved make conforming to IS : 733 in frames of false ceiling including aluminium angle cleats with necessary C.P. brass/ stainless steel sunk screws, aluminium perimeter angles fixed to wall with stainless steel rawl plugs @ 450 mm centre to centre and fixing the frame work to G.I. level adjusting hangers 6 mm dia. with necessary cadmium plated machine screws all complete as per approved architectural drawings and direction of the Engineer-in-charge (level adjusting hangers, ceiling cleats and expansion hold fasteners to be paid for separately).	kg	521.00
21.7		G.I. Ceiling Hangers in false ceiling	Providing and fixing 6 mm dia. G.I. level adjusting hangers (upto 1200mm length), fixed to roof slabs by means of ceiling cleats made out of G.I. flat 40x3mm size 60 mm long and stainless steel expandable dash fastener of 12.5 mm dia and 50 mm long, complete as per direction of Engineer -in-charge.	each	57.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
21.8		Aluminium cover sheet over expansion joints	Providing and fixing machine moulded aluminium covering of approved pattern and design, made out of machine cut aluminium sheet and machine holed for receiving dash fastener, over expansion joints on vertical surfaces/ceiling floors, the fixing on plate in one row on one side of joint only shall be done with stainless steel dash fasteners of 8 mm dia and 75 mm long bolt including providing aluminium washers 2 mm thick and 15 mm dia, at a staggered pitch of 200mm centre to centre including drilling holes in the receiving surface and providing expandable plastic sleeves in holes etc. complete as per direction of Engineer-in-Charge :		
	21.8.1	Anodised	Anodised aluminium sheet 2.5mm thick (anodised transparent or dyed to required shade according to IS: 1868, Minimum anodic coating of grade AC 15)	kg	439.00
	21.8.2	Powder coated	Powder coated aluminium sheet 2.5mm thick (minimum thickness of powder coating 50 micron)	kg	461.00
21.9		Silicon sealant	Filling the gap in between aluminium frame and adjacent RCC/ Brick/ Stone work by providing weather silicon sealant over backer rod of approved quality as per architectural drawings and direction of Engineer-in-charge complete. Upto 5 mm depth and 5 mm width	metre	53.00
21.10		Anodic coating	Extra for applying additional anodic coating AC 25 instead of AC 15 to aluminium extruded	kg	12.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			sections. For fixed portion & for shutters of doors, windows and ventilators.		
21.11		Double glazed hermetically sealed glazing	Providing and fixing double glazed hermetically sealed glazing in aluminium windows, ventilators and partition etc. with 6 mm thick clear float glass both side having 12 mm air gap including providing EPDM gasket, perforated aluminium spacers, desiccants, sealant (Both primary and secondary sealant ) etc. as per specifications, drawings and direction of Engineer-in-Charge complete.	sqm	3103.00
21.12		Aluminium Tubular handle bar	Providing and fixing aluminium tubular handle bar 32 mm outer dia, 3.0 mm thick and length as required with SS screws etc .complete as per direction of Engineer-in-Charge.		
	21.12.1	Anodized	Anodized (AC 15 ) aluminium tubular handle bar	metre	423.00
	21.12.2	Powder coated	Powder coated minimum thickness 50 micron aluminium tubular handle bar.	metre	458.00
	21.12.3	Polyester powder coated	Polyester powder coated minimum thickness 50 micron aluminium tubular handle bar.	metre	474.00
21.13		Brass locks	Providing and fixing Brass 100 mm mortice latch and lock with 6 levers without pair of handles(best make of approved quality) for aluminium doors including necessary cutting and making good etc. complete.	each	400.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
21.14		Anodised aluminium sub frame work	Providing and fixing anodised aluminium (anodised transparent or dyed to required shade according to IS: 1868. Minimum anodic coating of grade AC15) sub frame work for windows and ventilators with extruded built up standard tubular sections of approved make conforming to IS: 733 and IS: 1285, fixed with dash fastener of required dia and size (Dash fastener to be paid for separately).	kg	322.00
21.15		Aluminium casement windows fastener	Providing and fixing aluminium casement windows fastener of required length for aluminium windows with necessary screws etc. complete.		
	21.15.1	Anodized	Anodized (AC15) aluminium	each	54.00
	21.15.2	Powder coated	Powder coated minimum thickness 50 micron aluminium.	each	57.00
	21.15.3	Polyester powder coated	Polyester powder coated minimum thickness 50 micron aluminium.	each	56.00
21.16		Aluminium round shape handle	Providing and fixing aluminium round shape handle of outer dia 100mm with SS screws etc. Complete as per direction of Engineer-in-Charge		
	21.16.1	Anodized	Anodized (AC15 ) aluminium	each	62.00
	21.16.2	Powder coated	Powder coated minimum thickness 50 micron aluminium	each	65.00
	21.16.3	Polyester powder coated	Polyester powder coated minimum thickness 50 micron aluminium.	each	69.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
21.17		Anodised aluminium grill	Providing and fixing anodised aluminium grill (anodised transparent or dyed to required shade according to IS: 1868 with minimum anodic coating of grade AC15) of approved design/pattern, with approved standard section and fixed to the existing window frame with C.P. brass/ stainless steel screws @ 200mm centre to centre, including cutting the grill to proper opening size for fixing and operation of handles and fixing approved anodised aluminium standard section around the opening, all complete as per requirement and direction of Engineer-in-Charge. (Only weight of grill to be measured for payment).	kg	460.00
21.18		Frameless toughened glass door shutter	Providing and fixing 12 mm thick frameless toughened glass door shutter of approved brand and manufacture, including providing and fixing top & bottom pivot & double action hydraulic floor spring type fixing arrangement and making necessary holes etc. for fixing required door fittings, all complete as per direction of Engineer-in-Charge (Door handle, lock and stopper etc. to be paid separately).	sqm	4958.00
21.19		Heat /light control film reflective one way type to plain glass	Providing and fixing 50 micron thick reflective one way type heat /light control film to window/door glazing with complete accessories as per direction of Engineer-in-charge of approved brand and make.	sqm	448.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
21.20		Heat /light control film to frosted glass	Providing and fixing 50 micron thick Frosted heat /light control film to window/door glazing with complete accessories as per direction of Engineer-in-charge of approved brand and make.	sqm	518.00
21.21		Heat /light control film non reflective	Providing and fixing 25 micron thick Non reflective heat /light control film to window/door glazing with complete accessories as per direction of Engineer-in-charge of approved brand and make.	sqm	352.00
21.22		Toughened glass for partitions	Providing and fixing 12 mm thick toughened glass including all connectors and fixing accessories all complete for partitions, cubicals etc. As per direction of Engineer-in-Charge.	sqm	1786.00
21.23		Toughened glass railing	Providing and fixing 12mm thick toughened glass railing complete height of 1400mm with top 50m X 50mm teak wood hand railing finish with PU polish glass fitted with 45 mm dia SS glass holding studs.	metre	11765.00
21.24		Extra for eching film	Extra for froasted glass (with eching film) in item No. 21.22	sqm	837.00
21.25		Mil finish powder coated System aluminum partition/door/windows	Providing, section design pattern and fixing/installation of mil finish powder coated System aluminum partition/door/windows outer frame and shutter sections use(The profile should be of alloy 6063 T6 and dimensional tolerance should be within the limit specified in EN 12020) infill glass Dgu-5 mm ctg+ 10mm Air gap +5 mm ctg-1,5 for shutter pleated mesh use for fittings Handle, ( Casement for double side door handle)Locking system (MVD Locking), hinge type (Door hinges)All hardware and		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			accessories fitted must have corrosion protection to met requirement of minimum 480 hours of salt spray test as per ASTM B117. The drainage system should be built in to the 1.0 system with drainage cap equipped with non return valve. The wool pile should be enhanced with silent fin. Corner joints should mandatorily have spring loaded corner cleats to provide added strength to the corner. All accessories essential for smooth performance, durability should be used in line system . Product should have manufacturer and installation warranty of at least 10 years. All work complete as per directed by the Architect Engineer in-Charge Note:- After fixing the outer frame, the gap between frame and adjacent finish walls shall be filled with weather proof neutral cure silicon sealant on outside as well as inside with backer rod to provide the essential control of sealant depth and two sided adhesion of sealant.		
	21.25.1	3000X2600 mm	3000X2600 mm	sqm	16783.00
	21.25.2	3000X2400mm	3000X2400mm	sqm	17061.00
	21.25.3	1200X2600mm	1200X2600mm	sqm	27088.00
	21.25.4	1200X2700mm	1200X2700mm	sqm	26891.00
	21.25.5	4000X2600mm	4000X2600mm	sqm	18938.00
	21.25.6	4900X2600mm	4900X2600mm	sqm	17298.00
	21.25.7	1500X2600mm	1500X2600mm	sqm	23623.00
	21.25.8	2000X2600mm	2000X2600mm	sqm	20224.00
	21.25.9	2400X2700mm	2400X2700mm	sqm	18387.00
	21.25.10	3500X2600mm	3500X2600mm	sqm	15828.00
	21.25.11	4900X2600mm	4900X2600mm	sqm	17298.00
	21.25.12	4000X2600mm	4000X2600mm	sqm	18938.00

**CHAPTER – 22.0**  
**WATER PROOFING WORK**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
<b>1</b>	<b>2</b>	<b>3</b>
1.	IS 73	Paving Bitumen Specifications
2.	IS 702	Specifications for Industrial Bitumen
3.	IS 1322	Specifications for Bitumen felts for Water Proofing and Damp Proofing.
4.	IS 2645	Specifications for Integral Cement Water Proofing Compounds
5.	IS 3370 (Part -1)	Code of Practice for Concrete Structures for the Storage of Liquid: Part -1 General Requirements.
6.	IS 3384	Specifications for Bitumen Primer for Water Proofing and Damp Proofing
7.	IS 7193	Specification for Glass Fibre Bitumen Felts
8.	IS 12200	Provision of Water Stops at Transfers Construction Joints in Masonry and Concrete Dams - Code of Practice.
9.	IS 12432 (Part-3)	Application for Spray Applied Insulation - Code of Practice Part-3 Polyurethane/ Polyisocyanurate

**PREAMBLE**  
**WATER PROOFING WORK**  
**(CHAPTER: 22.0)**

**22.1 Water Proofing Treatment**

Blending Cement/Water with Water Proofing Compound shall be as described here under the required quantity of cement bags to be used for a particular portion of work should be emptied on a dry platform. Water proofing compound bearing ISI mark and conforming to IS 2645 should then be mixed properly with the cement. The quantity of water proofing compound to be mixed should be as prescribed by the manufacturer but not exceeding 3% by weight of cement. The quantity of cement and water proofing compound thus mixed should be thoroughly blended and the blended cement should again be packed in bags. For the water proofing compound in liquid form, the blending is to be done with water. This can be done by taking the just required quantity of water to be mixed in the particular batch of dry cement mortar. The required quantity of water thus collected per batch of dry cement mortar to be prepared should be mixed with liquid water proofing compound from sealed tins with ISI mark. The water thus mixed with water proofing compound shall be thoroughly stirred so that the water is blended with water proofing compound properly.

Where ever cement slurry is to used it shall be prepared by using 2.2 kg of blended cement per sqm. area. Each time only that much quantity shall be prepared which can be covered on the surface and the surface in turn would be covered with 25 mm thick cement mortar base within half an hour. Slurry prepared and remained unused for more than half an hour shall be totally rejected. Where ever cement mortar 1:3 (1 blended cement: 3 coarse sand) shall be prepared with cement/water duly blended as specified. Only that much quantity of cement mortar which can be consumed within half an hour, shall be prepared. Any cement mortar that is prepared and remains unused for more than half an hour shall not be used in the work and shall be rejected.

The surface to be treated with felt shall have a minimum slope of 1 to 120. This grading shall be carried out with cement concrete or cement plaster with sand, as desired, to the average thickness required and finished smooth. Such grading shall be paid for separately In existing roof where gola and drip course are provided at the junction of roof and vertical face of parapet wall, these shall be dressed suitably and finished smooth so as to ensure an easy and gradual turning of the flashing. Any dismantlement or forming and finishing smooth the junction for forming the base of the flashing shall not be measured or paid for separately and shall be deemed to form part of the preparation of the surface in the water proofing treatment While the grading of roof surface is being done, it shall be ensured that the outlet drain pipe have been fixed and mouth at the entrance have been eased and rounded off properly for easy flow of water.

When any pipe passes through the roof to be treated, angular fillet shall be built around it for the water proofing treatment to be taken over it. These fillets shall not be measured or paid for separately. Tucking in the water proofing felt will be required where the parapet wall exceeds 45cm in the height from the graded surface. Where the height is 45 cm or less, no groove will be required as the water proofing treatment will be carried over the top of the parapet wall to its full thickness. In the case of low dividing walls of height 30 cm or less, outlets therein shall be cut open for full height and the bottom and sides shall be rendered smooth and corners rounded and such treatment shall not be measured and paid for separately.

For carrying over and tucking in the water proofing felts into the parapet walls, chimney stacks etc. a horizontal groove 6.5 cm deep, 7.5 cm wide section with its lower edge at not less than 15 cm above the graded roof surface shall be left on the inner face of the same during construction if possible.



When such groove has not been left, the same shall be cut out neatly and the base at rear of the groove shall be finished smooth with cement plaster 1:4 (1 cement: 4 sand). Such cutting of the groove and its finishing smooth shall be deemed to be part of the water proofing item and shall not be measured or paid for separately. No deduction shall be made either for not making the groove or when the later has already been left in the masonry by the construction agency. The graded surface of the roof and concrete fillets and the faces of walls shall be thoroughly cleaned with wire brushes and all loose scales etc. removed. The surface shall then be dusted off. Any crack in the roof shall be cut to 'V' section, cleaned and filled up flush with cement mortar slurry 1:4 (1 cement: 4 sand) or blown type petroleum bitumen of IS grade 85/25, or approved quality conforming to IS 702. Such cleaning of the surface or treating the cracks shall not be paid for separately.

When the first strip of felt has been bonded to the roof, Subsequent strips shall overlap the preceding one by at least 7.5 cm at the longitudinal edges and 10 cm at the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and trailings of bitumen near edges of laps shall be levelled by heating the overlap with a blow lamp and levelling down unevenness.

## **22.2 Water Proofing Treatment with Intergral Crystalline Admixture**

### **22.2.1 General**

One method that can simplify the protective process is to make concrete with Integral Crystalline Admixtures that reduce its permeability in effect to make the concrete itself waterproof. Apart from the regular workability admixtures, Integral Crystalline Durability admixtures shall be added to all concrete, structural and otherwise, to waterproof & enhance the Concrete Durability. The Crystalline Admixture shall be added either at the time of batching at the batching plant or in the drum of the transit mixer, when the concrete arrives the point of pouring.

The concrete water proofing industry redefined their terminology a short time ago. American Concrete Institute (ACI) 212-3R-10 "Report on Chemical Admixture for Concrete" documents devoted chapter 15 / page 46 to permeability reducing admixtures (PRA's) that outlines PRAH & PRAN classification or Differentiates between those suitable for concrete exposed to Non Hydrostatic Conditions (PRAN) and concrete exposed to Hydrostatic Conditions (PRAH). Besides reducing permeability some PRA's impart other beneficial characteristics such as reduced drying shrinkage, reduced chloride-ion penetration, improved freeze thaw resistance and enhanced autogenous sealing.

### **22.2.2 Material**

Integral crystalline water-proofing admixture is one part cementitious powder added to the concrete mix at the time of batching. Integral crystalline water-proofing admixture consists of hydrophilic chemicals such as Portland cement, very fine treated silica sand and various active, proprietary chemicals. These active chemicals react with moisture in fresh concrete and with the by-products of cement hydration to cause a catalytic reaction, which generates a non-soluble crystalline formation throughout the pores and capillary tracts of the concrete. Thus, the concrete becomes permanently sealed against the penetration of water or liquids from any direction. The concrete is also protected from deterioration due to harsh environmental conditions. Integral crystalline water-proofing admixture is specially formulated to meet varying project and temperature conditions. This reaction continuous over the life of the concrete serving to seal not only initial shrinkage cracks, but also cracks that occur over time.

### 22.2.3 Technical Specifications /Parameters

The specifications of the materials should match or exceed the requirements mentioned in nomenclature of the item the product should be stored under dry condition. The shelf life of the integral crystalline admixture should be treated as one year when stored under normal conditions.

The water proofing compound used in integral crystalline water proofing treatment shall satisfy all the requirements indicated in relevant standards or as specified in concerned relevant codes etc. and the same shall be got tested and get approved from the Engineer-in-charge before its use.

The integral crystalline waterproofing admixtures of hydrophilic in nature shall confirm to the following requirements:

1. Dosage as specified in the item or higher as recommended by manufacturer's specification, material shall fulfill the requirements of American Concrete Institute Guidelines ACI-212- 3R-10 Chapter 15 and fall under PRAH (Permeability reducing Admixtures for HYDROSTATIC conditions) and must reduce Coefficient of Permeability of concrete by more than 90% (preferably ZERO Permeability), when compared to control concrete and tested as per DIN 1048 Part 5 by carrying out 4 cycles each of 5 bar hydrostatic pressure for 72 hours and drying for 48 hours between the cycles & co-efficient of Permeability calculated as per Darcy's Formula/ Valenta equation by incorporating penetration values obtained at the end of fourth cycle pressure.
2. The crystalline admixture shall be compatible with any other concrete admixture confirming to ASTM C494 and IS 9103.
3. The performance of the crystalline admixture must not be restricted by water-cement ratio of concrete mix. In other words, the crystalline admixture must perform at any water-cement ratio of the concrete mix.
4. It shall possess CE mark approval as per EN934-2 and shall be procured from CE mark approved manufacturing unit. It shall also possess approval certificate from any national apex institution mandated to issue design codes. The product has no corrosion effect on reinforcement steel according to test norm DIN V18998. The maximum chloride content lies less than 0.1% and maximum alkali content less than 9.3%.
5. The material must be capable of withstanding high hydrostatic pressure. It is important that the civil contractor chooses the best material available in the market and the product meeting all the required criteria and demonstrating highest resistance to the high hydrostatic pressure will be given preference.  
In addition to recognizing the use of Integrate Crystalline Admixtures. ACI 212-3R-10 has also provided some guideline in para 15.3-"Selection and Evaluation" to select the best quality PRAH's materials as maximum permeability reducing admixtures at maximum Hydrostatic Pressure. Para 15.3 stated that the effect of the admixture can be evaluated by testing the permeability of concrete both directly and indirect methods. The US Army Corps of Engineers CRC C48-92 (1992) test method is a direct measurement of concrete permeability resistance during exposure to water under 200 psi or 13.8 bars or 1.38 MPa of hydrostatic pressure.
6. The material must reduce Chloride diffusion Co-efficient by minimum 45% when tested as per ASTM C 1556-4 and compared with the control concrete, thereby prolonging the durability & service life of the treated concrete structure.
7. The material must demonstrate minimum reduction of 20% in shrinkage cracks as compared to control concrete when tested as per standard BSISO1920-8:2009 & no internal expansion under Sulphate attack, when tested as per ASTM C-1012-12.
8. The crystalline admixture must be capable of self-healing of cracks up to a width of 0.5mm.

9. Product must possess third party assurance, confirming that the product, when used in the concrete, will have no detrimental side effects in terms of Alkali Silica Reaction (ASR), corrosion of steel re-enforcement etc.

10. The product performance shall not be affected by wear abrasion of the treated concrete surface and crystalline treated concrete shall not require protection layer.

11. The crystalline admixture shall be non-toxic and shall confirm to NSF-61 USA.

**Note:** - The manufacturer shall produce relevant test certificates of Integral Crystalline Admixture Material from reputed laboratories as per relevant codes stated above. To support the claim of crystal formation, national/ international test report of scanning electrons microscopic (SEM)Photographs dandified and mature crystal formation to plug all the capillary track and pores of the concrete shall be provided. Total quantity of Integral Crystalline Admixture Material required shall be arranged only after obtaining the prior approval of the Engineer-in-Charge in writing. Materials shall be kept under double lock and key and proper account of water proofing compound used inthe work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements. Contractor shall associate himself with anyone of the specialist firmsmentioned in approved list of specialized agencies for the work relating to the Water Proofing Treatment.

#### **22.2.4 Recommended uses**

- Foundations/Rafts Reservoirs, Bridges and Dams
- Sewage and Water Treatment Plants Secondary Containment Structures
- Tunnels and Subway Systems Underground Vaults
- Parking Structures Swimming Pools and water tanks
- Pre-Cast, Cast-in-Place and Shotcrete applications Basement Retaining Walls

#### **22.2.5 Dosage**

Dosage 0.8% (minimum) to the weight of cement content per cubic meter of concrete or higher dosage as recommended by the manufacturer's specification.

#### **22.2.6 Mixing**

The integral crystalline admixture shall be used @ 0.8% (minimum) to the weight of cement content per cum of concrete or higher as recommended by the manufacturer's specification desired to meet water proofing and durability criteria. Integral crystalline Admixture must be added to the concrete at the time of batching at the batching plant or in the drum of the transit mixer, when the concrete arrives the point of pouring. The sequence of procedures for addition will vary according to the type of batch plant operation and equipment. The mixing shall be followed as below unless& until specified otherwise. For any detailing and mixing guidelines the manufacturer's specifications should be followed.

#### **22.2.7 Ready mix plant- Dry batch operation**

Add integral crystalline admixture in power form to the drum of the ready-mix truck under the batch plant and add 60%- 70% of the required water, along with required aggregate. Mix the materials for 2-3 minutes to ensure that the integral crystalline admixture is distributed evenly throughout the mix water. Add the balance of materials to the ready-mix truck in accordance with standard batching practices.

### **22.2.8 Ready mix plant- Central mix operation**

Mix integral crystalline admixture with water to form a very thin slurry (e.g. 18kg of powder mixed with 22.7 litre of water). Pour the required amount of material into the drum of the ready-mix truck. The aggregate, cement, sand and water should be batched and mixed in the plant in accordance with standard practices (taking into account the quality of water that has already been placed in the ready-mix truck). Pour the concrete into the truck and mix for at least 5 minutes to ensure even distribution of integral crystalline admixture throughout the concrete.

### **22.2.9 Precast batch plant**

Add integral crystalline admixture to the aggregate and sand, then mix thoroughly for 2-3 minutes before adding the cement and water. The total concrete mass should be blended using standard practices. It is important to obtain a homogeneous mixture of integral crystalline admixture with the concrete. Therefore dry integral crystalline admixture powder should never be mixed directly to wet concrete as this may cause clumping and hence thorough dispersion in the concrete mix may not occur.

### **22.2.10 Setting time and strength**

The setting time of concrete mix is directly affected by the chemical and physical composition of ingredients, temperature of the concrete and prevailing climatic conditions. Retardation of set may occur when using integral crystalline admixture. The amount of retardation will depend upon the concrete mix design and the dosage rate of integral crystalline admixture. However, under normal conditions, integral crystalline admixture will provide a normal set concrete. Concrete containing integral crystalline admixture may develop higher ultimate strengths than plain concrete. Trial mixes of the concrete should be carried out under project conditions to determine setting time and strength of the concrete.

### **22.2.11 Application**

Concrete treated with Integral Crystalline Admixture should be placed and finished in accordance with good concrete practices. ACI guidelines and recommendations should be observed.

### **22.2.12 Precaution / Special Consideration**

It is important to obtain a homogeneous mixture of Crystalline Admixture with the concrete. Therefore, do not add dry Crystalline Admixture power directly to wet concrete as this may cause clumping and through dispersion will not occur. When incorporating Integral Crystalline Admixture, the temperature of the concrete mix should be above 4° C.

### **22.2.13 Storage / Self Life**

Integral Crystalline Admixture must be stored dry at a minimum temperature of 7° C and its selflife is one year when stored under proper conditions.

### **22.2.14 Measurement**

The quantity of Integral Crystalline Admixture will be measured in kg correct to two places of decimal as per the dosage as specified to the weight of cement content per cubic meter of reinforced cement concrete. The total weight of cement in kg is to be calculated as per the mix design of reinforced cement concrete.

### **22.2.15 Rate**

The rate shall include the cost of all labour and materials involved in all the operations described above.

## **22.3 Water Proofing Treatment with Integral Crystalline Water Proofing Coating / Slurry**

### **22.3.1 General**

This Integral crystalline water proofing coating / slurry of hydrophilic in nature is applied to surface of the concrete to water proof and protect the concrete in-depth. It consists of Portland cement, specially treated quartz sand and a compound of active chemicals. Integral crystalline water proofing coating material needs only to be mixed with water prior to application. When integral crystalline water proofing material is applied to a concrete surface, the active chemicals react with moisture and the by-products of cement hydration to cause a catalytic reaction that generates an insoluble, crystalline structure. These crystals fill the pores and minor shrinkage cracks in the concrete to prevent any further water ingress (even under pressure). However, integral crystalline water proofing material will still allow the passage of vapor through the structure (i.e. the concrete will be able to “breathe”). Even after the concrete has cured, integral crystalline water proofing material remains dormant in the concrete and will reactivate in the presence of moisture to seal capillary tracts and hairline cracks. In addition to water proofing the structure, integral crystalline water proofing Slurry protects concrete against seawater, wastewater, aggressive groundwater and many other aggressive chemical solutions. Integral crystalline water proofing material is approved for use in contact with potable water and is therefore suitable for use in water storage tanks, reservoirs, water treatment plants, etc. Integral Crystalline Slurry is not a decorative material.

### **22.3.2 Material**

This Integral crystalline water proofing material consists of Portland cement, specially treated quartz sand and a compound of active chemicals. The water proofing compound used in integral crystalline water proofing treatment shall satisfy all the requirements indicated in relevant standards or as specified in concerned relevant codes etc. and the same shall be got tested and get approved from the Engineer-in-charge before its use. Technical Specification/ Parameters. The integral crystalline slurry / coating material of hydrophilic in nature shall confirm to the following requirements:

1. Dosage as specified or at the manufacturer’s recommended reduction of co-efficient of Permeability of concrete more than 90% at 56 days curing, when tested as per DIN 1048 Part 5 (after applying 4 cycle each 5 bar hydrostatic pressure) and permeability co-efficient calculated as per Valenta / Darcy’s formula.
2. It shall confirm to EN1504-3 (For structural repairs-R3, Compressive Strength > 25 Mpa) supplied from an approved manufacturing unit having CE approval confirming to EN1504-3R3.
3. The product has no corrosion effect on reinforcement steel according to test norm DIN V18998. The maximum chloride content lies less than 0.1% and maximum alkali content less than 9.3%.
4. The material must be capable of withstanding high hydrostatic pressure. It is important that the civil contractor chooses the best material available in the market and the product meeting all the required criteria and demonstrating highest resistance to the high hydrostatic will be given preference.

5. The Integral Crystalline Slurry must be capable of self-healing of cracks up to a width of 0.5mm.
6. Product must possess third party assurance, confirming that the product, when used in the concrete, will have no detrimental side effects in terms of Alkali Silica Reaction (ASR), corrosion of Steel Reinforcement etc.
7. The product performance shall not be affected by wear abrasion of the treated concrete surface and crystalline treated concrete shall not require protection layer.
8. Potable Water Compatibility: Nontoxic & suitable for use in potable water facilities- NSF listed as per ANSI 61 listing.

**Note:** The manufacturer shall produce relevant test certificates of Integral Crystalline water proofing slurry material from reputed laboratories as per relevant codes as stated above. Total quantity of the Integral Crystalline water proofing slurry material required shall be arranged only after obtaining the prior approval of the Engineer-in-Charge in writing. Materials shall be kept under double lock and key and proper account of water proofing compound used in the work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements. Contractor shall associate himself with anyone of the specialist firms mentioned in approved list of specialized agencies for the work relating to the Water Proofing Treatment.

### **22.3.3 Recommended uses**

- Foundations/Rafts Reservoirs, Bridges and Dams
- Sewage and Water Treatment Plants Secondary Containment Structures
- Tunnels and Subway Systems Underground Vaults
- Parking Structures Swimming Pools and water tanks
- Pre-Cast, Cast-in-Place and Shotcrete applications Basement Retaining Walls

### **22.3.4 Preparation of surface**

All concrete to be treated with integral crystalline water proofing slurry material must be clean and have an “open” capillary surface. Remove laitance, dirt, grease, etc. by means of high pressure water jetting, wet sandblasting or wire brushing. Faulty concrete in the form of cracks, honeycombing, etc. must be chased out, treated with the same material and filled flush with the mortar mixture as specified by the manufacturer. Surface must be carefully pre-watered prior to the application of integral crystalline water proofing material. The concrete surface must be damp but with no wet sheen on the surface.

### **22.3.5 Mixing**

Integral crystalline water proofing slurry / coating material should be mechanically mixed with clean water to a creamy consistency resembling to thick oil. Only that much material should be mixed can be used within 20 minutes and mixture should be stirred frequently. The mixture should not be allowed to set, if it happens, simply re-stir to restore workability but no more water should be added to it. The ratio of integral crystalline water proofing material with water should be as below

i) Vertical surface: - For applying with brush the ratio should be 5 parts of integral crystalline water proofing material to 2 parts of water. For applying with spray the ratio should be 5 parts of Integral Crystalline water proofing coating material to 2.75 – 3.25 parts of water.



ii) Horizontal surface: - The ratio should be 3 parts of Integral Crystalline water proofing coating material to 1 part of water. This should be applied by brush only.

### **22.3.6 Application Procedure**

The slurry mix of the Integral Crystalline water proofing slurry material shall be applied in one or two coats as specified/ required according to work situation in the item. After preparation of surface as described in para 22.23.2, and making the surface saturated with water before application of Crystalline Slurry, then first coat of the slurry mix shall be applied by the brush or appropriate power spray equipment. The second coat as specified shall be applied while the first coat is still green. The other method of application known as Dry powder consistency can also be applied on horizontal surfaces only. The specified amount of integral crystalline water proofing material is distributed in powder form through a sieve or a semi mechanical barrow spreader and troweled into the freshly placed concrete as this reaches the initial set. The integral crystalline water proofing material to be used shall be as following:-

i.) Vertical surface: - Two coats of integral crystalline water proofing material slurry coat shall be applied @ of 0.70 kg per sqm. per coat or as specified.

ii.) Horizontal surface: - One coat of integral crystalline water proofing material slurry coat shall be applied @ of 1.10 kg per sqm or as specified by the manufacturer to harden concrete. Alternatively integral crystalline water proofing material mix can be dry sprinkled @ of 1.00 kg per sqm and trowel applied to fresh concrete when it has reached initial set.

iii.) Construction joint: - Integral crystalline water proofing material mix shall be applied either as slurry coat or dry powder consistency immediately prior to placing the next lift/ bay of concrete @ 1.60 kg per sqm. or as specified.

iv.) Binding concrete: - Integral crystalline water proofing material mix shall be applied either as slurry coat or dry powder consistency immediately prior to placing the overlying concrete slab.

### **22.3.7 Curing**

The treated surfaces should be kept damp for a period of five days and must be protected against direct sun, wind and frost, by covering with polyethylene sheeting, damp burlap or similar material.

### **22.3.8 Precaution / Special Consideration**

Do not apply Integral Crystalline Slurry at temperatures at or below freezing or to frozen or freezing surfaces. Integral Crystalline slurry cannot be used as an additive to concrete or plasters. (Integral Crystalline Admixture should be considered for these applications).

### **22.3.9 Storage / Self Life**

When properly stored in a dry place in unopened and undamaged original packaging its self life is 12 months.

## 22.4 Water Proofing Treatment with Integral Crystalline Water Proofing Dry-Shake

### 22.4.1 General

Crystalline water proofing dry-shake of hydrophilic in nature is a unique Integral Crystalline chemical treatment for the waterproofing and protection of concrete. Crystalline water proofing dry-shake has been formulated for dry-shake applications on horizontal concrete surfaces where greater impact and abrasion resistance is required.

### 22.4.2 Material

Integral Crystalline water proofing dry-shake (dry powder) compound consists of Portland cement, various active proprietary chemicals, and a synthetic aggregate hardener that has been crushed and graded to particle sizes suitable for concrete floors. Crystalline water proofing dry-shake becomes an integral part of the concrete surface, thereby eliminating problems normally associated with coatings (e.g. scaling, dusting, flaking and delaminating). The active chemicals react with the moisture in the fresh concrete causing a catalytic reaction that generates a non-soluble crystalline formation within the pores and capillary tracts of the concrete. Technical Specification/ Parameters: The Integral Crystalline dry shake material of hydrophilic in nature shall confirm to the following requirements:

1. Dosage as specified or at the manufacturer's recommended reduction of co-efficient of Permeability of concrete more than 90% at 56 days curing, when tested as per DIN 1048 Part 5 (after applying 4 cycle each 5 bar hydrostatic pressure) and permeability co-efficient calculated as per Valenta / Darcy's formula.
2. It shall confirm to EN1504-3 (For structural repairs-R3, Compressive Strength > 25 Mpa) supplied from an approved manufacturing unit having CE approval confirming to EN 1504-3R3.
3. The product has no corrosion effect on reinforcement steel according to test norm DIN V18998. The maximum chloride content lies less than 0.1% and maximum alkali content less than 9.3%.
4. The material must be capable of withstanding high hydrostatic pressure. It is important that the civil contractor chooses the best material available in the market and the product meeting all the required criteria and demonstrating highest resistance to the high hydrostatic will be given preference.
5. The Integral Crystalline dry shake must be capable of self-healing of cracks up to a width of 0.5mm.
6. Product must possess third party assurance, confirming that the product, when used in the concrete, will have no detrimental side effects in terms of Alkali Silica Reaction (ASR), corrosion of Steel Reinforcement etc.
7. The product performance shall not be affected by wear abrasion of the treated concrete surface and crystalline treated concrete shall not require protection layer.
8. Potable Water Compatibility: Nontoxic & suitable for use in potable water facilities- NSF listed as per ANSI 61 listing.

**Note:** The manufacturer shall produce relevant test certificates of Integral Crystalline water proofing dry shake material from reputed laboratories as per relevant codes as state above. Total quantity of the Integral Crystalline water proofing dry shake material required shall be arranged only after obtaining the prior approval of the Engineer-in-Charge in writing. Materials shall be kept under double lock and key and proper account of water proofing compound used in the work shall



be maintained. It shall be ensured that the consumption of the compound is as per specified requirements. Contractor shall associate himself with anyone of the specialist firms mentioned in approved list of specialized agencies for the work relating to the Water Proofing Treatment.

#### **22.4.3 Application Rate (Dose)**

Crystalline water proofing dry-shake material to be used under normal conditions should cover the application surface @ minimum 0.60 kg per sqm. Depending upon of the degree of abrasion resistance required. If the surface is to be used under heavy traffic conditions or where greater abrasion resistance is required, the manufacturers recommendation should be taken into account while applying crystalline water proofing dry-shake on the concrete surface.

#### **22.4.4 Application Procedure**

- i.)** After fresh concrete is placed. Consolidated and leveled, wait until concrete can be walked on leaving an indentation of 6-8mm.
- ii.)** Concrete should be free of bleed water and be able to support the weight of a power trowel. Float open the surface.
- iii.)** Immediately after floating open the surface and within one hour of finishing the concrete, apply one-half of the Integral Crystalline water proofing dry-shake material by hand or mechanical spreader, in one direction only. The Integral Crystalline water proofing dry-shake material must be spread evenly.
- iii)** As soon as the Integral Crystalline water proofing dry-shake material has absorbed moisture from the base slab, it should be power floated to the surface.
- iii v.** Immediately after power floating, apply remaining Integral Crystalline water proofing dry-shake material at right angles to the first application.
- iv )** Allow remaining Integral Crystalline water proofing dry-shake material to absorb moisture from the base slab and then power float the material into the surface. When concrete has hardened sufficiently, power trowel surface to the required finish.

#### **22.4.5 Curing**

Curing is important and shall begin as soon as final set has occurred but before surface starts to dry. Conventional moist curing procedures such as water spray, wet burlap or plastic covers may be used. Curing should continue for at least 48 hours. In hot dry sunny or windy conditions, it is advisable to use an evaporation retardant on the fresh concrete surface to prevent premature drying of the slab conditions due consultations should be made from the technical representatives of the manufacturer for specific instructions. In lieu or moist curing, concrete sealers and curing compounds may be used. In all cases, recommended guidelines for proper curing should be followed.

#### **22.4.6 Recommended uses**

Foundations /Rafts Slabs Water tank base slab Sewage and Water Treatment Plants below Grade Structures Warehouses Floors Traffic Bearing Surfaces Parking Structures

#### **22.4.7 Precaution / Special Consideration**

For the best results when applying Integral Crystalline dry shake materials, the air content of the concrete shall not exceed 3% (a high air content can make it difficult to achieve a proper application).

In hot, dry, or windy conditions, it is advisable to use an evaporation retardant on the fresh concrete surface to prevent premature drying of the slab. Chronic moving cracks or joints will require a suitable flexible sealant.

#### **22.4.8 Storage / Self Life**

Integral Crystalline dry shake must be stored dry at a minimum temperature of 7° C and its self life is one year when stored under proper conditions.

#### **22.4.9 Measurement**

The quantity of Integral Crystalline dry shake sprinkled area shall be calculated in sqm correct to two places of decimal. The Length & breadth/height of the Integral Crystalline dry shake sprinkled area shall be correct to a centimetre.

#### **22.4.10 Rate**

The rate shall include the cost of all the labour, material and equipments involved in all the operations described above.

### **22.5 Crystalline Water Proofing Mortar**

#### **22.5.1 Material**

Crystalline water proofing mortar consists of Portland cement, specially treated quartz sand and a compound of active chemicals. The active chemicals react with moisture and the by-products of cement hydration to cause a catalytic reaction, which generates an insoluble integral crystalline complex. These crystalline complexes grow in the presence of water and block the capillaries of the concrete and minor shrinkage cracks, thus water proofing the concrete. Chemicals activation begins when the powder is mixed with water and may take several days to completely block the capillaries, depending on ambient temperature and environmental conditions. It can be applied to the positive or negative water pressure sides of a structure.

#### **22.5.2 Technical Specification/ Parameters:**

- 1.** It shall conform to EN1504-3 (For structural repairs-R3, Compressive Strength > 25 Mpa) supplied from an approved manufacturing unit having CE approval confirming to EN 1504-3R3.
- 2.** The product has no corrosion effect on reinforcement steel according to test norm DIN V 18998. The maximum chloride content lies less than 0.1% and maximum alkali content less than 9.3%.
- 3.** Product must possess third party assurance, confirming that the product, when used in the concrete, will have no detrimental side effects in terms of Alkali Silica Reaction (ASR), corrosion of Steel Reinforcement etc.
- 4.** The product performance shall not be affected by wear abrasion of the treated concrete surface and crystalline treated concrete shall not require protection layer.
- 5.** Potable Water Compatibility: Nontoxic & suitable for use in potable water facilities- NSF listed as per ANSI 61 listing.
  - (i) Installation of seal strips, reglets and coves at joints to assure water tightness
  - (ii) Patching and filling / sealing of routed out cracks.

- (iii) Patching of tie holes and faulty construction joints.
- (iv) Repairing of spalled and honeycombed area.

**Note:** The manufacturer shall produce relevant test certificates of Crystalline Mortar from reputed laboratories as per relevant codes as state above. Total quantity of the water proofing Crystalline Mortar material required shall be arranged only after obtaining the prior approval of the Engineer-in-Charge in writing. Materials shall be kept under double lock and key and proper account of water proofing compound used in the work shall be maintained. It shall be ensured that the consumption of the compound is as per specified requirements. Contractor shall associate himself with anyone of the specialist firms mentioned in approved list of specialized agencies for the work relating to the Water Proofing Treatment.

### **22.5.3 Recommended Uses**

This material can be applied in conjunction with crystalline water proofing coating for:

### **22.5.4 Preparation of Surface**

All surfaces to be patched, repaired or sealed with crystalline water proofing mortar must be clean and sound. Crack should be routed out to a U-shaped configuration, approximately 25 mm wide and a minimum of 25 mm deep. Tie holes should be roughened prior to filling. Spalled and honeycombed area must be thoroughly cleaned and chiseled back to sound concrete prior to repair. Remove all dirt, cement laitance, form release agents, curing compounds, paints, coating, etc. by means of wet or dry sandblasting, high pressure water jet or other approved mechanical means. Surfaces must be well moistened to a dull dampness at the time of application. The concrete should be damp with no wet sheen on the surface.

### **22.5.5 Mixing**

- i.) For routed cracks, coves and non-moving joints: Add water to crystalline water proofing mortar powder until a medium stiff, trowelable consistency reached. The texture of the mix should be pliable enough to be trowelled into the cracks with some pressure, but not so pliable that it would run out or sag out of the crack. Approximate mixing ratio (by volume) is 4.5 parts crystalline water proofing mortar powder to 1 part water. Alternatively, 450gm of crystalline water proofing mortar powder to 100 ml of water is to be mixed.
- ii.) Tie holes and pointing applications: Add only a small amount of water. Mixed consistency should be that of “dry earth,” holding a shape when squeezed in your hand but easily crumbled when pressed between fingers. Mix only as much material as can be used within 20 minutes.

### **22.5.6 Application Procedure**

- i.) For sealing cracks and faulty construction joints, routed out/making U-shape groove size 25x25mm and then priming the surface with integral crystalline slurry @0.05 kg per running meter and while the surface is tacky filled the cavity upto surface crystalline mortar @ 1.50 kg per running meter. Once crystalline mortar is touch dry then finally applying two coats of integral crystalline slurry @0.05 kg per running meter per coat.
- ii.) For repairing spalled & honeycombed areas, prepared the surface and chiesel back upto sound concrete and then primed the area with integral crystalline slurry @0.70 kg per sqm. and while the surface is tacky repair and level the honeycomb area with crystalline mortar @ 22.70 kg per sqm. for an average thickness of 10mm. Once crystalline mortar is touch dry then finally two coats of integral crystalline slurry @ 0.70kg per sqm. per coat.

iii.) For patching of tie rod holes, prepared tie rod hole surface and primed the area with integral crystalline slurry @ 0.07 kg per sqm and while the surface is tacky repair and filled the tie rod holes with crystalline mortar @ 0.040 kg per hole. The crystalline mortar shall be tightly rodded into tie holes or packed tightly. For 25x25x25 mm hole, use 0.040 kg per hole to fill the tie hole.

### **22.5.7 Curing**

Provide protection against extreme weather conditions, such as heavy rain or freezing conditions, during the setting period. Curing is not normally required except during hot, low humidity weather. In these conditions, a light mist of water approximately 25 hours after the repair is completed will help to ensure a controlled cure. In extreme dry heat, water misting may be carried out at required intervals more frequently.

### **22.5.8 Precaution / Special Consideration**

Crystalline mortar shall not applied at temperatures below 40°F (4°C), to a frozen substrate or if temperatures will drop below freezing during the curing period (approximately 24 hours). This product is not recommended for use in expansion or construction joints. Crystalline mortar can be applied in (13 mm) layers not exceeding 2.5 inch (approximately 6.5 cm) to prevent shrinkage cracks in the mortar.

### **22.5.9 Storage / Self Life**

Crystalline mortar shall be stored in a dry enclosed area off the ground at a minimum temperature of 7°C. Self life when stored in proper conditions in unopened, undamaged packaging is 12 months.

### **22.5.10 Measurement**

Faulty construction joint will be measured by measuring the length in running meter correct to a centimetre. Repair of honeycombed area will be measured in square meter correct to two places of decimal by measuring the length and width of treated area correct to a centimetre. Repair of tie rod holes will be measured in numbers.

### **22.5.11 Rate**

The rate includes the cost of all the labour and material involved in all the operations described above.

## **22.6 Swellable Type Water Stop Tape**

### **22.6.1 General**

Swellable type water stop tape of size 19 mm x 25 mm is a unique sealing compound designed to expand rapidly when exposed to moisture, making it a self-healing joint material for construction joint applications /treatment.

### **22.6.2 Material**

This is a swellable type sealing compound which expand rapidly after coming in to contact or exposed to moisture. This acts as a self healing material and is used for applications in construction joints.

### **22.6.3 Physical Properties**

i.) Specific gravity (ASTM D71):  $1.35 \pm 0.05$  (ASTM D-71)

- ii.) Volatile matter: 1% maximum (ASTM D-6)
- iii.) Penetration, 150g cone at 25°C, 5sec: 40 ± 5mm (ASTM D-217)
- iv.) Rate of Rapid Expansion:

(a) Fresh Water Exposure: 24 Hours-140%, 48 Hours- 175%, 72 Hours-190% & 120 Hours-210%  
(b) Salt Water Exposure: 24 Hours-7%, 48 Hours-12%, 72 Hours-14%, 120 Hours-18%  
The water stop material should meet the requirements to EU REACH Regulation (EC) No 1907/2006.

#### **22.6.4 Physical Properties of Swellable Waterstop Primer**

- i.) % Solid: Min 20%
- ii.) Flash Point: 93 deg C
- iii.) Dry Time: 25 deg C: 10 min
- iv.) Dry Time: 4 deg C: 60 min

#### **22.6.5 Recommended Uses**

Typical applications for swellable type waterstop tape include building foundations, slabs, retaining walls, storage tanks, and similar non-moving cold construction joints

#### **22.6.6 Application**

- i.) The entire surface length where the water stop is to be applied is cleaned thoroughly by using blower and brush. Apply one coat of required primer throughout the length of the joint @ 3.78 litre per 240 running metre. Allow the primer to dry for 10 to 15 minutes at the temperature of 25°C. This should be allowed to dry for some longer time in the areas where the temperature are low.
- ii.) By using the heel of the hand and moderate pressure, press the self expanding joint material firmly into the position on the structure on the entire area which has been primed and dried. Make sure that the product has bonded with the primed area.
- iii.) Where required, splice ends to form a continuous, uninterrupted seal. For best results, cut each end at opposite 45deg. angles and tightly butt ends together. **DO NOT OVERLAP ENDS.** Gently knead the spliced ends creating an uninterrupted seal.
- iv.) Peel the protective covering from the exposed side of the installed expandable joints sealing compound.
- v.) Pour the matting structural member in position.

**Notes:** Always use swellable type waterstop primer to avoid displacement of the swellable type waterstop tape during concrete pouring. It may be necessary to utilize masonry nails or other mechanical means to hold the sealant in place on vertical surfaces. Place swellable type waterstop tape so that it is not closer than 5 cm away from the outer surface of poured structure. If a Keyway is utilized, place the swellable type waterstop tape into the bottom of the formed Keyway area.

#### **22.6.7 Precaution / Special Consideration**

Always use swellable type waterstop primer to ensure tight adhesion and to aid in preventing swellable type waterstop tape from moving during the concrete pour. For vertical surfaces, nails may be used to hold the product in place in conjunction with swellable type waterstop primer. Swellable type waterstop tape shall be used at a minimum depth of 50 mm inside the concrete. When used on pipes and other structural penetrations, swellable type waterstop tape shall be cut to measured length and placed around the penetration with ends butted. In all cases, swellable type

waterstop tape shall be in direct contact with the substrate along the entire length of the installation. Swellable type waterstop tape is not an expansion joint sealant and only suitable for non-moving concrete joints. Swellable type waterstop tape should not be installed in standing water or on frozen or icy surfaces

#### **22.6.8 Storage / Self Life**

When stored in a dry enclosed area off the ground at a minimum temperature of 45°F (7°C) in unopened, undamaged cartons, its self life is unlimited.

#### **22.6.9 Measurement**

The measurement shall be taken by measuring the length of swellable type waterstop tape in running metre correct to a centimeter. Length shall be measured in metres correct to two places of decimal. Measurement shall be made in metres.

#### **22.6.10 Rate**

The rate shall include the cost of all labour and materials involved in all the operations described above.

#### **22.6.11 Measurement**

The quantity of Integral Crystalline Slurry coat will be measured in sqm. The Length & breadth/height of the coated area by Integral Crystalline Sully shall be measured correct to a centimeter. The area shall be calculated in sqm correct to two place of decimal.

#### **22.6.12 Rate**

The rate shall include the cost of all the labour, material and equipments involved in all the operations described above.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.1		Water proofing on horizontal surface, kota stone	<p>Providing and laying integral cement based treatment for water proofing on horizontal surface at all depth below ground level for under ground structures as directed by Engineer-in-Charge consisting of:</p> <p>(i) Ist layer of 22mm to 25mm thick approved and specified rough stone slab over a 25mm thick base of cement mortar 1:3 (1 cement: 3 sand) mixed with water proofing compound conforming to IS: 2645 in the recommended proportion over the levelling course ( levelling course to be paid separately). Joints sealed and grouted with cement slurry mixed with water proofing compound.</p> <p>(ii) 2nd layer of 25mm thick cement mortar 1:3 (1 cement: 3 sand) mixed with water proofing compound in recommended proportions.</p> <p>(iii) Finishing top with stone aggregate of 10mm to 12mm nominal size spreading @ 8 cudm/sqm thoroughly embedded in the 2nd layer. (with 5 years service guarantee) Using rough Kota stone.</p>	sqm	916.00
22.2		Water proofing on vertical surface, kota stone	<p>Providing and laying integral cement based treatment for water proofing on the vertical surface by fixing specified stone slab 22 mm to 25mm thick with cement slurry mixed with water proofing compound conforming to IS:2645 in recommended proportions with a gap of 20mm (minimum) between stone slabs and the receiving surfaces and filling the gaps with neat cement slurry mixed with water proofing compound and finishing the exterior of stone slab with cement mortar 1:3 (1 cement : 3 sand) 20 mm thick with neat cement punning mixed with water proofing compound in recommended proportion complete at all levels and as directed by Engineer-in-charge (with 5 years service guarantee) Using rough Kota stone.</p>	sqm	1013.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.3		Water proofing treatment four course blown bitumen treatment	Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of : <b>a)</b> Ist course of applying cement slurry @ 4.4 Kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including roundingoff junction of vertical and horizontal surface. <b>b)</b> IInd course of 20mm cement plaster 1:3 (1 cement: 3 sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. <b>c)</b> IIIrd course of applying blown or residual bitumen applied hot at 1.7 Kg. per sqm of area. <b>d)</b> IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 Kg/sqm.) (with 5 years service guarantee)	sqm	440.00
22.4		PVC water stops for construction/ expansion joints	Providing and Placing in position suitable PVC water stops conforming to IS:12200 for construction/ expansion joints between two RCC members and fixed to the reinforcement with binding wire before pouring concrete etc. complete (with 5 years service guarantee)		
	22.4.1	225mm	Serrated with central bulb (225mm wide, 8-11mm thick).	metre	551.00
	22.4.2	180 mm	Dumb bell with central bulb (180mm wide, 8mm thick).	metre	499.00
	22.4.3	320 mm	Kickers (320mm wide, 5mm thick).	metre	522.00
22.5		Water proofing treatment two course cement mortar	Providing and laying water proofing treatment in sunken portion of WCs,bathroom etc., by applying cement slurry mixed with water proofing cement compound consisting of applying : <b>a)</b> First layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm. This layer will be allowed to air cure for 4 hours. <b>b)</b> Second layer of slurry of cement @ 0.242 kg/sqm mixed with water proofing cement	sqm	207.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			compound @ 0.126 kg/sqm. This layer will be allowed to air cure for 4 hours followed with water curing for 48 hours. The rate includes preparation of surface, treatment and sealing of all joints, corners, junctions of pipes and masonry with polymer mixed slurry.		
22.6		Water proofing treatment Fibre glass cloth and cement slurry	<p>Providing and laying water proofing treatment on roofs of slabs by applying cement slurry mixed with water proofing cement compound consisting of applying :</p> <p>a) After surface preparation, first layer of slurry of cement @ 0.488 kg/sqm mixed with water proofing cement compound @ 0.253 kg/sqm.</p> <p>b) Laying second layer of Fibre glass cloth when the first layer is still green. Overlaps of joints of fibre cloth should not be less than 10 cm.</p> <p>c) Third layer of 1.5 mm thickness consisting of slurry of cement @ 1.289 kg/sqm mixed with water proofing cement compound @ 0.670 kg/sqm and sand @ 1.289 kg/sqm. This will be allowed to air cure for 4 hours followed by water curing for 48 hours. The entire treatment will be taken upto 30cm on parapet wall and tucked into groove in parapet all around.</p>	sqm	338.00
22.7		Water proofing treatment brick coba	<p>Providing and laying integral cement based water proofing treatment including preparation of surface as required for treatment of roofs, balconies, terraces etc consisting of following operations:</p> <p>a) Applying a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with water proofing compound conforming to IS. 2645 and approved by Engineer-in-charge over the RCC slab including adjoining walls upto 300mm height including cleaning the surface before treatment.</p> <p>b) 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 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 sand ) admixed with water</p>	sqm	885.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>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.</p> <p>c) After two days of proper curing applying a second coat of cement slurry using 2.75kg/sqm of cement admixed with water proofing compound conforming to IS : 2645 and approved by Engineer-in-Charge.</p> <p>d) Finishing the surface with 20 mm thick jointless cement mortar of mix 1:4 (1 cement: 4 sand) admixed with water proofing compound conforming to IS: 2645 and approved by Engineer-in-charge including laying glass fibre cloth of approved quality in top layer of plaster and finally finishing the surface with trowel with neat cement slurry and making pattern of 300x300 mm square 3mm deep.</p> <p>e) 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: (with 5 years service guarantee) With average thickness of 120mm and minimum thickness at khurra as 65 mm.</p>		
22.8		Water proofing Four courses hessian base bitumen felt	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 metre 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 decimeter per square metre including preparation of surface but excluding grading complete with : (with five years service gurantee). Bitumen felt (hessian base) type 3 grade I conforming to IS: 1322.	sqm	371.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.9		Water proofing hessian based bitumen felt	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 metre 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 but excluding grading, complete. (With five years service guarantee).	sqm	597.00
22.10		Water proofing Six courses fibre based grade-I bitumen felt	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 metre of area respectively, second and fourth courses of roofing felt type 2 grade I (fibre base self finished bitumen felt) six and final courses of stone grit 6 mm and down size or pea sized gravel spread at 6cu.dm per sqm including preparation of surface, excluding grading, complete. (With five years service guarantee).	sqm	585.00
22.11		Water proofing Six courses fibre base grade-II bitumen felt	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 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 6 mm and down size or pea sized gravel spread at 6 cubic dm per sqm including preparation of surface but excluding grading, complete. (With five years service guarantee)	sqm	586.00
22.12		Deduct for omitting water proofing treatment final course 6mm grit	Deduct for omitting in water proofing treatment final course of spreading stone grit 6mm down size or pea sized gravel at 6 cudm per sqm.	sqm	10.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.13		Water proofing Bituminous solution primer on roof and wall	Supplying and applying bituminous solution primer on roof and or wall surface at 0.24 litre per sqm.	sqm	23.00
22.14		Roof grading	Grading roof for receiving water proofing treatment with		
	22.14.1	C.C. 1:2:4	Cement concrete 1:2:4 (1 cement : 2 sand : 4 graded stone aggregate 20 mm nominal size)	cum	6569.00
	22.14.2	CM 1:3	Cement mortar 1:3 (1 cement : 3 sand)	cum	9308.00
	22.14.3	CM 1:4	Cement mortar 1:4 (1cement : 4 sand)	cum	8437.00
22.15		Water proofing treatment six course (1.5mm thick APP membrane) bitumen based	Providing and laying insitu six 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 and 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 20 micron HMHDPE film. (with 5 years service guarantee)	sqm	504.00
22.16		Water proofing treatment four course (2.0mm thick APP membrane) bitumen based	Providing and laying in situ four 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 and 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. (with 5 years service guarantee).	sqm	368.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.17		Water proofing treatment six course (2.0mm thick APP membrane) bitumen based	Providing and laying in situ six 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 and 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 100 micron HMHDPE film sandwiched on both sides with polymeric mix and the polymeric mix is protected on both side with 20micron HMHDPE film. (with five years service gurantee).	sqm	606.00
22.18		Water proofing treatment five layer (2.0mm thick APP membrane) reinforced with glass fibre mesh bitumen based	Providing and fixing APP (Atactic Polypropylene Polymer) modified prefabricated five layer 2mm thick water proofing membrane for corrugated roof sheets, 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 viscocity 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 notless 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 manufacture of membrane. (With five years service gurantee).	sqm	389.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.19		Water proofing treatment five layers (3mm thick APP membrane, glass fibre mesh) bitumen based	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 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 : (with 5 years service guarantee)	sqm	440.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.20		Water proofing treatment five layers (3mm thick APP reinforced with non-woven polyester matt) bitumen based	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: (with 5 years service guarantee).	sqm	510.00
22.21		Extra for protective geotextile	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. [for item No. 22.18 to 22.20]	sqm	59.00
22.22		Water proofing with fibre glass mesh and two component acrylic resin	Water proofing treatment over Roof, Wall, Chajjas,, Balcony with fibre glass mesh and Sealer coat at leakage/ seepage area consisting of (i) Surface preparation roughening of surface, opening cracks in 'V' groove in size of 5mmX10mm (WXD), filling of cracks with putty with laying fiber glass mesh, Cleaning of surface by scrubbing with steel wire/Nylon brush. Removing all dust particles and washing with adequate water to clean completely. (ii) Providing and applying 1 <sup>st</sup> coat of fibre glass mesh (minimum thicknes 70-80 micron) and two component flexible waterproof and protective modified mortar, dry powder 80%	sqm	465.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>chemical 20% acrylic resin having 30% solid contents) with mix proportion of part 1 and 2 with proper mixing with laying of fiber glass mesh (of weaving size of 10X10 yarn/inch duly coated with alkaline resistant polymer). Allow the coating to air cure for minimum 2 Hrs. After two hours of 1<sup>st</sup> coat applying 2<sup>nd</sup> coat (minimum thickness 100 micron) of fibre glass mesh of with mix proportion of part 1 and 2 with proper mixing. Allow the coating to air cure for minimum 2 hrs. Consumption of two component should be acrylic resin @ 17.90 kg for 10 sqm area or as per manufacture instructions. (After two coats of diamond shield, surface is to be cured properly minimum for 4 hrs. before application of third coat).</p> <p>(iii) Providing and applying 1<sup>st</sup> coat of sealer coat 50-60 micron (single component High build elastomeric, fixable pure acrylic waterproofing membrane having solid content of 65%) and allow it to air cure for 4Hrs. minimum. After two hours minimum of 1<sup>st</sup> coat applying 2<sup>nd</sup> and final coat 120-140 micron of sealer coat and allow it to air cure for 4 Hrs minimum. Consumption of Sealer coat should be @ 5.40 kg per 10 sqm area.</p> <p>(iv) The treated area should be cured with water for 48 hrs. by flooding the surface.</p> <p>(v) The final appearance of the coating will be milky white. All above operations to be done in order. (five years guarantee)</p>		
22.23		Waterproofing treatment with rubberized elastomeric membrane	<p>Providing water proofing treatment over Roof, Wall, Chhajjas, Balcony with Rubberized elastomeric cold applied liquid waterproofing membrane blend of special resin and rubber with more than 1300% elongation (confirming ASTM-D2370-98), at leakage/seepage area consisting of the following operation.</p> <p>(i) Removal of damaged waterproofing treatment if any like bituminous membrane / plaster/ brick bat koba/screeding etc.</p> <p>(ii) Surface preparation: Roughening of surface by scrubbing with steel wire/ Nylon brush/ Removing all dust particles and washing with adequate water to clean completely, opening of cracks in 'V' groove</p>	sqm	544.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>in size of 5mm x 10m (WxD), filling of cracks with elastomeric creak filler/PU sealent repair of potholes and holor makingon roof surface by polymer mortar with adding SBR bonding agent.</p> <p><b>(iii)</b> Providing and applying 1st coating of rubberized elastomeric liquid membrane as primer (ratio 1:2 1 part liquid membrane and 2 part water) by brush/ Roller/ Spray having minimum thickness of 70-80 micron. Allow the coating to set in natural air for minimum 2 hrs, then put reinforcement by laying 45gsm fibre glass mesh and applying 2nd coat of rubberized elastomeric liquid membrane (Ratio: 1 part membrane and 20% water) with minimum thickness 100-120 micron. Allow the coating to set in natural airfor minimum 12 hrs.</p> <p><b>(iv)</b> Providing and applying 3rd coat of rubberized elastomeric liquid membrane (Ratio: 1 part membrane and 10% water). Total DFT (Dry film thickness) thickness after 3<sup>rd</sup> coat must be 280-300 micron and consumption in three coats @ 6.5kg for 10sqm.</p> <p><b>(v)</b> Providing and applying 4th and 5th coat of High quality waterproof membrane in white colour, single component special synthetic resin based flexible thixotropicwhite color coating with excellent UV resistance (SRI - 144) with more than 300% elongation (confirming ASTM D 412-98) in ratio: 1 part membrane and 10% water thickness of 200 micron DFT in two coats, with average consumption @ 5kg per 10 sqm. After application of fourth coat let it air dry for minimum 3 hrs before application of fifth coat.</p> <p><b>(vi)</b> The treated area must be tested for water leakage/seepage by flooding with water for 48 hrs</p> <p><b>(vi)</b> Application of membrane coating shall be got done by authorized applicator of manufacturer.</p> <p><b>(vi)</b> 5 years of service guarantee to be provided.</p> <p>All above operations to be done in order as per direction on Engineer-in-Charge.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.24		Fibre reinforced liquid waterproofing	Supplying and applying fibre reinforced, UV resistant elastomeric liquid applied waterproofing & Heat reflective coating coating with PU Hybrid polymers & acrylic fibers. The coating shall resist 10 bars of water pressure as per DIN 1048 standards, with elongation of 350% as per ASTM D412 & crack bridging of upto 2.5mm conforming to ASNZ standard. The operation shall be carried out after scrapping and properly cleaning the surface to remove loose particles with wire brushes, complete in all respect as recommended by the manufacturer's specification and as per the direction of Engineer-in-Charge.	sqm	365.00
22.25		Acrylic polymer modified cementitious waterproofing	Supplying and applying two component elastomeric acrylic polymer modified cementitious waterproofing coating, having 80% elongation as per ASTM D412, resisting 5 bars hydrostatic pressure as per DIN 1048, reduction to rapid chloride shall be 70 as per DIN 1048, crack bridging upto 1.2mm as per ASTM 4548.5. The coating shall have food grade certificate from laboratories like CFTRI. The mixing ratio of the coating shall be 2 parts of powder & 1 part of liquid without any water addition in the mixing, etc., complete as per manufacturers specifications and as per direction of Engineer-in-Charge.	sqm	195.00
22.26		Polyurethane liquid water proofing membrane	Providing and applying UV Stable polyurethane liquid water proofing membrane having Sun Reflectivity Index (SRI) of 106 on top of concrete roof / Retaining wall / Old layer of bituminous surfaces / Polyurethane foam and metal surfaces in three or more coats @20kg/ 10 sqm consisting of a coat of two component epoxy primer in ratio of 1:3 (one part of resin and 3 parts of hardner) at a consumption of 2kg/10sqm. the vital physical and chemical parameters shall be as under : Min Elongation	sqm	750.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			at break of 600% as per ASTM D412 and tensile strength of 3.0 N/mm <sup>2</sup> as per ASTM D412. The operation shall be carried out after scrapping and properly cleaning the surface to remove loose particles with wire brushes, complete in all respect as recommended by the manufacturer's specification and direction of Engineer-in-Charge.		
22.27		Waterproofing of RCC base slab with 1.2 mm thick HDPE membrane	Supplying & installing waterproofing treatment by using 1.2 mm thick HDPE membrane before casting of the base RCC slab. The pre-applied membrane gets bonded to the underneath of the poured concrete used as base slab. The membrane shall consist of a thick HDPE film, a highly aggressive pressure sensitive adhesive and weather resisting coating which bonds integrally to poured concrete of base slab. The membrane shall conform to basement waterproofing protection to grades 2, 3 & 4 as defined in BS 8102:2009. The waterproofing membrane shall have following minimum properties: <b>a)</b> Resist hydrostatic pressure of up to 70 m head of water as per ASTM D5385; <b>b)</b> Puncture Resistance of 950 N (as per ASTM E154) <b>c)</b> Elongation of >400 % (as per ASTM D412) <b>d)</b> Peel Strength of concrete: >1500 N/m (as per ASTM D903) <b>e)</b> Tensile strength of 28.2 MPA (as per ASTM D412).	sqm	1738.00
22.28		Waterproofing of RCC base slab and vertical wall with 2 mm thick PVC membrane	Providing and applying 2.0 mm thick twin colour flexible PVC waterproofing membrane. Flexibility under low temperatures as per EN 495-5 should be < - 20degC. On all horizontal surfaces Geotextile 300 Gsm to be laid over PCC, then laying PVC membrane over Geotextile and to be sealed with hot air welding method at all joints and over PVC membrane provide 300 Gsm Geotextile Then protection screed of	sqm	1670.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			suitable thickness. On all vertical surfaces Geotextile 300 Gsm to be laid along with Vertical wall, than laying PVC membrane over Geotextile and to be sealed with hot air welding method at all joints and over PVC membrane providing protection layer of Drain Board HDPE Dimple sheet before backfilling of soil.		
22.29		Waterproofing cum heat reflective roof coating	Providing and applying waterproofing & Heat reflecting roof coating with 100% acrylic elastomeric polymers. Contains 30% Volume solid, tensile strength 8 kg/cm <sup>2</sup> , crack bridging, VOC 30 ± 5 gm/ltr upto 2 mm. then applying two coats with forced coverage of 20 sqft/ltr/two coats. The operation shall be carried out after scrapping & propely clening the surface to remove loose particles with wire brush/Jet washer. Apply 1 coat @1 ltr/10 sqm & 3 undiluted coats @ 8 ltr/10 sqm with 4 hrs interval of each coat.The work shall be carried out as recommended by the manufacturer's specification & the direction of the Engineer-in-Charge.	sqm	342.00
22.30		Crack repairing upto 5 MM crack	Providing & applying crack fill paste for crack filling up to 5 mm cracks.Widen the crack by putty knife in V/U shape & apply1st priming coat of crack fill paste dilutedwith water in 1:1 proportion over the crack bybrush. Apply 2nd coat with filling of crack fill paste when the surface is tacky but not dried completely with putty knife & spatula.After 4 hours of application 2nd coat apply 3rd coat of Crack fill paste. The work shall be carried out as recommended by the manufacturer's specification & the direction of the Engineer-in-Charge	metre	55.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.31		Waterproofing roof by waterbase polyurethane elastomeric liquid applied membrane	Providing & applying single pack component, solvent-free, cold applied, Polyurethane modified, elastomeric liquid applied waterproofing membrane- PU coat with excellent UV resistant capacity, Non-toxic with high SRI Index, eco friendly, low VOC & complies with the requirement as laid out in ASTM D 6083-97a. It can be applied on cementitious substrates, brick & stone, Bituminous coatings, metals, wooden substrates, paint/coatings with application of two coats without dilution along with a self Priming Coat-50% dilution with water. Surface should be cleaned properly with required tools & crack repairing by cement mortar mixed with latex for waterproofing application. Apply in 3 coats (1st priming coat @ 2 kg/10 Sqm and 2nd & 3rd coat @ 4 kg/10 Sqm of each coat) for complete waterproofing with Interval of 4 hours between every coat. The material shall meet the requirement as specified in ASTM D2370-98 of elongation at break of film >350% with geotextile fleece =50% approx. The work shall be carried out as recommended by the manufacturer's specification & the direction of the Engineer-in-Charge. The product performance shall carry guaranteed for 5 year against any leakage.		
	22.31.1	With Geotextile fleece	For Horizontal surface (with Geotextile fleece) two coats without dilution & 1 Self priming coat- 50% dilution with water @ 10 kg/m <sup>2</sup>	sqm	459.00
	22.31.2	Without Geotextile fleece	For Horizontal surface (without Geotextile fleece) two coats without dilution & 1 Self priming coat- 50% dilution with water @ 10 kg/m <sup>2</sup>	sqm	390.00
22.32		Waterproofing RCC base slab and wall with Integral crystalline admixture	Providing and mixing integral crystalline admixture for water proofing treatment to RCC structures like basement raft, retaining walls, reservoir, sewage & water treatment plant, tunnels / subway and bridge deck etc. at the time of transporting of concrete into the drum of the ready-mix truck, using integral crystalline admixture @ 0.80% (minimum) to	kg	239.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			the weight of cement content per cubic meter of concrete) or higher as recommended by the manufacturer's specification in reinforced cement concrete at site of work. The material shall meet the requirements as specified in ACI-212-3R- 2010 i.e. by reducing permeability of concrete by more than 90%, Compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure. The crystalline admixture shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the Engineer-in-Charge. The product performance shall carry guarantee for 10 years against any leakage.		
22.33		Waterproofing with Integral crystalline slurry of hydrophilic nature	Providing and applying integral crystalline slurry of hydrophilic in nature for waterproofing treatment to the RCC structures like retaining walls of the basement, water tanks, roof slabs, podiums, reservoir, sewage & water treatment plant, tunnels / subway and bridge deck etc., prepared by mixing in the ratio of 5 : 2 (5 parts integral crystalline powder: 2 parts water by weight) for vertical surfaces and 3 :1 (3 parts integral crystalline slurry : 1 part water by weight) for horizontal surfaces and applying the same from positive (internal) side with the help of synthetic fiber brush. The material shall meet the requirements as specified in ACI- 212-3R-2010 i.e by reducing permeability of concrete by more than 90% compared with control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on positive side. The crystalline slurry shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the engineer-in-charge. The product performance shall carry guarantee for 10 years against any leakage.		
	22.33.1	Vertical surface	For vertical surface two coats @ 0.70 kg per sqm	sqm	412.00
	22.33.2	Horizontal surface	For horizontal surface one coat @ 1.10 kg per sqm.	sqm	319.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
22.34		Waterproofing horizontal surface by Integral crystalline (dry shake) of hydrophilic nature	Providing and applying integral crystalline (dry shake) of hydrophilic in nature for waterproofing treatment to the RCC structures like basement raft, foundation slab, sewage & water treatment plant slab, warehouses floor, parking structures and water tank base slab etc. sprinkled @ 0.60 kg per sqm or higher as recommended by the manufacturers specification over the lean concrete of above cited structures. The material shall meet the requirements as specified in ACI-212-3R-2010 i.e. by reducing permeability of concrete by more than 85% compared control concrete as per DIN 1048 and resistant to 16 bar hydrostatic pressure on negative side. The crystalline dry shake shall be capable of self-healing of cracks up to a width of 0.50mm. The work shall be carried out all complete as per specification and the direction of the Engineer-in-charge. The product Performance shall carry guarantee for 10 years against any leakage.	sqm	249.00
22.35		Crystalline mortar 4:5 for the treatment of faulty construction joints/holes	Providing and applying crystalline mortar by mixing in the ratio of 4.5 : 1 (4.5 parts crystalline mortar : 1 part water) for the treatment of faulty construction joints, cracks, tie rod holes and spalled & honeycombed surface of RCC underground structures like basement, water tanks, bridge deck etc. to ensure water tightness. The crystalline mortar shall conform to the EN 1504-3 having compressive strength Class R4 > 45 MPa and adhesive bond strength Class R3 > 1.5 MPa. The work shall be carried out all complete as per specification and the direction of the Engineer-In-Charge. The product performance shall carry guarantee for 10 years against any leakage.		
	22.35.1	Construction joints	For sealing cracks and faulty construction joints, routed out/making U-shape groove size 25x25mm and then primed the area with integral crystalline slurry @0.05kg/ running metre and while the surface is tacky filled the groove upto surface with crystalline mortar @1.50kg/ running metre. Once crystalline mortar is touch dry then finally applied two	metre	449.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			coats of integral crystalline slurry @0.05kg/running metre per coat.		
	22.35.2	Tie rod hole	For patching of tie rod holes, prepared tie rod hole surface and then primed the area with integral crystalline slurry @ 0.070 kg/sqm and while the surface is tacky repair and then filled the tie rod holes with crystalline mortar @ 0.040 kg per hole. The crystalline mortar should be tightly rodded into tie rod holes or packed tightly (For 25x25x25 mm tie rod hole, use 0.040 kg to fill the hole)	each hole	16.00
22.36		Waterproofing of RCC base and wall using swellable type water stop tape	Providing and applying of swellable type water stop tape, 19mm x 25mm thick in linear meter (expansive nature) for construction joints treatment of RCC structure such as raft slab, retaining walls, water storage tank and at the junctions of raft slab with the retaining walls etc. After cleaning the surface, one coat of required primer for swellable water stop tape shall be applied throughout the length of the joint @3.78 litre per 240 running meter. Over the primed surface swellable type water stop tape shall be placed. The work shall be carried out all complete as per specification and the direction of the Engineer-In-Charge. The product performance shall carry guarantee for 10 years against any leakage.	metre	426.00
22.37		Waterproofing treatment of bathroom or tiled balcony area using waterproofing sheets	Providing and applying waterproofing treatment in bathroom or tiled balcony area without breaking or removing tiles, by using waterproofing sheets as per manufacturer's data sheet instructions. Permitting use of bathroom/balcony after 24 hours of application of treatment, Complete with materials and labour and guarantee of leakage for a period of 5 year.	sqm	653.00



**CHAPTER – 23.0**  
**MODULAR OPERATION THEATRE**

**PREAMBLE**  
**MODULAR OPERATION THEATRE**  
**(Chapter No. – 23)**

**23.1 Wall and ceiling panels**

The main requirements for any operation theatre is wall and ceiling system that they should be impact resistant, show resistance to solvents & chemicals, prevent colonizing of micro-organisms or neutralize micro-organisms which come in contact with the wall surface. The surface should be stable prevent cracking and movement, scrub able-amenable to cleaning & completely sealed finish, biological attack resistant & have hygiene finish & lastly have hydrothermal performance. The exposed surface of panels should be easily washable, scratch free, dent free, flame resistant, scratch resistant as per BS 3900 Part E2 standard.

All wall and ceiling mounted equipment should be flush and sealed into theatre wall/ceiling by means of durable sterile jointing system. The wall and ceiling panel design and construction should allow for the installation and support of all equipments with provision of openings on back side required for repair and maintenance without affection rigidity and strength. In case required one should be able to easily remove the panel for service requirement.

The total distance between the inside and outside surfaces of the theatre should vary to suit the architect's layout.

The cavity between the inner and outer surface of walls and ceiling should be left with minimum obstruction for the possible addition of services, pipes, conduits etc, to be run within the cavity at later date.

**23.2 Anti-bacterial paint:-**

Anti-bacterial and anti- fungus sterile coating shall be applied on finished walls and ceiling with at 2-3 coats to achieve a thickness of minimum 200 micron and it should resistance to water, most chemicals commonly used in hospital departments. It should neutralize micro-organisms which come into contact and should prevent colonizing or sparing of micro-organisms.

The sterile coating should show resistance to a wide range of mixed species, including stubborn pathogens such as MRSA, Acinetobacter sp, Aerobic aero genes, Bacillus subtilis, Escherichia coli, Listeria monocytogenes, Pseudomonas aeruginosa, Pseudomonas putida, Salmonella typhimurium, Serratia marcescens, Staphylococcus Aureus.

The sterile coating should remain unaffected by radiation, its anti-microbial system should not leach out and its anti-microbial properties should last for a minimum of 10 years.

The sterile coating should be easily maintained and should withstand repeated cleaning with alkaline detergents, antiseptics and fumigation agents without any degradation to the surface finish or performances. Coating should conform to standards HTM 08-01/HTM 56

### **23.3 Surgeon's scrub sink (2 bay):-**

There should be Surgeon's scrub sink of stainless steel grade SS 304, seamless welded constructions polished to a satin finished with hands free operation by infra red sensors with programmable adjustment for thermostatic mixing and food of water with foam flow attachment and beta dine dispensers, Knee/ foot operated switches should also be provide additionally. It should also have wall mounted possibility.

### **23-4 G.I. Puff panels for wall and ceiling:-**

The OT wall shall be constructed using GI puff panels having 0.8 mm tick GI sheet on both sides. These panels should have been produced in a double band laminator, in which two continuously moving belts carrying 120 GSM galvanized steel of 0.80mm thickness are firmly bonded together by sprayed in insulating foam, which hardens during the process. The core consists of rigid polyurethane foam, which has been injected under high pressure, with a minimum density of 40kg/m<sup>3</sup>. The thickness of puff shall be minimum 50 mm. The puff panel shall be fixed to the floor with bottom track of 1.5 mm thick steel. U channel section having min size of 50 mmX50 mm. The bottom shall be fixed in the floor of the OT with 10 mm tick and min 60 mm long SS fasteners which shall be fully threaded and power drilled. The panels of walls and ceiling shall be tied together by suitable SS coving. The joints shall be filled with metal filler and shall be sand casted on site till smooth finish is obtained. Wall & panel joints shall not be visible after the final wall coating is applied. The gap between the masonry wall surfaces and the panel of the theatre shall be sufficient for the flues mounting of equipment's. This gap shall be provided to accommodate the equipment at a the date and to enable services, pipes, conduits etc, to be run within the gape. All wall mounted equipment shall be flush mounted and seated in operation theatre. All the sharp edges and corners shall be in radius to avoid bacterial contamination. Access boxes shall be fitted to the rear of all wall mounted equipment to enable maintenance to be carried out from outside the operation theatre. There shall be provision for accommodating 4 return riser air ducts with SS 304 grills to meet HVAC requirements as per HVAC layout. Product should have warranty of at least 10 years.

### **23.5 Toughened glass window**

Modular OT should have a double isolated fixed glazing, with not less than 5 mm thick toughened glass window which have 12 mm air gap in between. Window frame should be power coated aluminium fixed flush with wall panels should have horizontal venetian blinds of power coated aluminium strips of vista level.

### **23.6 Storage unit**

There should be a storage unit of stainless steel grade SS304 with 10mm thick toughened glass shelves supported with D type bracket (SS 304 grade)

### **23.7 Writing Board:**

The writing unit/white Board of size 900/600mm flush mounted 1.60mm thick white lamination board, bonded to a 40mm high density fiber board sheet for additional rigidity. The unit should open to create a wall mounted writing surface within the operating room.

### **23.8 Hatch Box/ Pass Box:**

The Hatch box manufactured with stainless steel grade. SS 304 provided in operation theatre to remove waste material from OT to dirty linen area just adjacent to operation theatre Hatch box equipped with electronically operated two nos doors. It is designed in such a way that only one door should be opened at a time.

The UV light should be so installed that it is kept on while both the doors are closed, this UV light has to be automatically turned off in case of opening of either of the doors. There should be indicators on both sides of the OT so that door open/close status can be monitored from both ends.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
23.1		Stainless steel grade SS304 O.T. Wall Panels	<p>Supply, installation, testing, commissioning of modular OT wall &amp; Corner panels made of stainless steel (SS) of grade SS304 .The inner surface of wall should be constructed with 1.5 mm thick stainless steel grade SS304 backed by minimum 12 mm thick gypsum board fixed by grouting and suitable galvanized iron frame on the masonry walls of OT with stainless steel fasteners of 10 mm dia and 600 mm length at suitable intervals. The steel sheet panel shall be indigenous of reputed make and shall be provided with manufactures test certificate. The fastener shall be fully threaded and shall be power drilled. The panels shall be fixed to the wall by a 1.5 mm thick U shape SS channel of minimum size 50 mm x 50 mm. The individual wall panels shall have folded edges which shall be fixed to S.S. U channel by welding and then shall be welded together. The inner surface of O.T. walls (facing inside the Modular OT) should be easily washable, scratch free, dent free, flame resistant, stretch resistant as per BS 3900 Part E2 standards.</p> <p>All joints shall be filled with metal casted and shall be sand flush on site till ready to receive the plastic finish. The individual wall panels should be perfectly sealed together without any gap and free of projections. Wall panel joints should be invisible when the OT is finished. The gap between masonry wall and the panel of the theatre shall be sufficient for the flush mounting of equipments and to enable services, pipes, conduits etc., to run within the gap as per approved layout. All wall-mounted equipment shall be flush mounted and sealed into operation theatre. All the sharp edges and corners shall be in curve to avoid bacterial contamination. The wall panel design shall be such that it allows installation and provide support to all equipment without affecting rigidity and strength. All wall mounted equipment should be flush mounted and sealed into theatre wall by means of a sterile jointing system. There shall be provision for accommodating 4 return riser air ducts with SS304 grills to meet the HVAC requirements as</p>	sqm	9750.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			per HVAC layout. Product should have warranty of at least 10 years. The work should be executed as per the directions of Engineer-in-Charge.		
23.2		Stainless steel grade SS304 O.T. Ceiling Panels	Supply ,installation , testing ,commissioning of modular OT ceiling panels made of stainless steel (SS) of grade SS304 .The inner surface of panels should be constructed with 1.5 mm thick stainless steel grade SS304 backed by minimum 12 mm thick gypsum board fixed by grouting on the roof of OT . The sheet panel shall be indigenous of reputed make and shall be provided with manufactures test certificate. The outer surface of panels shall be fixed to the roof by essential fastener supports with stainless steel fastener of 10 mm dia and min. 60 mm length at suitable interval. The fastener shall be fully threaded and power drilled. Ceiling support element should be galvanized or powder coated steel suspension bracket with tension springs. Themimum size of the tie/threaded rod shall be 10 mm dia and section as per site requirement. The individual fasteners except those at the edges should be removable individually. The inner surface of panels (facing inside the MOT) should be easily washable, scratch free, dent free, flame resistant, stretch resistant as per BS 3900 Part E2 Standards. All joints shall be filled with metalcasted and shall be sand flush on site till ready to receive the plastic finish. The individual SS panels should be perfectly sealed together withoutany gap and free of projections. SS ceiling panel joints should be invisible when the OT is finished. The gap between roof & panels the inside and outside surfaces of the theatre shall be variable to suit the architects' layout, but shall be sufficient for the flush mounting of equipment's. The gap between roof & panel shall be left to accommodate the equipment at a later date and to enable services, pipes, conduits etc., to run within the gap. All ceiling mounted equipment shall be flush mounted and sealed into operation theatre. All the sharp edges and corners shall be in curve to avoid bacterial contamination. The ceiling	sqm	10150.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			panel design shall be such that it allows installation and provide support to all equipment and the provision of openings required for the installations, without affecting rigidity and strength. All ceiling mounted equipment should be flush mounted and sealed by means of a sterile jointing system. The ceiling should be thermodynamically stable, not getting heated with electrical wiring or air flow and should not sag with weight of pendants. There shall be provision for accommodating room lighting, air supply inlet, ceiling service units, return air outlets etc and should be integrated with SS panel ceiling system. Product should have warranty of at least 10 years. The work should be executed as per the directions of Engineer-in-Charge.		
23.3		Anti bacterial paint on G.I.Puff panel or S.S. panel of O.T.	Providing and establishing anti-bacterial & anti fungicidal sterile coating of liquid plastic paint on GI Puff/SS panel of modular OT. The paint should be seamless, easy to clean, should have vapor permeability which allows substrate moisture to escape and protects against growth of bacteria, mould and yeasts, moisture resistance, freeze / thaw resistance. Anti-bacterial paint's anti-microbial quality should remain active throughout the life of the product. Vapors permeable structure should allow damp substrate to dry out without causing blistering. It should tolerate cleaning with hospital chemical agents. Filling of all joints and cavities should be with metallic epoxy filler and sand casted flush to provide a joint-less finish. This should include all fittings, accessories, hardware, support structures, etc. required for installation. Anti-bacterial and anti-fungus sterile coating shall be applied on the finished walls & ceiling with at least 2-3 coats to achieve a thickness of minimum 200 micron. Before application of sterile wall coating an appropriate primer shall be applied. The primer shall be supplied along with the paint and should be of the same make as that of paint. and shall be applied prior to coating of anti-bacterial & anti- fungus sterile paint on walls & ceiling 2-3 coats	sqm	1200.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			shall be applied to achieve a thickness of 200 microns. Sterile coating and primer shall be applied on the surface by air-less spray gun. Sterile coating shall withstand against application of commonly used cleaners in the operation rooms and shall withstand against regular steam cleaning. Product should have warranty of at least 10 years. The work should be executed as per the directions of Engineer-in-Charge.		
23.4		Surgeon's scrub sink (2 bay ) in O.T.	Supplying, fixing installation, testing and commissioning of scrub sink with the following specifications:- Compact surgical scrub sink should be designed for use in OT complex for pre procedural scrub up. (Double sink combination size 1600 mm X 450mm X 1650 mm back height & 1200 mm and front height as suitable) • Each fixture should be fabricated from heavy gauge type 304 stainless steel (minimum thickness 1.5mm) and should be seamless welded construction, polished to a satin finish • The scrub sink should be provided with a front access panel which should be easily removed for access to the water controlled valve, waste connections, stoppers and strainers. • Hands free operation should include infra-red sensors with programmable adjustment. • Thermostatic mixing, valve control should be located behind the access panel and maintain constant water temperature. • Timing should be adjustable to meet individual application requirements. • Provided with infrared sensors, thermostatic control taps with feel safe temperature controls with foam flow attachments and provide with Betadine dispensers . • All units should have reduced anti- splash fronts. • Knee/foot operated switch should be provided additionally. The work should be executed as per the directions of Engineer-in-Charge.	each	86000.00
23.5		G.I. puff panels for O.T wall	Supply, installation, testing and commissioning of modular OT Wall and corner panels with insulated prefabricated puff Panels. The OT wall shall be constructed using GI puff panels having 0.8 mm thick GI sheets on both sides. These panels should have been produced in a double band laminator, in which two continuously moving belts carrying 120 GSM galvanized steel sheets of	sqm	7000.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>0.80 mm thickness are firmly bonded together by sprayed -in insulating foam, which hardens during the process. The core consists of rigid polyurethane foam, which has been injected under high pressure, with a minimum density of 40kg/m<sup>3</sup>. The thickness of Puff shall be minimum 40 mm. The sheet panel shall be of indigenous reputed make and be provided with manufactures test certificate. The puff panel shall be fixed to the floor with bottom track of 1.5 mm thick steel U channel section having min size of 50mm X 50mm. The bottom shall be fixed in the floor of the OT with 10mm thickness and min. 60 mmlong SS fasteners which shall be fully threaded and power drilled. The Panels of walls and ceiling shall be tied together by suitable SS coving. The individual wall panels of wall and ceiling shall be tied together by suitable SS coving. The individual wall panels shall be welded together by SS. All joints shall be filled with metal filler and shall be sand casted on site till smooth finish is obtained. Wall &amp; panel joints shall not be visible after the final wall coating is applied. The gap between the masonry wall surfaces and the panel of the theatre shall be sufficient for the flush mounting of equipment's. This gap shall be provided to accommodate the equipment at a latter date and to enable services, pipes conduits etc, to be run within the gap. All wall-mounted equipment shall be flush mounted and sealed in operation theatre. All the sharp edges and corners shall be in radius to avoid bacterial contamination. The wall panel design shall be such that it enables the installation and supports all equipment's. Provision of openings required for the installations shall not affect rigidity and strength of the panel. Access boxes shall be fitted to the rear of all wall-mounted equipment to enable maintenance to be carried out from outside the operation theatre. Product should have warranty of at least 10 years. The work should be executed as per the directions of Engineer-in-Charge.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
23.6		G.I. puff panels for OT ceiling	<p>Supply, installation, testing and commissioning of modular OT ceiling panels with insulated prefabricated puff Panels. The OT ceiling shall be constructed using GI puff panels having 0.8 mm thick GI sheets on both sides. These panels should have been produced in a double band laminator, in which two continuously moving belts carrying 120 GSM galvanized steel sheets of 0.80 mm thickness are firmly bonded together by sprayed -in insulating foam, which hardens during the process. The core consists of rigid polyurethane foam, which has been injected under high pressure, with a minimum density of 40kg/m<sup>3</sup>. The thickness of Puff shall be minimum 40 mm. The sheet panel shall be of indigenous reputed make and be provided with manufacturer's test certificate. The puff panel shall be fixed to the floor with bottom track of 1.5 mm thick steel U channel section having min size of 50mm X 50mm. The bottom shall be fixed in the floor of the OT with 10mm thickness and min. 60 mm long SS fasteners which shall be fully threaded and power drilled. The Panels of walls and ceiling shall be tied together by suitable SS coving. The individual panels of wall and ceiling shall be tied together by suitable SS coving. The individual wall panels shall be welded together by SS. All joints shall be filled with metal filler and shall be sand casted on site till smooth finish is obtained. Wall &amp; panel joints shall not be visible after the final wall coating is applied. The gap between the masonry wall surfaces and the panel of the theatre shall be sufficient for the flush mounting of equipment's. This gap shall be provided to accommodate the equipment at a latter date and to enable services, pipes conduits etc, to be run within the gap. All wall-mounted equipment shall be flush mounted and sealed in operation theatre. All the sharp edges and corners shall be in radius to avoid bacterial contamination. The wall panel design shall be such that it enables the installation and supports all equipment's. Provision of openings required for the installations shall not affect rigidity and strength of the panel. Access boxes shall be fitted to the rear of all wall-mounted equipment to enable maintenance to be carried out from outside the operation theatre. Product should have warranty of at least 10 years. The work should be executed as per the directions of Engineer-in-Charge.</p>	sqm	7500.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
23.7		Doubled toughened glass O.T. window	Providing and establishing the view windows of size 1.00 m x1.00 m. It should be provided with each operation theatre and should have double isolated fixed glazing with not less than 5 mm thick toughened glass on both sides with 12 mm air gap. Window frame should be of powdered coated aluminum of approved shape flush mounted with wall paneling should have horizontal venetian blinds of powder coatedaluminum strips of vista level or equivalent of approved shade including necessary accessories. Window (Size: - 1000 mm x 1000 mm) with both side glass with blinds sandwiched in between.The blinds should be openable from inside the O.T. The work should be executed as per the directions of Engineer-in-Charge.	sqm	25000.00
23.8		Storage unit in O.T.	Supply and installation of storage unit of SS 304 of reputed make and having size 1665 x 865 x 350 mm and having two or more glass shelves of toughened glass 10 mm thick, supported with D type bracket (SS 304 grade) with 10 mm thickness and rubber gasket of 2mm and mountedflush on wall. The work should be executed asper the directions of Engineer-in-Charge.	nos	30000.00
23.9		Writing board in O.T.	Supply & Installation of writing unit/white board of size 900/600 mm having 1.60 mm thick white laminate board top, bonded to a 40 mm high density fiber board sheet for additional rigidity. The unit should open to create a wall mounted writing surface within the operating room. The work should be executed as per the direction of Engineer-in-Charge.	nos	3700.00
23.10		Hatch box / pass box in O.T.	A hatch of size 600mm x 600mm manufactured by stainless steel grade SS 304, should beprovided in the operation theatre as specified in the scope of the work to remove waste materials from the operation theatre to dirty linen area (or dirty corridor) just adjacent to operation theatre. Each hatch box should be electronically operated.The hatch box should be designed in such a way that only one door should be opened at a time.The UV light should be so installed that it is kept on while both the doors are closed, this UV light has to be automatically turned off in case of opening of either of the doors. There should be indicators on both sides of the OT so that the dooropen/close status can be monitored from both ends. Hatch Box should be installed as per	nos	26000.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			manufacturer's instructions manual. The work should be executed as per the direction of Engineer-in-Charge.		
23.11		Homogeneous Conductive PVC Vinyl Flooring in O.T.,ICU,OPD.	Providing and fixing 2 mm thick homogeneous conductive PVC (Poly Vinyl Flooring) EN (European Standard), total weight is 3250 g/m2, approx. PUR (Polyurethane Reinforced ), abrasion group P: $\leq 2.00$ mm, residual indentation approx. 0.03 mm, anti-bacterial and fungal resistance, castor wheel test qualified, dimensional stability $\leq 0.40\%$ , static electrical charge $< 2$ kv, all vinyl sheets must be linked crosswise with a continuous copper strip and finally connected to earth for grounding electrostatic electrical charges. impact soundreduction approx. +4db, good resistance to scratch, slip, chemical and fire.100% recyclable (eco-freindly) Low VOC emissions after 28days of installation (lower than $\leq 10\mu\text{g}/\text{m}^3$ ), Phthalate free, directional in design.The floor finish should be termite free at the room perimeter passing over a concealed cove forming and continuing up on the wall upto 100mm. Recommended to use inarea like ICU , Post operative, Recovery rooms, OPD, Patient rooms, Corridors ,passages etc.	sqm	2830.00
23.12		Homogeneous anti-static PVC vinyl flooring on O.T.,ICU & Server area	Providing and fixing permanently static dissipative pressed homogeneous conductive PVC ( Poly Vinyl Flooring) EN (European Standard), anti static, wear layer thickness is 2mm (EN429), vinyl flooring having carbon backing with total weight 3000 g/m2 approx (EN 430), XR PUR (Polyurethane Reinforced) , anti- bacterial and fungal resistance, abrasion group P: $\leq 4.0$ mm, residual indentation approx. 0.02 mm, castor wheel test qualified, dimensional stability $\leq 0.40\%$ , static electrical charge $< 2$ kv, all vinyl sheets must be linked crosswise with a continuous copper strip and finally connected to earth for grounding electrostatic electrical charges. good resistance to scratch, slip, chemical and fire, electric resistance is as per EN 1081 and ESD approved, restorable properties,available in rolls. 100% recyclable (eco - freindly). Low VOC emission after 28days of installation (lower than $\leq 100\mu\text{g}/\text{m}^3$ ), Phthalate free non-directional in Design. Recommended to use in area like Operation theater, ICU, Server room, etc.	sqm	3455.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
23.13		Heterogeneous antifungal PVCvinyl 0.92mm thick wall coveringin OT,ICU,server room, etc.	Providing and fixing 0.92mm thick hetrogeneous compact PVC (Poly Vinyl Wall Covering) for Interior wall area, with wear layer thickness 0.12mm of PVC, EN(European Standard) total weight is 1500 g/m2, approx PUR (Polyurethane Reinforced), good resistance to chemical and fire, doesn't favour in growth of fungi and bacterial, 100% recyclable (eco-freindly), low VOC emissions after 28 days of installation (lower than $\leq 10\mu\text{g}/\text{m}^3$ ), phthalate free, directional in design, The wall finish should termite free at the room perimeter. Recommended to use in area like OT,ICU, Corridors, Patient Room etc.	sqm	1598.00
23.14		Homogeneous 1.3mm thick Antifungal Pvc Vinyl Wall Covering in OT, ICU, server room, etc.	Providing and fixing 1.3mm thick homogeneous PVC (Poly Vinyl Wall Covering) for interior area with wear layer thickness 1.3 mm of PVC, EN (European Standard) total weight is 2100 g/m2,approx. PUR (Polyurethane Reinforced), goodresistant to chemical and fire, doesn't favour in growth of fungi and bacterial, 100% recyclable (eco-freindly), low VOC emissions after 28days of installation (lower than $\leq 10\mu\text{g}/\text{m}^3$ ), phthalate free, directional in design.The wall finish should termite free at the room. Recommended to use in area like OT,ICU,Corridors, Passages , Patient Room Etc	sqm	1763.00
23.15		Homogeneous 2.00mm thick antibacterial PVC Vinyl Flooring in OT, ICU, server room, etc.	Supply and installation of 2mm thick homogeneous vinyl flooring, Highest abrasion wear rating Group T (EN660), binder content exceeds 55% of the flooring composition, no waste technology, consisting of PVC resin, plasticizers and stabilizers, type I. flooring (EN ISO 10581). UV cured, cross linked polyurethane reinforcement. PUR surface. Anti-bacterial, antistatic, non-directional design. 100% recyclable, no wax products, phthalate free, solvent free, roll dimensions 2x20mtr., (EN ISO 23997), Product specification (EN649), European classification EN685 class: 34/43, residual indentation EN433 max 0.1mm, Dimensional stability (EN ISO 23997) max 0.4%, Abrasion group (MSZ EN 660-1) T, Fire resistance EN 13501-1 BF1-s1, Slip resistance DIN 51130 R9, EN 13893 DS, electrical resistance EN 1815 <2 kv, Chemical resistance EN ISO 26987, Castor chair resistance EN ISO 4918, Hygenie Bacterial resistant, Seaming method - hot welding, finishing complete . Recommended to use in area like Operation theater, ICU, Server room, etc.	sqm	2100.00

**CHAPTER – 24.0**  
**STEEL STRUCTURE**  
**PRE-FABRICATED BUILDINGS**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S.No.</b>	<b>I.S. No.</b>	<b>Subject</b>
1.	IS 801-1975	Indian Standard code of practice for use of cold formed light gauge steel structural member's in general building construction.
2.	IS 800-2007	Indian Standard General Construction in steel Code of Practice.
3.	IS 875-1987-Part I	Indian Standard Code of Practice Design Loads-Dead Load
4.	IS 875-1987-Part II	Indian Standard Code of Practice Design Loads-Imposed Load
5.	IS 875-1987-Part III	Indian Standard Code of Practice Design Loads-Wind Load
6.	IS 875-1987-Part III	Indian Standard Code of Practice Design Loads- Special Load and combination.
7.	IS 1893-2002	Criteria for Earthquake Resistant Design of Structures.
8.	AISI	American Iron Steel Institute for CFS Member.
9.	IS 14862-2000	Cement fiber board
10.	IS 8183	Glass wool insulation
11.	IS 8386-1993	Non asbestos fiber Cement board

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
24.1		LGSF super structure (wall panel, trusses purling etc.)	<p>Designing, providing, installing and fixing factory finished custom designed cold form Light Gauge Steel Framed super structure comprising of steel wall panel, trusses, purlins etc manufactured out of minimum 0.75 mm thick steel sheet as per design requirements. The steel sheet shall be galvanized (AZ-150gms Aluminium Zinc Alloy coated steel having minimum yield strength 300-550 Mpa) conforming to AISI specifications and IBC 2009 for cold formed steel framing and construction and also as per IS: 875-1987, ISO 800-1984 and IS:801- 1975. The wind load shall be as per provisions of IS 875 (part -III). LGSFS frame shall be designed as per IS: 801 using commercially available software such as Frame CAD Pro-11.7/ STAAD PRO-V8i/ArchitekV2.5.16/ Revit architecture-2011 or equivalent. Proper usage of Connection Accessories like Heavy Duty Tension Ties, Light Duty Hold-ons, Twist Straps (to connect truss with wall frames), Strong Tie, Tie Rod, H-Brackets, Boxing Sections, L-Shaped Angles for better structural stability. The framing section shall be cold form C-type having minimum web depth 89 mm x 39mm flange x 11mm lip in required length as per structural design requirement duly punched with dimple/slot at required locations as per approved drawings. The slots will be along centre line of webs and shall be spaced minimum 250mm away from both ends of the member. The frame can be supplied in panelized or knock down condition in specific dimensions and fastened with screws extending through the steel beyond by minimum of three exposed threads. All self drilling tapping screws for joining the members shall have a Type II coating in accordance with ASTM B633(13) or equivalent corrosion protection of gauge 10 &amp; 12, TPI 16 &amp; 8 of length 20mm. The frames shall be fixed to RCC slab or Tie beam over Neoprene</p>	kg	192.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>rubber using self expanding carbon steel anchor bolt of dia as per approved drawings. design subject to minimum 12mm diameter and 121mm length conforming to AISI 304 and 316 at 500mm c/c with minimum embedment of 100mm in RCC (RCC to be paid separately) and located not more than 300mm from corners or termination of bottom tracks complete in all respects. The item also includes the submission of stability reports duly examined and issued by any NIT/IIT. The rate includes the concept design, detailed design, fabrication of sections, transportation, installation and all required fixing arrangement at site as described above. The main frame shall be fixed to RCC slab or Plinth Tie beam, over Neoprene rubber using self- expanding carbon steel anchor bolt of dia. as per design subject to minimum 12 mm diameter and minimum 121 mm length, confirming to AISI 304 and 316 at 500 mm c/c with minimum embedment of 100 mm in RCC (RCC to be paid separately) and located not more than 300 mm from corners or termination of bottom tracks complete in all respects. Welding shall not be permitted to the member of structure having thickness less than 1.09 mm. Load-bearing steel framing members shall have a legible label, stamp, stencil or embossment, spaced at a minimum of 1200 mm on center along the length of the member, with the following minimum information: Manufacturer's Name; Minimum uncoated steel thickness in mm, Minimum coating designation and, Minimum yield strength in MPa. Rate is inclusive of designing charges contractor shall submit shop drawings and structural stability report from any structural engineer empanelled in o/o the chief architect, MPPWD or NIT/IIT.</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
24.2		Pre-engineered steel work	Design, supply, fabrication, Transport and erection of structural Steel/Mild Steel built-up sections for Pre-Engineered steel building in column, Rafter, Truss, floor joist, Wind Bracings, Tie Beam, foundation bolts, Fasteners etc. including two coats of Epoxy paint and one coat of prime. These structural steel/built-up sections shall be manufactured using advanced CNC Plasma/Oxy Acetylene cutter and H Beam Welding line, Welding shall be in full depth on both sides of the plate adopting relevant I.S. Code, design of PEB Steel building to be proof checked by any NIT/IIT	kg	78.70
24.3		Trim for window and door	Providing and fixing Trim for window and door 1mm thick with zinc coating not less than 275gm/m <sup>3</sup> galvanizedsheet material Girth up to 400mm.	metre	592.00
24.4		Neoprene rubber	Providing and Fixing neoprene rubber in between wall frame and foundation.	sqm	292.00
24.5		External wall panels on LGSF work	Providing and fixing of external wall system on Light gauge steel frame work with . Outer face having 6mm thick heavy duty fiber cement board fixed on 9mm thick heavy duty fiber cement board confirming to IS 14862:2000, category IV type A (High pressure steam cured) as per standard sizes fixed with self-drilling / taping screws / fasteners @ 60cm c/c of approvedmake. A groove of 2 mm to 3mm shall be maintained and grooves shall besealed with silicon based sealant. The board shall be fixed in a staggered pattern.Screws shall be of counter sunk rib head of 1.60mm to 4 mm thick of 8 to 10 gauge of length varying from 25to 45 mm and internal face 12.5mm thick gypsum plaster board fixed on 8mm thick fiber cement boardconfirming to IS 14862:2000 of category III type B (High pressure steam cured) as per standard sizes fixedwith self-drilling / taping screws / fasteners @ 60cm c/c of approved	sqm	2813.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			make, proper taping and jointing to be done using fiber mesh tape and epoxy and acrylic based jointing compound for seamless finish. Including breathable vapour barrier underneath the cement fiber board as per national building code 2009 complete as per direction of Engineer-in-Charge. (cost of frame work to be paid for separately). <b>Note:</b> Insulating material is not required in the hollow wall space between two cement fiber boards.		
24.6		Internal wall panels on LGSF work	Providing and fixing internal wall panels on Light gauge steel frame work with 12.5mm thick gypsum plaster board conforming IS 2095:2011 fixed on 8mm thick fiber cement board conforming to IS 14862:2000 of category III type B (High pressure steam cured) as per standard sizes fixed with self-drilling / taping screws / fasteners @ 60cm c/c of approved make, Screws shall be of counter sunk rib head of 1.60mm to 4 mm thick of 8 to 10 gauge of length varying from 25 to 45 mm. Proper taping and jointing to be done using fiber mesh tape and epoxy and acrylic based jointing compound for seamless finish.(cost of frame work to be paid for separately) <b>Note:</b> Insulating material is not required in the hollow wall space between two cement fiber boards.	sqm	1988.00
24.7		Breathable vapor barrier on exterior face	Providing and fixing in all exterior face panels breathable vapor barrier underneath the cement fiber board as per National Building Code 2009 complete as per direction of Engineer- in-charge.	sqm	195.00
24.8		Heavy duty fiber cement board	Supplying and installation of moisture resistant/fire resistant 6 mm thick Heavy duty fiber cement board (High pressure steam cured) conforming to IS 14862:2000 of category III type B as	sqm	827.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			per standard sizes fixed with self-drilling / tapping screws. Screws shall be of counter sunk rib head of 1.60mm to 4mm thick of 8 to 10 gauge of length varying from 25 to 45 mm.		
24.9		Thermal insulation	Providing and fixing thermal insulation with Resin Bonded glass wool conforming to IS: 8183, having density 48 kg/m <sup>3</sup> . 50 mm thick, wrapped in 200 G Virgin Polythene Bags fixed to wall with screw, rawl plug and washers and held and in position by crisscrossing GI wire etc. complete as per directions of Engineer-in-Charge.		
	24.9.1	Glass wool thermal insulation	Providing and fixing insulation with resin bonded Glass wool	sqm	338.00
	27.9.2	Rock wool thermal insulation	Providing and fixing insulation with resin bonded Rock wool	sqm	238.00
24.10		Lap siding	Supply and installation of moisture/fire resistant lap siding 8 mm thick and width as per standard sizes made of cement fiber board with embossed decorative finish to give pleasing exterior finish fixed horizontally with staggered joints including minimum overlap of 32 mm on external cement fiber board conforming to IS 14862:2000 fixed with self-drilling/tapping screws/fasteners of approved make.	sqm	702.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
24.11		Iron profile sheets	Providing and fixing precoatedgalvanised iron profile sheets (size, shape and pitch of corrugation as approved by Engineer-in-Charge) 0.50 mm + 0.05 %, total coated thicknesswith zinc coating 120 gsm as per IS: 277 in 240 mpa steel grade, 5-7 micronsepoxy primer on both side of the sheet and polyester top coat 15-18 microns. Sheet should have protective guard film of 25 microns minimum to avoid scratches while transportation and should be supplied in single length upto 12 metre or as desired by Engineer-in- charge. The sheet shall be fixed using self-drilling /self-tapping screws of size (5.5x 55mm) with EPDM seal, complete upto 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.	sqm	652.00
24.12		Roofing accessories	Providing and fixing precoatedgalvanised steel sheet roofing accessories 0.50 mm + 0.05 % total coated thickness, Zinc coating 120gsm as per IS: 277 in 240 mpa steel grade, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 microns using self-drilling/ self-tapping screws complete :		
	24.12.1	Ridge	Ridges plain (500 - 600mm).	metre	722.00
	24.12.2	Flashing/Aprons	Flashings/ Aprons.( Upto 600 mm)	metre	706.00
	24.12.3	North light curves	North light curves.	metre	777.00
	24.12.4	Barge board	Barge board (Upto 300 mm).	metre	669.00
	24.12.5	Crimp curve	Crimp curve	sqm	738.00
	24.12.6	Gutter	Gutter. (600 mm over all girth).	metre	848.00
24.13		Under deck insulation	Providing and fixing thermal insulation of ceiling (under deck insulation) with Resin Bonded Fiber glass wool conforming to IS: 8183 density 24kg/m <sup>3</sup> , 50mm thick, wrapped in aluminium foil laminated placed over		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			metal mesh between the gape of purlin and sheet with wire mesh of 12.5mm x24 gauge wire mesh, using self- drilling/ self-taping screws of size (5.5x55mm), EPDM seal.		
	24.13.1	Under deck insulation (Fiber glass wool)	Providing and fixing under deck fiber glass wool insulation.	sqm	368.00
	24.13.2	Under deck insulation (Rock wool)	Providing and fixing under deck rock wool insulation.	sqm	268.00
24.14		PUF panels for roofs 30mm thick external face corrugated	Providing and fixing PUF insulated continuous sandwich panels for roofs of total thickness not less than 30 mm made out from continue line method panel shall have pre coated GI sheet on both side of Polyurethane foam with external face being corrugated in shape for GI and PU foam both material. The crest height of the panel shall be of 35 mm minimum with 250mm c/c pitch. The Precoated sheet shall be of minimum 240mpa steel grade confirming to IS 14245:1995 and shall have zinc coating of 120 gsm as per IS:277, 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 micron. The PPGI Sheet shall have protective guard film of minimum 25 microns to avoid scratches while transportation. The roof panels are laid over a frame work of trusses, columns and purlins fixed using 90 mm self-drilling bolts with rubber washer including all types of flashings. PU Foam must be self-extinguishing. Fire retardant type having minimum density of 40 Kg/ Cum.(±2 Kgs) including 0.25 mm craft paper edging, self-tapping screws of required length and nos. etc. complete as per structural design and direction of Engineer-in-charge.		
	24.14.1	PPGI sheet 0.5mm thick	PPGI sheet 0.5mm thick skin on both sides.	sqm	2555.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	24.14.2	PPGI sheet 0.35mm thick	PPGI sheet 0.35mm thick skin on both sides.	sqm	2276.00
24.15		PUF panels for wall	Providing and fixing PUF insulated continuous sandwich panels for wall of total thickness not less than 50 mm or 40mm (as specified) and width 1.0m, made out from continue line method on automatic plant. Panel shall have pre coated GI sheet on both side of Polyurethane foam confirming to IS 12436:1988. The precoated sheet shall be of minimum 240 mpa steel grade confirming to IS 14246:1995 and shall have zinc coating of minimum 120 gsm as per IS:277, 5-7 microns epoxy primer on both side of the sheet andpolyester top coat 15-18 micron. ThePPGI Sheet shall have plastic protective guard film of minimum 25 microns to avoid scratches during transportation. The panels shall be vertically joined together by tongue and groove joints. The PU foam shall be self- extinguishing, fire retardant type havingminimum density of 40 kg/Cum. ( $\pm 2$ Kgs) including 0.25 mm thick craft paper edging on both edges. The panels shall be fixed to the steel frame structure with minimum 5mm thick craft paper edging on both edges. The panels shall be fixed to the steel frame structure with minimum 5mm thick self- tapping GI screws of required length and nos. with minimum spacing of 300 mm c/c. UUF panel 40 mm thick.		
	24.15.1	50mm thick wall	50 mm thick		
	24.15.1.1	PPGI sheet 0.5mm thick	PPGI sheet 0.5mm thick skin on both sides.	sqm	2566.00
	24.15.1.2	PPGI sheet 0.35mm thick	PPGI sheet 0.35mm thick skin on both sides.	sqm	2276.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	24.15.2	Wall 40 mm	PUF panels for 40 mm thick wall		
	24.15.2.1	PPGI sheet 0.5mm thick	PPGI sheet 0.5mm thick skin on both sides.	sqm	2496.00
	24.15.2.2	PPGI sheet 0.35mm thick	PPGI sheet 0.35mm thick skin on both sides.	sqm	2218.00
24.16		Solid wall panels 75mm thick AAC core sandwiched between cement board	Supply and installation of moisture/fire resistant solid wall 75mm thick non asbestos fiber reinforced aerated cement sandwich panel made out of light weight fiber reinforced aerated cement/ concrete core composed of Portland cement, fly ash, binders etc. and 4mm thick non asbestos fiber cement board conforming to IS 14862:2000 and ISO : 8336:1993 (E) on either side of the core, having a tongue and groove on longitudinal side of the panels and fixed to steel structure frame by pre-coated water head self-drilling/tapping fasteners of minimum 100 mm length and 4 mm dia of approved make as per design. Rate include for supply and fixing of 15mm high density non asbestos fiber cement board conforming to IS 14862:2000 and ISO 8336:1993 (E) on exterior side of the steel structure frame with similar fastening arrangement. The joints of the cement boards must be sealed with polymer fortified thin set mortar and self-adhesive alkali resistant dry wall fiber mesh tape of minimum 100 mm width complete in all respects.	sqm	2234.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
24.17		U track for closing of end joints for cut PUF panels	Providing and fixing of Bottom and top U track for closing of end joints for cut PUF panels. The U track shall be made out of 1 mm thick pre coated GI sheet. The Precoated sheet shall be of minimum 240 mpa steel grade confirming to IS 14246:1995 and shall have zinc coating of minimum 120 gsm as per IS:277:1992 , 5-7 microns epoxy primer on both side of the sheet and polyester top coat 15-18 micron. The PPGI Sheet shall have plastic protective guard film of minimum 25 microns to avoid scratches during transportation. The U track shall be fixed with suitable POP rivet with wall roof panels and plinth with Expandable fasteners with minimum spacing of 450 mm c/c. The U track shall be fixed to RCC Plinth or Tie Beams by suitable anchor bolts.		
	24.17.1	For 50mm thick panel	For panel of size of 52mmx30mm with 5mm lipping on both edges.	RM	338.00
	24.17.2	For 40mm thick panel	For panel of size of 42mmx30mm with 5mm lipping on both edges.	RM	323.00
24.18		Drywall partition (66mm thick)	Supplying and installation of magnesia block 66 mm thick drywall partition including Framework includes Floor/Head GI channels having thickness 0.5mm, length 3600mm, equal flanges of 32mm and web of 50mm fixed to floor and ceiling with suitable fasteners at 300mm centers staggered. Noise and fire rated silicon bead sealant to be caulked along the perimetre of the partition frame before fixing channels. Then Stud channel having thickness 0.45mm, length 3600mm, unequal flanges of 34/36mm and web of 48mm should be placed into the floor/head channel positioned vertically at 600mm centers. Extra reinforcement to be provided at openings (doors, windows, etc.,) The first layer of magnesia oxide block 8mm thick should be fixed on one side of the Stud framework in a staggered pattern by using suitable metal fasteners at 300mm centers. Second layer of magnesia oxide block	sqm	1578.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>8mm thick should be fixed other side of the frame work similar fashion as the first layer. 3mm gap should be maintained between boards. 3 mm gap shall be filled with jointing compound. Magnesia oxide block shall have following physical characteristics.</p> <ul style="list-style-type: none"> <li>• Core - Magnesia</li> <li>• Fire Rating – upto 150mins</li> <li>• Acoustics – STC upto 44-50</li> <li>• Climate (OC RH) – 50, 99</li> <li>• Moisture Absorption - 6.8% after 2hrs and 11.3% after 24hrs soaking</li> <li>• Wet Expansion - &lt; 0.02% from ambient to saturation</li> <li>• Dry Contraction - ≤ 0.02% from evaporation</li> <li>• Moisture Movement - 0.02%</li> <li>• Light reflectance – 80 %</li> <li>• Green (RC %) – 30</li> <li>• Strength - Antisag</li> <li>• Impact - 4kg hammer 175mm</li> </ul>		
24.19		Extra for thermal insulation 50mm thick synth PF	Add extra for providing and fixing Thermal insulation by providing 50mm thick synth PF (Phenolic Foam) having density 1000 GSM within the cavity held in position by using chicken wire mesh/ cross bracing/ pasting to the wall.	sqm	768.00
24.20		Solid wall 75mm panel thick, polystyrene sandwich between cement board	Supply and installation of moisture/fire resistant solid wall 75mm thick non asbestos fiber reinforced with expanded polystyrene sandwich panel made out of light weight fiber cement facing board composed of Portland cement, fly ash, binders expanded polystyrene beads etc. and 4mm thick non asbestos fiber cement board (category 3 type B) conforming to IS 14862:2000 and ISO : 8336:1993 (E) on either side of the core, having a tongue and groove on longitudinal side of the panels and fixed to steel structure frame by pre-coated water head self-drilling/tapping fasteners of minimum 100 mm length and 4 mm dia of approved make as per design. Rate include for supply and fixing of 15mm high density non asbestos fiber cement board conforming	sqm	1862.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			to IS 14862:2000 and ISO 8336:1993 (E) on exterior side of the steel structure frame with similar fastening arrangement. The joints of the cement boards must be sealed with polymer fortified thin set mortar and self-adhesivealkali resistant dry wall fiber mesh tape of minimum 100 mm width complete in all respects.		
24.21		Cement bonded particle board to wall /partition wall	Supply and installation of termite proof, moisture/fire resistant cement bonded particle board confirming to IS: 14276: 1995 in wall panel on structure to form wall/partition wall on external face of the frame fixed the self-drilling/tapping screws/fasteners of approved make. The hollow wall space between two cement particle board providing with 50mm thick resin bonded glass wool insulation conforming to IS 8183 of density not less than 48kg/cum (glass wool insulation shall be paid separately). All exterior faces of the wall/frame shall essentially be provided with breathable vapor barrier underneath of the cement bonded particle board. The inslational of the vapor barrier should conforming to the provision of the international building code 2009 and as per the design, The joints of the cement board must be sealed with polymer modified thin set mortar conforming to ANSI A 118.4 standard and self-adhesivealkali resistant dry wall fiber mesh tap of minimum 100 mm width. All exterior wall corner of cement bonded particle board wall panel must be reinforced with galvanized metal angel of 100X100X1.09 mm thickness and fixed on both adjoining walls with self-drilling/tapping fasteners of approved make as per design including providing silicone gel caulking complete in all respects.		
	24.21.1	12mm thick	12mm thick cement bonded particle board as per IS: 14276	sqm	487.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	24.21.2	10mm thick	10mm thick cement bonded particle board as per IS: 14276	sqm	402.00
24.22		EPS panels	Providing and fixing in position factory made EPS cement sandwich wall/roof/floor light weight solid core panels made of core material of EPS granule balls/beads (conforming to IS 4671:1984 and shall have density not less than 15kg per cum) adhesive, cement, sand, flyash and other bonding material in mortar state processed to form in a preset mould. The outer face on both sides of the panels will be non asbestos fiber cement board conforming to IS 14862:2000 or Calcium silicate board conforming to EN 14306:2009 of 5mm thick each. Panel shall be laid on 6mm thick cement mortar (1 cement: 2 fine sand) mixed with chemical adhesive of 0.5kg per 50kg of cement or shall be preferably fixed into 'C' channel made of 1.2mm thick MS plate screwed/fastened to the slab/column/beam etc. The panel shall fixed vertically with tongue and groove joint and horizontally locked with steel bar between each other and floors and filled with cement mortar and adhesive. Panels should be used as floor & roofing with additional structural support, steel or RCC depending upon the design. All the operation shall be completed in all respect as per drawings, Manufacturers specifications and under the overall direction of Engineer-in-Charge (Cost of all the material is included except "C channel" which will be paid separately).		
	24.22.1	50 mm thick	Non load bearing panels 50mm thick of required size	sqm	466.00
	24.22.2	60mm thick	Non load bearing panels 60mm thick of required size	sqm	523.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	24.22.3	75mm thick	Non load bearing panels 75mm thick of required size	sqm	674.00
	24.22.4	90mm thick	Non load bearing panels 90mm thick of required size	sqm	707.00
	24.22.5	100mm thick	Non load bearing panels 100mm thick of required size	sqm	870.00
24.23		Non asbestos aerated cement sandwich panels	Providing and fixing in position factory made non asbestos fibre reinforced aerated cement sandwich wall/roof/floor light weight solid core panels made of light weight cement concrete core composed of OPC cement, pulverized flyash, quick lime, cotton pulp & Gypsum in mortar state mixed with aeration agent in a preset mould. The outer face on both sides of the panels will be non asbestos fibre cement board confirming to IS 14862:2000. These solid wall panels are installed using Galvanized iron steel tracks/C channel of 1mm thick of required sizes as recommended by manufacturer's and fixed to floor and RCC soffit in plumb to each other with steel screw/fasteners. The panel shall be fixed vertically with tongue & groove joint with cement based polymer modified jointing compound. The exposed surface finished with fibre mesh/glass fibre tape with polymer based jointing compound having superior flexibility. Panels should be used as floor & roofing with additional structural support, steel or RCC depending upon the design. All the operation shall be completed in all respect as per drawings, Manufacturers specifications and under the overall direction of Engineer-in-Charge (Cost of all the material is included except "tracks/C channel" which will be paid separately).		

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (in Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	24.23.1	50mm thick	Non load bearing panels 50mm thick of required size (minimum 4mm thick fibre cement board)	sqm	970.00
	24.23.2	75mm thick	Non load bearing panels 75mm thick of required size (minimum 5mm thick fibre cement board)	sqm	1183.00

**CHAPTER – 25.0**

**SANITARY AND WATER SUPPLY**  
**(PREMIUM RANGE INSTALLATION)**

## SANITARY INSTALLATION AND WATER SUPPLY (PREMIUM RANGE)

### Chapter-25

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.1		Orrisa Pan	Providing and fixing white vitreous china Anti germ Fluoro-Polymer Coated Water closet squatting pan with 100 mm sand cast Iron P and S- trap, and 7.2 liter Low level, dual flush, PP (Poly Propylene) made open slim wall hung cistern capacity 3 liter/6 liter flushing, with all fittings and fixtures complete including cutting and making good the wall and floors wherever required.		
	25.1.1	Size 260 x 440x 580mm	White Vitreous china Anti germ Fluoro-Polymer coated Orissa Pattern W. C. Pan of Size 260 x 440 x 580mm With integral foot rests. (Premium Range)	each	5510.00
	25.1.2	Size 445 x 585 x 260 mm	White Vitreous china Anti germ Fluoro-Polymer coated Orissa pattern W. C. pan of size 445 x 585 x 260 mm with integral foot rests. (Premium Range)	each	4256.00
25.2		European Pedestal	Providing and fixing white vitreous china pedestal type Anti germ Fluoro-Polymer Coated Water Closet with soft closing seat cover, and 7.2 litre Low level slim dual flushing, PP (Poly Propylene) made 80 mm thick concealed flushing cistern, flushing capacity 3 litre/6 litre, with all fittings and fixtures complete including cutting and making good the wall and floors wherever required.		
	25.2.1	Size 390 X 365 X 540mm	Anti-germ Fluoro-Polymer Coated (nano coating) European W. C. with solid poly propylene made soft closing seat cover (Premium Range)	each	11956.00
	25.2.2	W. C. pan size 350 x 480 x 390 mm	Anti-germ Fluoro-Polymer Coated Water Closet European type W. C. pan size 350 x 480 x 390 mm with solid poly propylene made soft closing seat cover (Premium Range)	each	8640.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.3		Wall Hung WC	Providing and fixing white vitreous china European Wall hung Anti germ Fluoro-Polymer Coated water closet of approved shape with soft closing seat cover, and 7.2 litre Low level slim dual flushing, PP (Poly Propylene) made 80 mm thick concealed flushing cistern, flushing capacity 3 litre/6 litre, with all fittings and fixtures complete including cutting and making good the wall and floors wherever required.		
	25.3.1	Size 350 X 360 X 545mm	Anti germ Fluoro-Polymer Coated (Nano coating) Wall hung water closet Size 350 X 360 X 545mm with solid poly propylene made soft closing seat cover (Premium Range)	each	21040.00
	25.3.2	Size 360 x 570 x 360mm	Anti germ Fluoro-Polymer Coated (Nano coating) Wall hung water closet size 360 x 570 x 360mm with solid poly propylene made, soft closing seat cover (Premium Range)	each	17382.00
	25.3.3	Size 360 x 640 x 690mm	Anti germ Fluoro-Polymer Coated (Nano coating) Wall hung water closet size 360 x 640 x 690mm with solid poly propylene made, soft closing seat cover (Premium Range)	each	15096.00
	25.3.4	Size 360 x 535 x 380mm	Anti germ Fluoro-Polymer Coated (Nano coating) Wall hung water closet size 360 x 535 x 380mm or greater size with solid poly propylene made, soft closing seat cover (Premium Range)	each	14491.00
25.4		European Couple closet :	Providing and fixing white vitreous china Anti germ fluoro-polymer coated couple water closet flushing capacity 3 and 6 litre of approved shape with 15mm quarter turn angular stop cock and pvc connection pipe i/c cutting and making good the wall and floors wherever required with all fittings and fixtures etc. complete .		
	25.4.1	Size 760 X 360 X 635mm	Anti germ Fluoro-Polymer Coated couple water closet Size 760 X 360 X 635mm with solid poly propylene made soft closing seat cover. (Premium Range)	each	18369.00
	25.4.2	Size 405 x 730 x 800mm	Anti germ Fluoro-Polymer Coated couple water closet Size 405 x 730 x 800mm with solid poly propylene made soft closing seat cover. (Premium Range)	each	15393.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.4.3	Size 370 x 640x 760mm	Anti germ Fluoro-Polymer Coated couple water closet Size 370 x 640 x 760mm with solid poly propelyne made soft closing seat cover. (Premium Range)	each	14812.00
	25.4.4	Size 375 x 650x 800mm	Anti germ Fluoro-Polymer Coated couple water closet Size 375 x 650 x 800mm with solid poly propelyne made soft closing seat cover. (Premium Range)	each	13070.00
25.5		Eropean SinglePiece Pedestal WC	Providing and fixing white vitreous china Anti germ fluoro-polymer coated single piece W.C. dual flushing capacity 3 and 6 litre of approved shape with 15mm quarter turn angular stop cock and pvc connection pipe i/c cutting and making good the wall and floors wherever required allfittings and fixtures etc. complete.		
	25.5.1	Size 770 X 375 X 695mm	Anti germ Fluoro-Polymer Coated Single Piece W.C. Pan Size 770 X 375 X 695mm with solid poly propelyne made soft closing seat cover.(Premium Range)	Each	34049.00
	25.5.2	Size 370 x 685x 835mm	Anti germ Fluoro-Polymer Coated Single Piece W.C. Pan Size 370 x 685 x 835mm with solid poly propelyne made soft closing seat cover.(Premium Range)	each	24685.00
	25.5.3	Size 390 x 710x 710mm	Anti germ Fluoro-Polymer Coated Single Piece W.C. Pan Size 390 x 710 x 710mm with solid poly propelyne made soft closing seat cover.(Premium Range)	each	22362.00
	25.5.4	Size 360 x 640x 690mm	Anti germ Fluoro-Polymer Coated Single Piece W.C. Pan Size 360 x 640 x 690mm with solid poly propelyne made soft closing seat cover.(Premium Range)	each	15393.00
25.6		Extended WallHung WC:	Providing and fixing white vitreous china made Anti germ fluoro-polymer coated extended wall hung type couple closet along with dual flushing cistern flushing capacity 3 & 6 litre approved shape with 15mm quarter turn angular stop cock and pvc connection pipe i/c cutting and making good the wall and floors wherever required allfittings and fixtures etc. complete.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.6.1	Size 760X360X635 mm	Anti germ Fluoro-Polymer Coated extended wall hung type couple closet Size 760X360X635mm with solid poly propylene made soft closing seat cover (Premium Range)	each	18369.00
	25.6.2	Size 365x635x770 mm	Providing and fixing white vitreous china made Anti germ fluoro-polymer coated extended wall hung type couple closet Size 365x635x770mm along with dual flushing cistern flushing capacity 3 & 6 litre. (Premium Range)	each	9585.00
25.7		Counter Top Wash Basin :	Providing and fixing white vitreous china type Anti germ Fluoro-Polymer Coated Wash Basin with C.I. Brackets, 15 mm C. P. wall mounted pressmatic pillar cock auto closing system (decol technology), 15mm quarter turn angular stop cock, 32 mm C.P. brass made waste coupling length 130mm and 32 mm C.P. Brass Made Bottle Trap size 200x300mm fittings and fixtures complete including Painting of fittings and cutting and making good the wall and floors wherever required.		
	25.7.1	Size 160x580x450 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Wash Basin Size 160x580x450 mm with basin mounted pressmatic pillar cock auto closing system (decol technology). (Premium Range)	each	13520.00
25.8		Counter Top Basin :	Providing and fixing white vitreous china type Anti germ fluoro-polymer coated counter top washbasin with 15 mm C. P. wall mounted pressmatic Pillar cock auto closing system (decol technology), 32 mm C.P. brass waste coupling length 130mm and 32 mm C.P. brass bottle trap size 200x300mm i/c cutting and making good the wall and floors wherever required all fittings and fixtures etc. complete.		
	25.8.1	Size 190x600x435 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Wash Basin Size 190x600x435mm with wall mounted pressmatic pillar cock auto closing system (decol technology). (Premium Range)	each	17314.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.8.2	Size 570x415x200 mm	Providing and fixing white vitreous china type Anti germ fluoro-polymer coated counter top washbasin Size 570x415x200mm with 15 mm C. P. wall mounted pressmatic Pillar cock auto closing system (decol technology). (Premium Range)	each	10670.00
25.9		Counter Top Basin :	Providing and fixing white vitreous china type Anti germ fluoro-polymer coated counter top washbasin with 15 mm C. P. wall mounted single lever concealed basin mixture, (cartridge size 32 mm) 32 mm C. P. brass waste coupling length130mm and 32 mm C. P. brass bottle trap size 200x300mm i/c cutting and making good the wall and floors wherever required, all fittings and fixtures etc. complete. (Premium Range)		
	25.9.1	Size 190x600x435 mm	White Vetrious China Anti germ Fluoro-Polymer Coated Wash Basin Size 190x600x435mm with wall mounted single lever concealed basin mixture (cartridge size 32mm.) (Premium Range)	each	16414.00
	25.9.2	Size 600x400x175 mm	Providing and fixing white vitreous china type Anti germ fluoro-polymer coated counter top washbasin Size 600x400x175mm with 15 mm C. P. wall mounted single lever concealed basin mixture. (Premium Range)	each	13141.00
25.10		Counter Top Wash Basin	Providing and fixing white vitreous china type Anti germ Fluoro-Polymer Coated Wash Basin with 15 mm Table mounted single lever Tall boy basin mixture, (cartridge size 32 mm) 15mm quarter turn angular stop cock, 32 mm C. P. brass made waste coupling length 130mm and 32 mm C. P. Brass Made Bottle Trap size 200x300mm fittings and fixtures complete including Painting offittings and cutting and making good the wall and floors wherever required.		
	25.10.1	Size 190x600x435 mm	White Vetrious China Anti germ Fluoro-Polymer Coated Wash Basin Size 190x600x435mm with Table mounted single lever Tall boy basin mixture, (cartridge size 32mm.) (Premium Range)	each	19114.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.10.2	Size 510x400x135 mm	White vitreous china type Anti germ fluoro-polymer coated counter top wash basin Size 510x400x135mm with tall boy basin mixture, (cartridge size 32 mm). (Premium Range)	each	13330.00
25.11		Flat Back Half Stall Urinal :	Providing and fixing white vitreous china flat back Anti germ fluoro-polymer coated urinal (Inbuilt spreaders, bottle trap and ceramic waste coupling) with 15mm brass pressmatic auto closingconcealed urinal flush valve with wall flange (decol technology, 400000 operation warranted) i/c cutting and making good the wall and floors wherever required, all fittings and fixtures etc. complete .		
	25.11.1	Size 670 X 330 X325 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Urinal Size 670 X 330 X325 mm. (Premium Range)	each	13335.00
	25.11.2	Size 475 x 320 x 730 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Urinal Size 475 x 320 x 730 mm.(Premium Range)	each	10100.00
	25.11.3	Size 375 x 315 x 620 mm.	White Vitreous China Anti germ Fluoro-Polymer Coated Urinal Size 375 x 315 x 620 mm.(Premium Range)	each	8939.00
25.12		Flat Back Half Stall Sensor Urinal :	Providing and fixing white vitreous china Flat Back Anti germ Fluoro-Polymer Coated urinal (Inbuilt spreaders, Inbuilt Bottle trap and inbuilt ceramic Waste coupling)with sensotronic concealed type flushing valve for urinal complete set with installation box with control cock complete including painting of fittings and brackets, cutting and making good the wall and floors wherever required .		
	25.12.1	Size 670 X 330 X325 mm	White Vetrious China Anti germ Fluoro-Polymer Coated Urinal Size 670 X 330 X325 mm with sensotronic concealed type flushing valve for urinal complete set with installation box with control cock. (Premium Range)	each	21059.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.12.2	Size 330 x 345 x 610 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Urinal size 330 x 345 x 610 mm with concealed sensor flushing valve for urinal complete set with installation box, (Premium Range)	each	16136.00
25.13		Vitreous china Flat Back Urinal	Providing and fixing white vitreous china Flat Back Anti germ Fluoro-Polymer Coated Urinal (Inbuilt spreaders, Inbuilt Bottle trap and inbuilt ceramic Waste coupling) with 15mm Brass made pressmatic (Decol technology, 400000 operation warranted) concealed flushing Stop cock complete including painting of fittings and brackets, cutting and making good the wall and floors wherever required .		
	25.13.1	Size 730 X 480 X310 mm	White Vitreous China Anti germ Fluoro-Polymer Coated Urinal Size 730 X 480 X310 mm with 15mm Brass made pressmatic auto closing concealed urinal flush valve with wall flange (Decol technology, 400000 operation warranted). (Premium Range)	each	12290.00
25.14		Flat Back Anti germ Fluoro-Polymer Coated Urinal	Providing and fixing white vitreous china Flat Back Anti germ Fluoro-Polymer Coated Urinal (Inbuilt spreaders, Inbuilt Bottle trap and inbuilt ceramic Waste coupling) with sensor complete including painting of fittings and brackets, cutting and making good the wall and floors wherever required.		
	25.14.1	Size 710 X 480 X300 mm	White Vitreous China made Flat Back Anti germ Fluoro-Polymer Coated Urinal (Inbuilt spreaders, Inbuilt Bottle trap and inbuilt ceramic Waste coupling) Size 710 X 480 X300 mm with sensor (Premium Range)	each	20014.00
	25.14.2	Size 710 x 310 x 485 mm	Providing and fixing white vitreous china flat back Anti germ fluoro-polymer coated Urinal size 710 x 310 x 485 mm (Inbuilt spreaders, bottle trap and ceramic waste coupling) with inbuilt sensor for flushing. (Premium Range)	each	14418.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.15		Urinal Glass Partition (Straight):	Providing & Fixing 8mm thick froasted Urinal glass partition size 900x450mm brass made bracket with chrome plating. (Premium Range)	each	6900.00
25.16		Urinal glass partition (Curve):	Providing & Fixing 8mm thick froasted Urinal glass partition size height 900 mm top width 450mm and bottom width 300mm brass made bracket with chrome plating. (Premium Range)	each	8400.00
25.17		Bath tub (plain) 180x80x47cm	Providing & Fixing plain bath tub of size 180x80x47cm body made of PMMA (Poly Methyl metha acrylate) with 20mm woodenreinforcement. (Premium Range)	each	24558.00
25.18		Pillar cock	Providing and fixing in position best Indian ( bonut size 24mm, ceramic disc size 19mm andmin. body thickness 2mm, nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn) Pillar cock. (Premium Range)	each	1014.00
25.19		Bib cock	Providing and fixing in position best Indian ( bonut size 24mm, ceramic disc size 19mm andmin. body thickness 2mm, nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn)Bib cock. (Premium Range)	each	1014.00
25.20		Angular stop cock	Providing and fixing in position best Indian ( bonut size 24mm, ceramic disc size 19mm andmin. body thickness 2mm, nickel plating. 10 micron and chrome plating 0.3 micron, quarter turn) Angular stop cock. (Premium Range)	each	912.00
25.21		Concealed stop cock	Providing and fixing in position best Indian (bonut size 24mm, ceramic disc size 19mm and min. body thickness 2mm, nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn) Concealed stop cock. (Premium Range)	each	1123.00
25.22		Wall Mixer	Providing and fixing in position best Indian ( bonut size 24mm, ceramic disc size 19mm andmin. nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn) Wall Mixer with 115mm bend. (Premium Range)	each	3942.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.23		Wall Mixer (3-in1)	Providing and fixing in position best Indian ( bonut size 24mm, ceramic disc size 19mm, nickel plating 0.10 micron and chrome plating 0.3micron, quarter turn) 3-in1 Wall Mixer .(Premium Range Sanitary Ware)	each	4290.00
25.24		Flush cock quarter turn	Providing and fixing in position best Indian C. P. brass made quarter turn (Ceramic disc Size 25mm) Flush Cock for Indian W. C. (Orissa Pan).(Premium Range)	each	1851.00
25.25		Wall Mixer 40 mm (auto)	Providing and fixing in position best Indian single Lever Auto Mixing Wall Mixer (Cartridge Size 40mm, nickel plating 0.10 micron and chrome plating 0.3 micron) for Shower area use only. (Premium Range)	each	4116.00
25.26		Wall Mixer 32 mm (auto)	Providing and fixing in position best Indian single Lever Auto mixing Basin Mixer (Cartridge Size 32mm, nickel plating 0.10 micron and chrome plating 0.3 micron) For Wash Basin area use only. (Premium Range)	each	3767.00
25.27		Diverter (auto)	Providing and fixing in position best Indian single Lever Auto Mixing Diverter (Cartridge Size 47mm, nickel plating 0.10 micron and chrome plating 0.3 micron) for Shower area use only. (Premium Range)	each	4232.00
25.28		Spout	Providing and fixing in position best Indian C. P. brass made Spout (nickel plating 0.10 micron and chrome plating 0.3 micron). (Premium Range)	each	925.00
25.29		Shower arm length 300mm	Providing and fixing in position best Indian C. P. brass made Shower Arm Length 300mm (nickel plating 0.10 micron and chrome plating 0.3micron). (Premium Range)	each	890.00
25.30		Shower arm length 450 mm	Providing and fixing in position best Indian C. P. brass made Shower Arm Length 450mm (nickel plating 0.10 micron and chrome plating 0.3 micron).(Premium Range Sanitary Ware)	each	1071.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.31		Shower arm length 600 mm	Providing and fixing in position best Indian C. P. brass made Shower Arm Length 600mm (nickel plating 0.10 micron and chrome plating 0.3micron) .(Premium Range Sanitary Ware)	each	1216.00
25.32		Shower rose 300mm	Providing and fixing in position best Indianshower rose 300mm dia body and face chromeplated, brass made body, Silicon based Rubbit cleaning nozzles.(Premium Range Sanitary Ware)	each	7894.00
25.33		Shower rose 150mm	Providing and fixing in position best Indianshower rose 150mm dia, body and face chrome plated, brass made body, Silicon based Rubbit cleaning nozzles.(Premium Range)	each	3481.00
25.34		Shower rose 200 mm	Providing and fixing in position best Indianshower rose 200mm dia body and face chromeplated, brass made body, Silicon based Rubbit cleaning nozzles .(Premium Range)	each	4526.00
25.35		Shower rose 240mm	Providing and fixing in position best Indianshower rose 240mm body and face chrome plated, brass made body, Silicon based Rubbit cleaning nozzles.(Premium Range)	each	6501.00
25.36		2-way bib cock	Providing and fixing in position best Indian (bonut size 24mm, ceramic disc size 19mm and min. body thickness 2mm, nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn) 2- way Bib Cock .(Premium Range)	each	1448.00
25.37		Non-return valve	Providing and fixing in position best Indian Health Faucet with 8mm dia 1 meter long Flexible Tube and wall bracket with N. R. V. (non-return wall).(Premium Range Sanitary Ware)	each	1433.00
25.38		Pillar cock (wash basin)	Providing and fixing in position best Indian Auto Closing Pillar Cock (with DECOL cartridge) for wash basin use. (Premium Range)	each	1752.00
25.39		Bib cock (auto)	Providing and fixing in position best Indian Auto Closing Bib Cock (with DECOL cartridge) for common area use. (Premium Range)	each	1796.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
25.40		Urinal valve (auto)	Providing and fixing in position best Indian Auto Closing Urinal valve open type (with DECOL cartridge) for urinal use only. (Premium Range)	each	1796.00
25.41		Urinal valve (concealed)	Providing and fixing in position best Indian Auto Closing Urinal valve concealed type (with DECOL cartridge) for urinal use only. (Premium Range)	each	1955.00
25.42		Pillar cock wall mounted	Providing and fixing in position best Indian Auto Closing wall mounted Pillar Cock (with DECOL cartridge) for wash basin use only. (Premium Range)	each	2838.00
25.43		Flush valve 40 mm (auto)	Providing and fixing in position best Indian Auto Closing 40mm Flush valve (for W. C. European and Wall Hung Type) concealed type (with DECOL technology/ cartridge). (Premium Range)	each	2722.00
25.44		Flush valve 40 mm (dual)	Providing and fixing in position best Indian Auto Closing 40mm Dual Flow (3.0/6.0 liter) Flush valve (for W. C. European and Wall Hung Type) concealed type (with DECOL technology/ cartridge). (Premium Range)	each	2896.00
25.45		Flush valve 32 mm (concealed)	Providing and fixing in position best Indian Auto Closing 32mm, Flush valve (for W. C. European and Wall Hung Type) concealed type (with DECOL technology/cartridge). (Premium Range)	each	2722.00
25.46		Faucet Wash Basin	Providing and fixing in position best Indian Sensotronic Sensor Faucet for Wash Basin use only. (Premium Range)	each	8297.00
25.47		Faucet For Urinal	Providing and fixing in position best Indian Sensotronic Sensor Faucet For Urinal use only. (Premium Range)	each	7716.00
25.48		Faucet wall mounted	Providing and fixing in position best Indian Sensotronic Sensor concealed type Faucet For Wall Mounted Water Closet use only. (Premium Range)	each	10853.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.49		Towel rail 300 mm	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Single Towel Rail 300 mm long. (Premium Range)	each	1230.00
25.50		Towel rail 600 mm	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Single Towel Rail 600 mm long. (Premium Range)	each	1142.00
25.51		Towel holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Swivel Towel holder Twin Type. (Premium Range)	each	1171.00
25.52		Towel ring square	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Single Towel Ring Square. (Premium Range)	each	881.00
25.53		Soap dish holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Soap Dish Holder. (Premium Range)	each	602.00
25.54		Soap dispenser	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Soap Dispenser with Metallic Bottle. (Premium Range)	each	2391.00
25.55		Tumbler holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Tumbler Holder. (Premium Range)	each	591.00
25.56		Toilet paper holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Toilet paper holder with Flap. (Premium Range)	each	1067.00
25.57		Toilet Roll Holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Toilet Roll Holder. (Premium Range)	each	649.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.58		Glass Self 600mm	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Glass Self-size 600mm with toughened glass (Premium Range)	each	1067.00
25.59		Double hook	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Double coat Hook. (PremiumRange)	each	533.00
25.60		Towel Rake 600 mm	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) Towel Rake 600 mm. (Premium Range)	each	2374.00
25.61		W. C. brush holder	Providing and fixing in position best Indian C. P. Brass made (0.3 micron Chrome and 10 micron Nickel plated) W. C. Brush Holder. (Premium Range)	each	1317.00
25.62		Urinal glass	Providing & Fixing 8mm thick froasted Urinal glass partition size 900x450mm brass made bracket with. (Premium Range)	each	8400.00
25.63		Wall hung basin	Wall Hung Basin: Providing and fixing white vitreous china type Anti germ fluoro-polymer coated wall mounted wash basin with C.I. brackets, C. P. brass single lever basin mixer, 15mm quarter turn angular stop cock, 32 mm C.P. brass waste coupling length 130mm and 32 mm C.P. brass bottle trap size 200x300mm i/c cutting and making good the wall and floors wherever required, all fittings and fixtures etc. complete . (Premium Range)		
	25.63.1	550x400x200 mm	white Vetrious china Anti germ fluoro-polymer coated wall mounted wash basin size 550x400x200 mm. (Premium Range)	each	8300.00
	25.63.2	565x435x215 mm	white Vetrious china Anti germ fluoro-polymer coated wall mounted wash basin size 565x435x215 mm. (Premium Range)	each	10274.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	25.63.3	575x470x190 mm	white Vitrious china Anti germ fluoro-polymer coated wall mounted wash basin size 575x470x190 mm. (Premium Range)	each	10506.00
	25.63.4	600x470x160 mm	white Vitrious china Anti germ fluoro-polymer coated wall mounted wash basin size 600x470x160 mm. (Premium Range)	each	10971.00
	25.63.5	635x430x190 mm	white Vitrious china Anti germ fluoro-polymer coated wall mounted wash basin size 635x430x190 mm. (Premium Range)	each	14688.00
25.64		Wash basin wall hung	Wall Hung Basin ; Providing and fixing white vitreous china type Anti germ fluoro-polymer coated wall mounted wash basin with C.I. brackets, 15 mm C. P. brass pillar cock, 15mm quarter turn angular stop cock, 32 mm C.P. brass waste coupling length 130mm and 32 mm C.P.brass bottle trap size 200x300mm i/c cutting and making good the wall and floors wherever required, all fittings and fixtures etc. complete . (Premium Range)		
	25.64.1	635x 430x190 mm.	white Vitrious china Anti germ fluoro-polymer coated wall mounted wash basin size 635x430x190 mm. (Premium Range)	each	12095.00
25.65		Sink mixer	Providing and fixing in position best Indian, quarter turn table mounted sink mixer (bonut size 24mm, ceramic disc size 19mm and min. nickel plating 0.10 micron and chrome plating 0.3 micron). (Premium Range)	each	3241.00
25.66		Sink cock	Providing and fixing in position best Indian, quarter turn wall mounted sink cock (bonut size 24mm, ceramic disc size 19mm and min. nickel plating 0.10 micron and chrome plating 0.3 micron). (Premium Range)	each	1756.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.67		Shower glass cubical	Shower Glass Cubical: Providing and fixing toughen glass shower enclosure conformed Is 2553 (part 1. 1990) or IS 14900. 2000 or IS 2835. 1987 or IS 14450. 2000 with C. P. brass 5 Year warranted hardware, 19mm dia SS 304 grade stabilizer, all plastic Parts of food grade plastic and all glass shall be toughened at 700 degree Celsius and Anti lime scale treated including painting of fittings, cutting and making good the wall and floors wherever required, all fittings and fixtures etc. complete. (Premium Range)		
	25.67.1	1000x2000x 2000mm	Providing and fixing 8 mm toughen glass wall to wall sliding shower enclosure size 1000mm X 2000mmX2000mm. (Premium Range)	each	37735.00
	25.67.2	800x2000x 1950 mm	Providing and fixing 8 mm toughen glass made to measurement door Openable (inside/outside) shower enclosure two parts size 800mm x 2000mm x1950mm. (Premium Range)	each	35412.00
	25.67.3	1200mm x 1200mm x 1950mm	Providing and fixing corner entry 6 mm toughen glass made to measurement shower enclosure size 1200mm x1200mm x 1950mm with aluminum profile on sides, shower enclosure with door sliding on both sides. (Premium Range)	each	35412.00
25.68		Shower panel anti finger	Shower Panel : Providing and fixing shower panel with Anti finger point stainless steel body finish, Inbuilt absolute butadiene styrene (ABS) top shower with 60 nozzles and waterfall, embedded self, brass spout, multifunction water diverter for top shower, waterfall, hand shower, body jets, brass faucet body with thermostatic mixer. (Premium Range)	each	43460.00
25.69		Shower panel 200mm	Shower Panel : Providing and fixing shower panel of stainless steel structure, 200mm squareoverhead shower , 3 adjustable vertical jets (round), mixer and diverter, hand shower with 1 metre long flexible tube. (Premium Range)	each	41300.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.70		Thermostat mixer	Thermostat Mixer : Providing and fixing in position best Indian, concealed high flow bath and shower mixer with thermostatic control cartridge (standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function). (Premium Range)	each	16208.00
25.71		Shower mixer (exposed)	Providing and fixing in position best Indian, exposed wall mounted bath and shower mixer with thermostatic control cartridge with button attachment on spout with connecting legs and wall flange ( standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function) .(Premium Range)	each	8052.00
25.72		Shower mixer (wall mounted)	Providing and fixing in position best indian, eko exposed shower mixer (wall mounted) with thermostatic control cartridge, 115mm long bend pipe on lower side, connecting legs and wall flange (standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function) . (Premium Range)	each	5676.00
25.73		Shower mixer (tub mounted)	Providing and fixing in position best Indian, exposed shower mixer (tub mounted) with thermostatic control cartridge, with button attachment on spout with straight legs (standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function). (Premium Range)	each	8457.00
25.74		4 - way diverter	Providing and fixing in position best Indian, 4 - way diverter consisting of concealed body and wall flange for multiple shower working with one shut-off position and 3 outlets for body shower, head shower and spout ( standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function). (Premium Range)	each	7917.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
25.75		Control valve	Providing and fixing in position best Indian, thermostatic concealed high flow control valve with wall flange ( standard temperature range 15 degree c to 60 degree c, cartridge made of high performance thermostatic Polymer material with Anti scaled function) . (Premium Range)	each	11185.00
25.76		Medical Faucets washbasin	Medical Faucets : Providing and fixing in position best indian, single lever surgical purpose elbow action basin mounted mixer with extended Operating lever without popup waste system with 450mm long braided hoses (cartage size32mm, ceramic disc size 19mm and min. nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn). (Premium Range)	each	3698.00
25.77		Pillar cock elbow action	Providing and fixing in position best Indian, surgical purpose elbow action pillar cock with extended Operating lever.( bonut size 24mm, ceramic disc size 19mm and min. nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn) (Premium Range)	each	1539.00
25.78		Pillar cock wall mounted	Providing and fixing in position best Indian, surgical purpose elbow action wall mounted pillar cock with extended Operating lever and wall flange. (bonut size 24mm, ceramic disc size 19mm and min. nickel plating 0.10 micron and chrome plating 0.3 micron, quarter turn). (Premium Range)	each	1755.00
25.79		Grab bar	Providing and fixing in position best Indian, 692mm long, satin finish C. P. Brass grab bar made of 304 grade ss i/c all nuts and screw (0.3 micron chrome and 10 micron nickel plated). (Premium Range)	each	7264.00
25.80		Grab bar with left/right	Providing and fixing in position best Indian, satin finish, C. P. Brass grab bar with left/right 90 degree angle, made of 304 grade ss i/c all nuts and screws. (0.3 micron chrome and 10 micron nickel plated). (Premium Range)	each	12665.00



<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
25.81		Grab bar vertical swing	Providing and fixing in position best Indian, C. P. Brass grab bar vertical swing, 304 grade ss made all nuts and screws. (0.3 micron chrome and 10 micron nickel plated). (Premium Range)	each	17310.00
25.82		Urinal partition frosted glass	Providing and fixing 8mm thick frosted safety glass Urinal partition size 900mm height and 450mm width, fixed with C P brass bracket of appropriate size i/c cutting and making good the wall and floors wherever required with all fittings and fixtures etc. complete.(Premium Range)	each	5045.00

**Note : All the items and brand/make of chapter 25 (Sanitary installation and water supply(Premium Range)) Shall be executed only after the prior approval of Chief Engineer/ Additional Project Director.**

**CHAPTER – 26.0**  
**FIRE FIGHTING SYSTEM**

## LIST OF BUREAU OF INDIAN STANDARD CODES

<b>S. No.</b>	<b>I.S. No.</b>	<b>Subject</b>
1.	IS 1239 (Part-I) :1990	Mild steel tubes, tubular and other wrought steel fittings.
2.	IS 3589-2001	Steel pipe for water and sewerage.
3.	IS 5290-1993 (Reaffirmed 1998)	Landing valves specification (Hydrant valve) Third Revision)
4.	IS 13095-1991 (Reaffirmed 2003)	Butterfly valves for General purposes.
5.	IS 5312 (Part-I) 2004	Swing check type reflux. (Non return) valve for water works purposes specification. (Part-1 Single door pattern) (Part-II Multiple door pattern)
6.	IS 636-1988	Non-Percolating flexible fire fighting Delivery hose.
7.	IS 884-1985	First aid hose reel for fire fighting.
8.	IS 12585 (1988)	Specification for thermoplastic hoses for water - General Purpose.
9.	IS 904-1983	Specification for 2-way and 3-way suction collecting, heads for fire fighting purposes.

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
26.1		'C' class heavy duty MS pipe in underground	Providing laying, testing and commissioning of 'C' class heavy duty MS pipe confirming to IS 1239/3589 underground i/c fittings like elbows, tees, flanges, tapers, jointing with nuts bolts, gaskets and welding etc. underground including excavation and providing cement concrete blocks as supports, at prescribed intervals and anticorrosive treatment with coal tar/ asphalts tape as IS 10221, with 4mm thick fiber reinforced tape and 12mm overlap and refilling the trench etc. of the following sizes complete as directed by Engineering-in-Charge.		
	26.1.1	200 mm dia	200 mm dia	metre	2817.00
	26.1.2	150 mm dia	150 mm dia	metre	1927.00
	26.1.3	100 mm dia	100mm dia	metre	1275.00
	26.1.4	80 mm dia	80mm dia	metre	933.00
26.2		'C' class heavy duty MS pipe in on wall/ceiling	Providing laying, testing and commissioning of 'C' class heavy duty MS pipe confirming to IS 1239/3589 i/c fittings like elbows, tees, flanges, reducer, jointing with nuts bolts, gaskets and welding etc. and fixing the pipe on wall/ceiling with suitable hangers, clamps, supports, as required and painting with two or more coats of synthetic. Enamel paint of required shade complete as directed by Engineering-in-Charge.		
	26.2.1	200 mm dia	200 mm dia	metre	2806.00
	26.2.2	150 mm dia	150 mm dia	metre	1916.00
	26.2.3	100 mmdia	100 mm dia	metre	1328.00
	26.2.4	80 mm dia	80 mm dia	metre	921.00
	26.2.5	65 mm dia	65 mm dia	metre	743.00
	26.2.6	50 mm dia	50 mm dia	metre	588.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	26.2.7	40 mm dia	40mm dia	metre	443.00
	26.2.8	32 mm dia	32mm dia	metre	391.00
	26.2.9	25 mm dia	25mm dia	metre	310.00
26.3		Single headed hydrant valve	Providing and fixing single headed hydrant valve with instantaneous female Gun metal couplings of required dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank gunmetal cap and chain, adopter as required complete as directed by Engineer-in-Charge.		
	26.3.1	63mm dia	63mm dia	each	6700.00
	26.3.2	52mm dia	52mm dia	each	4690.00
	26.3.3	38mm dia	38mm dia	each	2990.00
26.4		Double headed hydrant valve	Providing and fixing double headed hydrant valve with instantaneous female Gun metal couplings of required dia with cast iron wheel ISI marked conforming to IS 5290 (Type -A) with blank gunmetal cap and chain, adopter as required complete as directed by Engineer-in-Charge.		
	26.4.1	63mm dia	63mm dia	each	9980.00
	26.4.2	52mm dia	52mm dia	each	6890.00
	26.4.3	38mm dia	38mm dia	each	4750.00
26.5		Flanged type sluice valve	Providing fixing, including testing and commissioning the following size of flanged type sluice valve of cast iron body and bronze/ gun metal seat confirming to class PN 1.6 of IS: 14846/IS: 780 complete with bolts and nuts, rubber insertions etc. as per specification complete as required.		
	26.5.1	200mm dia	200mm dia	each	5996.00
	26.5.2	150mm dia	150mm dia	each	4497.00
	26.5.3	100mm dia	100mm dia	each	2998.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	26.5.4	80mm dia	80mm dia	each	2399.00
	26.5.5	65mm dia	65mm dia	each	1950.00
	26.5.6	50mm dia	50mm dia	each	1500.00
26.6		Butterfly valve	Providing, fixing, testing and commissioning of butterfly valve PN 1.6, with Bronze/Gunmetal seat duly ISI marked complete with Nuts, Bolts, washers, gaskets, confirming to IS 13095, of following sizes as required.		
	26.6.1	200mm dia	200 mm dia	each	8530.00
	26.6.2	150mm dia	150 mm dia	each	6815.00
	26.6.3	100mm dia	100 mm dia	each	4500.00
	26.6.4	80mm dia	80 mm dia	each	3400.00
	26.6.5	65mm dia	65 mm dia	each	2515.00
	26.6.6	50mm dia	50 mm dia	each	1925.00
26.7		Orifice plate	Providing and fixing orifice plate made of 6mm thick stainless steel with orifice of required size in between flanged and landing valve of external and internal hydrant to reduce pressure to working pressure of 3.5 kg/cm complete as per specification required.	each	1195.00
26.8		Dual plate non-return valve	Providing, installation, testing and commissioning of dual plate non-return valve of following sizes confirming to IS 5312 complete with rubber gasket, GI bolts, nuts, washers etc. as required.		
	26.8.1	200mm dia	200 mm dia	each	9775.00
	26.8.2	150mm dia	150 mm dia	each	7350.00
	26.8.3	100mm dia	100 mm dia	each	4900.00
	26.8.4	80mm dia	80 mm dia	each	4000.00
	26.8.5	65mm dia	65 mm dia	each	3250.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	26.8.6	50mm dia	50 mm dia	each	2499.00
26.9		Stainless steel strainer	Providing, installation, testing and commissioning stainless steel strainer fabricated out of 1.6 mm thick stainless steel sheet with 3 mm dia holes with stainless steel flange.		
	26.9.1	80mm dia	80 mm dia	each	4570.00
	26.9.2	100mm dia	100 mm dia	each	6631.00
26.10		Gun metal valves	Providing, installation, testing and commissioning of gun metal valves of following sizes as required.		
	26.10.1	100mm dia	100 mm dia	each	3240.00
	26.10.2	80mmdia	80 mm dia	each	2592.00
	26.10.3	65mm dia	65 mm dia	each	2106.00
	26.10.4	50mm dia	50 mm dia	each	1620.00
	26.10.5	25mm dia	25 mm dia	each	810.00
26.11		RRL hose pipe	Supplying and fixing dia,15m long, RRL hose pipe with following diamale and female gun metal couplings duly binded with GI wire, rivets etc. confirming to IS 636 (type-A)as required.		
	26.11.1	70mm dia	70 mm dia	each	5499.00
	26.11.2	63mm dia	63 mm dia	each	4950.00
	26.11.3	50mm dia	50 mm dia	each	3930.00
	26.11.4	38mm dia	38 mm dia	each	2987.00
26.12		First -Aid hose reel	Providing and fixing first -Aid hosereel with MS construction spray painted in post office red, confirming to IS 884 with up to date amendments,complete with the following asrequired.) (a) 30-36m long 20mm (nominal	each	6065.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			<p>internal) dia water hose thermoplastic (textile reinforced ) type -2 as per IS 12585</p> <p>(b) 20mm (nominal internal) dia gun metal globe valve and nozzle.</p> <p>(c) Drum and brakets for fixing the equipments on wall.</p> <p>(d) Connections from riser with 40 mm dia stop valve (gun metal) and M.S. pipe</p>		
26.13		Hose cabinet 900x600x500mm	Providing and fixing hose cabinet of size 900x600x500mm made of 2 mm thick MS sheet with 4 mm thick float glass doors in front painted "FIRE" in red paint i/c necessary locking arrangement suitable to accommodate external hydrant with butterfly valve 2 nos. 15m Long hose pipe, 1 no branch pipe mounted on wall or raised brick platform& duly painted with post office red externally and white internally with synthetic enamel paint complete in all respects for external hydrant, as directed by Engineer-in-Charge.	each	8570.00
26.14		Hose cabinet size 700x600x300mm	Providing and fixing hose cabinet of size 700x600x300mm made of 16 gauge thick MS sheet with 4 mm thick float glass doors in front painted "FIRE" in red paint i/c necessary locking arrangement suitable to accommodate external hydrant with butterfly valve 2 nos. 15m Long hose pipe, 1 no branch pipe mounted on wall or raised brick platform& duly painted with post office red externally and white internally with synthetic enamel paint complete in all respects for external hydrant, as directed by Engineer-in-Charge.	each	4000.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
26.15		Gun metal branch pipe with nozzle	Providing and fixing 63mm gun metal branch pipe with 20mm (nominal internal diameter)size gun metal nozzle conforming to IS 903, suitable for instantaneous connection, to interconnect hose pipe coupling as required.	each	2510.00
26.16		4 way fire brigade connection	Providing and fixing 4way fire brigade connection (FBC)of cast iron body with 4 nos. gun metal male instantaneous inlet couplings complete with cap and chain as required. For 150mm dia MS pipe connection, confirming to IS 904 as required.	each	14150.00
26.17		2 way fire brigade connection	Providing and fixing 2 way fire brigade connection (FBC) of CI body with2 nos. gun metal male instantaneous inlet couplings complete with cap and chain as required. For 150mm dia MS pipe connection, confirming to IS 904 as required.	each	6000.00
26.18		Air vessel	Providing and fixing air vessel made of 250mm dia, 8mm thick MS sheet, 1200mm in height with air release valve on top and flanged connection to riser, drain arrangement with 25 mm dia Gunmetal wheel valve, with required accessories, pressure guage and painting with synthetic enamel paint of approved shade as required .	each	10150.00
26.19		Quartzoid bulb type sprinklers	Providing, fixing testing and commissioning of 15mm sizequartzoid bulb type sprinklers, set to operate at 68/79 degree Centigrade. Pendent type/upright type/side wall type with required accessories complete as directed by Engineer-in- Charge.	each	415.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
26.20		Control valve of cast iron body	Providing, fixing, testing and commissioning of installation control valve of Cast iron body and brass/bronze working parts comprising of water motor alarm, bronze seat clapper, and clapper arm, hydraulically driven mechanical going bell to sound continuous alarm when the Wet riser/Sprinkler system activates, pressure gauges, emergency, releases, strainer, pressure switch, cock valve complete with drain valve and bypass, test control box, ballvalves, MS pipe of required size flanges, orifice plate, gasket etc. of size 150 mm dia and obtaining NOC from local bodies etc required.	each	42500.00
26.21		Rosette plate for sprinkler	Providing and installation of adjustable Rosette plate for sprinkler as per direction of Engineer-in-Charge.	each	110.00
26.22		Electrically operated flow indicating switches in sprinkler branch line	Providing and fixing electrically operated flow indicating switches in sprinkler branch line on each floor with necessary junction box installed in accessible place. (Wiring from switches to panel not included).	each	3865.00
26.23		Pressure switch	Providing and fixing Pressure switch in the MS pipe Line including connection etc. as required. Capacity 4.5 kg.	each	1485.00
26.24		Flow switches	Providing and fixing flow switches in 100/150 mm dia MS pipe. Capacity 5.0 kg.	each	3525.00
26.25		Pressure transducer	Providing and fixing pressure transducer (dial type pressure gauge with isolation cock) in MS pipe line (dial diameter 100mm pressure range 0-10 kg/cm) suitable for 12 volts/24DC. Including connection etc. as required.	each	1510.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
26.26		Angle iron door frame and MS sheet cum glass shutter	Providing and fixing angle iron (40 x 40 x 5mm) door frame and M.S. sheet (2mm thick) cum glass shutter of size 1.2 x 2.1 m (N.S.) with 25 x 25 x 3 mm angle frame all around & stiffened in between including hinges, handle, locking arrangement, painting with approved synthetic enamel paint including sign writing on glass at internal hydrant including providing and fixing M.S. Sheet 2 mm thick on remaining portion above door to close opening including painting etc. as required.	each	7045.00
26.27		Carbon-di-oxide type fire extinguishers	Providing and fixing of carbon-di-oxide type fire extinguishers consisting of welded M.S. cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube 30 cm long high pressure discharge hose, discharge nozzle, suspension bracket conforming to IS : 15683 finished externally with red enamel paint and fixed to wall with brackets complete with internal charge.		
	26.27.1	2 kg	Capacity 2.0 kg	each	6960.00
	26.27.2	3 kg	Capacity 3.0 kg	each	8160.00
	26.27.3	4.5 kg	Capacity 4.5 kg	each	11351.00
26.28		ABC Power type fire extinguishers	Providing and fixing of ABC Power type fire extinguishers consisting of welded M.S. cylindrical body, squeeze lever discharge valve fitted with pressure indicating gauge internal discharge tube 30 cm long high pressure discharge hose, discharge nozzle, suspension bracket. Conforming to IS: 15683 finished externally with red enamel paint fixed to wall with brackets complete with internal charge.		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	26.28.1	1.0 kg	Capacity 1.0 kg	each	1560.00
	26.28.2	2.0 kg	Capacity 2.0 kg	each	1800.00
	26.28.3	4.0 kg	Capacity 4.0 kg	each	2400.00
	26.28.4	6.0 kg	Capacity 6.0 kg	each	3120.00
	26.28.5	9.0 kg	Capacity 9.0 kg	each	4080.00
26.29		Portable Automatic Fire Prevention Apparatus	Providing and fixing of Portable (FCO) Automatic Fire Prevention Apparatus very high quality bio degradable, ozone friendly UL (Underwriters Laboratories)listed, built in HDPE (High-density polyethylene) container to automatically extinguish fire when comes in contact with fire light in weight, compact in size extremely easy to use ABC powder type with automatic and manual operated CE certified with latest EN 1568-3:2008 & EN 1568-4:2008. The product shall be cover 5 years warranty as per guideline.		
	26.29.1	1 kg weight	1 Kg. weight Automatic Fire Extinguisher.	nos	5958.00
	26.29.2	1.5 kg weight	1.5 Kg. weight Automatic Fire Extinguisher.	nos	7486.00
	26.29.3	2.00 kg weight	2.00 Kg. weight Automatic Fire Extinguisher.	nos	8348.00

**CHAPTER – 27.0**  
**MISCELLANEOUS**

**MISCELLANEOUS  
(CHAPTER NO. 27)**

<b>Item No.</b>	<b>Sub ItemNo.</b>	<b>Item name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
27.1		Video shooting of buildings	Providing and carrying out video shooting of buildings, including hiring of vehicle equipments for video shooting, titling, lightening, mixing, lettering, editing, including cost of two colour CDs of approved makes and quality etc. complete.		
	27.1.1	Within 50 kms from dist. H.Q.	Within 50 kms from dist. H.Q.	per day	2500.00
	27.1.2	Beyond 50 kms from dist. H.Q.	Beyond 50 kms from dist. H.Q.	per day	2700.00
	27.1.3	Work upto 5 hours per day only	Work upto 5 hours per day only	per day	1500.00
27.2		Video shooting of buildings by drone in 4k resolution	Providing and performing video shooting and still photographs by drone in 4k resolution (FHD 1920X1080,24/25/30/48/50/60 frames to UHD 4096X2160, 24/25 frames) with 1.0 km horizontal and 300m vertical movement in any side of any building, ground or campus including hiring of vehicle equipments for video shooting, titling, lightening, mixing, lettering, editing, including cost of digital data (4k video) excluding cost of hard copies etc. complete. (Pay for hard copies as per item no. 27.3.2)		
	27.2.1	Within 50 kms	Within 50 kms from dist. H.Q.	per sqkm	8700.00
	27.2.2	Beyond 50 kms	Beyond 50 kms from dist. H.Q.	per sqkm	8950.00
	27.2.3	Add extra for additional movement	Add extra for every additional 1.0 km horizontal movement at same site.	per sqkm	5500.00
27.3		Still photographs	Shooting of still photographs outdoor and indoor of construction and other works of building, bridges, roads etc. at any distances. By camera Post Card size		

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	27.3.1	4"x6"	4"x6" size	3 nos.	75.00
	27.3.2	5"x7"	5"x7" size	3 nos.	135.00
	27.3.3	8"x12"	8"x12" Size (A-4 Size)	3 nos.	210.00
	27.3.4	20"x30"	20"x30" size (Banner Size)	1 no.	400.00
	27.3.5	Extra Copies	Extra Copies : Post Card size		
	27.3.5.1	4"x6"	4"x6" size	1 no	12.00
	27.3.5.2	5"x7"	5"x7" size	1 no	15.00
	27.3.5.3	8"x12"	8"x12" Size (A-4 Size)	1 no	50.00
	27.3.5.4	20'x30'	20'x30' size (Banner Size)	1 no	200.00
27.4		Name plate letter embossing on S.S.plate	Providing and fixing Stainless steel plate 304 grade of 1.50mm thick, including writing with Embossing of letters of required size including fixing at required placed with studs, screws and rawl plugs etc. compete as per direction of Engineer-in-Charge.	sqm	13652.00
27.5		Name plate computerized writing on S.S.plate	Providing and fixing of name plate for offices name of Stainless steel plate 304 grade of 1.50mm thick, including writing with computerized vinayle sheet letters of required size including fixing at required placed with studs, screws and rawl plugs etc. compete as per direction of Engineer-in-Charge.	sqm	11926.00
27.6		Name plate computerized writing on ACPfixing on pipe	Providing and fixing Aluminum composite panels Silver colour with matte finish, 3mm thick, (0.25mm 2.5mm and 0.25mm) sheet for name plate including writing with computerized vinayle sheet letters of required size including fixing at required placed with 1.25m Chromium plated Steel Pipe 15mm dia, compete as per direction of Engineer-in-Charge.	sqm	7287.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
27.7		Name plate computerized writing on ACP fixing with stud and screws	Providing and fixing Aluminum composite panels Silver colour with matte finish, 3mm thick, (0.25mm 2.5mm and 0.25mm) sheet for name plate including writing with computerized vinayle sheet letters of required size including fixing at required placed with studs, screws and rawl plugs etc. compete as per direction of Engineer-in-Charge.	sqm	6180.00
27.8		S.S letters	Providing and fixing stainless steel English (Capital) and Hindi letters in standard pattern bellow type made with 1.20 mm thick stainless steel (ASI Grade-304 ) Depth of letter shall not be less than 30mm and rate includes welding/soldering of joints polishing, buffing and fixing on the wall, plate and beam surface at any height with necessary nut and bolts/fastener wherever is required complete as per direction of Engineer-in-Charge.	per letter per cm height	75.00
27.9		External thermal insulation	Providing and fixing of external thermal insulation and composite system with First layer of self-extinguishing type Expanded Polystyrene (EPS) insulation boards of 120 mm thick ( max 1mX0.5m section), confirming to IS 4671:1984, having thermal conductivity of 0.034 W/mK, (measured as per IS 3346- 1980), density of 20-24 kg/m <sup>3</sup> measured as perIS 5688-1982, Fire retardant property self-extinguishing type as per EN 13501- 1, bonded with special polymer modified cementitious adhesive confirming to EOTA ETAG 004 (European Technical Approval) formulated to bond polystyrene insulation boards to typical mineral substrate (according to ETAG 004) and Polypropylene mechanical fasteners with plastic pin confirming to EOTA ETAG 014 (European Technical	sqm	3086.00



Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			Approval) having dia 10mm & L=200mm on finished level wall and the junction between two adjacent EPS boards to be sealed with low expansion moisture cure Polyurethane Foam.Second layer consists of Fiberglass mesh covered with alkali-resistant coating, mass per unit area > 145 gm/m <sup>2</sup> , mesh size: 3.9x4.0 mm ±10% embedded in special polymer modified cementitious Base Coat with hydrophobes and the corners will be protected with Corner- beads with alkali-resistant mesh wings at least 10 cm wide, mesh mass per unit area min 145 gm/m <sup>2</sup> . The surface will be levelled, finished, made smooth complete in all respect as per manufactures specification and as per directions of Engineer-in-Charge.		
27.10		Precast Boundary Wall	Providing and fixing of prestressed vertically casted concrete panels (both surfaces should be smooth and having grooves on both faces) of M-40 grade of concrete of size 2100x300x50 mm having minimum 4 nos of high tensile steel wire as per IS 6006:2014 of dia 3 mm placed horizontally in full length of panel with prestressed precast concrete column of M-40 grade of size 3000x150x150 mm having minimum 7 nos of high tensile steel wire as per IS 6006:2014 of dia 3 mm placed vertically in full length to erect precast boundary wall panels to height 2100 mm from GL including excavation of pit of size 750x750x900 mm in all kind of soil except rock for erection of columns and grouting the pit with M-20 grade of concrete. Manufacturing, transportation	metre	3478.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			and installation at site all complete as per the direction of Engineer-in-Charge.		
27.11		Add extra for additional height	Extra for every additional height of 0.3 m up to height of wall 3 m	metre	289.00
27.12		Acrylic multilingual Braille directional signboards	Providing and fixing acrylic multilingual Braille (raised dots) directional signboards of size 6" x9 " as per accessibility standards and having 3mm thick acrylic base plate with Upper Case San Serif words white acrylic non glare cut out letters of height 15mm raised not less than 0.8mm above base plate and the word written in Hindi with Devanagari non glare acrylic letters of height 15mm raised not less than above base plate and having a non-glare acrylic cut arrow pointing in the required direction. Each signboard as per manufacturer's specifications With 5 year replacement warranty, installed on the wall at the approved location and upto a height of 1200mm, as per prevailing NBC guidelines with entire satisfaction of the Engineer-in-charge.	each	1736.00
27.13		Tactile layout plan	Providing and fixing tactile layout plan of size 900mmX600mm as approved design with 5 year replacement warranty, made of 3mm thick acrylic non glare base plate and non-glare cut-out symbols with grade One/Two Braille on which individual facility points, like inquiry, reception, restrooms, medical rooms/first aid, cafeteria or breakout area, lounge, meeting room, conference room etc present the respective floors with pictograph wherever needed all in tactile raised by minimum of 1 to 2 mm in various colours to make it legible for seniors, partial vision impaired etc. All the facility names should be in	each	26101.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			braille, along with English. The either movable or fixed for easy reading. The map to be installed at specified locations and installed at a height of upto 1200mm from ground level, With 5 year replacement warranty as per prevailing NBC guidelines with entire satisfaction of the Engineer-in-charge.		
27.14		Tactile audio pictorial building layout	Providing and fixing of acrylic, non-glare, tactile audio pictorial building layout as per the approved size, design with 5 year replacement warranty, having 3mm thick acrylic non glare base plate of the approved colour and non-glare acrylic cut out symbols raised 3mm above base plate and Grade 2/ Grade 1 Braille to be integral with the sign face and be raised 0.5mm above base plate. The map to be installed at the specified location as per accessibility standards, shall be oriented to the position of the viewer and to be installed at a height of 800 mm from the finished ground/ floor level and using the necessary hardware specified by the manufacturer and to be installed up to the height upto 1200 mm from the finished ground/ floor level and using the necessary hardware specified by the manufacturer and to be installed complete as per design/specifications and as per prevailing NBC guidelines with entire satisfaction of the Engineer-in-charge.		38176.00
27.15		Fixing tactile of Photoluminescent Emergency evacuation map	Providing and fixing tactile of Photoluminescent Emergency evacuation map in Braille for each floor indicating the current position of the viewer saying "YOU ARE HERE" in Braille indicating the emergency exits, locations of fire extinguishers etc. The size of the board shall be 600 x 900mm. With 5 year replacement warranty and shall be installed	each	25521.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
			at a height of 1200mm from FFL and shall be oriented to the position of the viewer as per the direction of the site engineer complete as per design/specifications and guidelines as per the entire satisfaction of the the Engineer-in-charge		
27.16		Conspicuity tape	Providing and fixing of conspicuity tape 50mm width, on the treads in staircase including, cutting, pasting etc. As per harmonised guidelines complete in all respect to the entire satisfaction of Engineer-in-charge.	metre	118.00

**CHAPTER – 28.0**  
**LANDSCAPING AND HORTICULTURE**

**LANDSCAPING AND HORTICULTURE**  
**(Chapter-28)**

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item Name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
28.1		Trenching in ordinary soil	Trenching in ordinary soil up to a depth of 60cm including removal and stacking of serviceable materials and then disposing of surplus soil, by spreading and neatly leveling within a lead of 50m and making up the trenched area to proper levels by filling with earth or earth mixed with sludge or/and manure before and after flooding trench with water (excluding cost of imported earth, sludge or manure).	cum	186.00
28.2		Supplying and stacking of good earth	Supplying and stacking of good earth specific useful for plantation at site including royalty if any and carriage (earth measured in stacks will be reduced by 20% for payment).	cum	511.00
28.3		Supplying and stacking sludge	Supplying and stacking sludge at site including royalty and carriage (sludge measured in stacks will be reduced by 8% for payment).	cum	643.00
28.4		Supplying and stacking dung manure (fym) farm yard manure	Supplying and stacking at site dump manure from approved source, including carriage (manure measured in stacks will be reduced by 8% for payment) :	cum	734.00
28.5		Dressing of the trenched ground	Rough dressing the trenched ground including breaking clods.	100 sqm	445.00
28.6		Uprooting weeds	Uprooting weeds from the trenched area after 10 to 15 days of its flooding with water including disposal of uprooted vegetation.	100 sqm	151.00
28.7		Fine dressing of the ground	Fine dressing of the ground	100 sqm	113.00
28.8		Spreading of sludge, dung manure and / or good earth	Spreading of sludge, dump manure and / or good earth in required thickness as per direction of Engineer-in-charge (Cost of sludge, dump manure and / or good earth to be paid separately).	cum	16.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
28.9		Mixing earth and sludge or manure (fym) farm yard manure	Mixing earth and sludge or manure in the required proportion specified or directed by the Engineer-in-charge.	cum	11.00
28.10		Planting of Grass	Grassing with Selection No.1 grass including watering and maintenance of the lawn for 30 days or more till the grass forms a thick lawn, free from weeds and fit for mowing including supplying good earth, if needed (the grass and good earth shall be paid for separately):		
	28.10.1	In rows 5 cm	In rows 15 cm apart in both directions.	100 sqm	1163.00
	28.10.2	In rows 7.5 cm	In rows 7.5 cm apart in both directions.	100 sqm	2404.00
	28.10.3	In rows 5 cm	In rows 5 cm apart in both directions.	100 sqm	3601.00
	28.10.4	With grass	With grass turf	100 sqm	2856.00
	28.10.5	Grassing with selected grass turf	Providing and laying Selected type of Grassturf with earth 50mm to 60mm thickness on existing ground prepared with proper level and ramming with required tools wooden and than rolling the surface with light roller, making the surface smoothen and light watering the same, as per direction of Engineer-in-Charge.	sqm	99.00
	28.10.6	Grassing with Mexican/Zyosia grass turf	Providing and Laying Mexican/Zyosia carpet grass Turf with earth 50mm to 60mm thickness on existing ground prepared with proper level and ramming with tools wooden (Durmuth) and then rolling the surface with light roller make the surface smoothen and light watering with sprinkler and maintenance for 30 days or more till the grass establishes properly, as perdirection of Engineer-in-Charge.	sqm	310.00
	28.10.7	Seeding beds in existing soil	Preparation of preplanting of seeding beds in existing native soil. The seed or plantation bed top to be thoroughly cleaned, preferably by stone burier machine and to be made free of any stone or foreign material.	sqm	5.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	28.10.8	Seeding by machine	Seeding to be done by high speed precision mechanism machine, calibrated to required seeding density or as per site requirement. The machine should have front end rear rollers. The sown grass seed bed to be maintained for 30 days or germination whichever is earlier. The grass bed to be prepared of Cynadone Dactylon (Bermuda Grass), variety Gobi.	sqm	102.00
	28.10.9	Maintenance of Grassing	Maintenance of Grassing ground done by Seeding Method as mentioned in Item No. 28.10.6 from the stage of germination to first cut i.e. approximately 45 days.	sqm	40.00
28.11		Renovating lawns	Renovating lawns including weeding, cheeling the grass, forking the ground, top dressing with sludge or manure, mixing the same with forked soil, watering and maintaining the lawn for 30 days or more till the grass forms a thick lawn free from weeds and fit for mowing and disposal of rubbish as directed, including supplying good earth if needed but excluding the cost of sludge or manure (the good earth shall be paid for separately).	100 sqm	1081.00
28.12		Uprooting rank vegetation and weeds	Uprooting rank vegetation and weeds by digging the area to a depth of 60cm removing all weeds and other growth with roots by forking repeatedly, breaking clods, rough dressing, flooding with water, uprooting fresh growths after 10 to 15 days and then fine dressing for planting new grass, including disposal of all rubbish with all leads and lifts.	100 sqm	1861.00
28.13		Preparation of beds for hedging and shrubbery	Preparation of beds for hedging and shrubbery by excavating further 30cm deep of already prepared trench, 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, levelling etc. including stacking and disposal of materials declared unserviceable and surplus earth by spreading and levelling as directed, within a lead of 50mlift upto 1.5 m complete (cost of sludge, manure or extra earth to be paid for separately).	cum	67.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
28.14		Digging holes refilling mixed with manure or sludge	Digging holes in ordinary soil and refilling the same with the excavated earth mixed with manure or sludge in the ratio of 2:1 by volume (2 parts of stacked volume of earth after reduction by 20% : 1 part of stacked volume of manure after reduction by 8%) flooding with water, dressing including removal of rubbish and surplus earth, if any with all leads and lifts (cost of manure, sludge or extra good earth if needed to be paid for separately) :		
	28.14.1	120 cm dia	Holes 120 cm dia and 120 cm deep.	each	141.00
	28.14.2	60 cm dia	Holes 60 cm dia and 60 cm deep.	each	61.00
	28.14.3	45 cm dia	Holes 45 cm dia and 45 cm deep.	each	19.00
	28.14.4	30 cm dia	Holes 30 cm dia and 30 cm deep.	each	9.00
28.15		Planting different variety of plants	Providing and planting different variety of plants of approved quality and sizes as mentioned including making pits of required size at site, refilled with B.C. Soil mixture manuring and pesticide etc. complete (to be paid separately) including watering and 90 days maintenance from the date of final bill as per direction of Engineer-in-Charge complete in all respect (B.C. Mixture paid separately).		
	28.15.1	Shrubs (75-90 cm height)	Bahunia Tomentosa, Beloperone Species, Caselpinnia Pulcherima, Bird of Paradise, Callandra Emarginata, Callandra Hybrida, Cassia Bi flora, Cassia Laevigata, Cestrum Nocturnum, Dombeya Mastersii, Euphorbia Caracasana, Euphorbia Pulcherima, Excorea bi color, Excorea tri color, Ficus Blackii, Ficus Reginold, Ficus Panda, Gardenia, Gulphinia, Jasminoides, Hamelia Pattens, Heliconia, Hibiscus Rosasinensis, Hibiscus Verigated, Hibiscus Viceroy, Jatropha Multifida, Largestomia Indica, Malpighia Coccigera, Murraya Exotica, Murraya Koeniggi, Murraya Sambucum, Mussaenda Erythrophylla, Nerium Oleander, Nyctanthus Arbortristis, Plumbego Capensis, Putranjeeva Roxburghii, Tabernaemontana Coronaria, Tabernaemontana Divaricata, Tecoma Gaudi Chaudi, Tecoma Stans, Thevetia Nerifolia, Thuja Compacta and equivalent plants.	sqm	80.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	28.15.2	Creeper plants (height :30cm to 45 cm)	Allamanda Cathartica, Allamanda Grandiflora, Allamanda Violacea, Begonia Venustha, Boughan Villas (Variety : Butiana, Lady Mary Bearing, Mahaara, Mohan, Scarlet Queen Variagata, Glabra Formosa, Peruviana Odissi, Partha, Shubhra, Thimma, Spectabillis, L.N. Birla, Refulgens), Clerodendrum Splendens, Clerodendrum Thompsonae, Ipomea Purpurea, Jasminum Grandiflorum, Jasminum Humile (Yellow), Passiflora Caerulea (Rakhi Bel), Petrea Volubilis, Quis Qualis Indica, Tecoma Grandiflora, Veronia Elaegnifolia (Curtain Creeper), Mandvella, Garlic Creeper, Callimitis	each	50.00
	28.15.3	Ground cover plants height: 30cm-45cm	Alpinia Verigated, Alternanthera species, Aspyragus Myerri, Aspyragus Springenii, Aspidistra, Canna (regular, Dwarf), Chlorodendron Inermii, Chlorophytum (Green), Chlorophytum verigated, Coffea Chinensis, Dianella Verigated, Durranta (Goldiana, Green, Verigated), Euphorbia Milli hybrid, Ipomea (Golden leaves), Iresine herbstii, Juniper Prostata, Juniper Africana, Ophiopogon plant, Ophiopogon jaburan, Portulacaria Afra (jade Plant), Schefflera Green, Schefflera verigated, Setcreasea Purpurea, Syngonium (Butterfly) species, Syngonium miniature, Syngonium Dwarf, Syngonium variegated, Tradescantia, Wadelia Trilobata, Zebrina Tradescantia, Pendanas, Spider Lily Black, Spider Lily verigated, Aclypha (Red, Green,Mini), Lantana (Red, Yellow, Purple, White, verigated), Haemalia Mini and similar plants.	each	50.00
	28.15.4	Winter seasonal height: 20-30 cm	Any of one from Alyssum, Anemone, Antirrhinium Hybrid, Aster Hybrid, Begonia and its different varieties, Calendula, Carnation, Coleus, Daisy, Dianthus, Fressia, Gazania, Impatiens, Kalanchoe, Marigold Inca, Missam branthemum, Nemasia, Nasturitium, Ornamental Kale, Pansy Hybrid Sakata, Petunia Hybrids such as Bravo, Star and Picotee, Salvia, Stock, Stock, Verbena	each	42.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	28.15.5	Summer and rainy seasonal plants	Any of one from Celosia, Caladium Hybrid, Cockscomb, Cosmos, Gaillardia, Gomphorena, Kochchea, Portulacca, Sunflower Hybrid, Sunflower Single, Tapiocca Variegated (Manihot Esculenta), Vinca, Zinnia Hybrids.	each	42.00
	28.15.6	Rose plants height: 30cm & above	Budded Roses of H.T variety and miniature Roses.	each	170.00
	28.15.7	Rose plants creepers	Plant Creeper Rose Varieties	each	212.00
	28.15.8	Rose plant H.T. standard	Standard Roses H.T. Variety	each	382.00
28.16		Tree guard (bricks)	Half brick circular tree guard in bricks, internal diametre 1.25 metre and height 1.2 metre above ground and 0.20 m below ground, bottom two courses laid dry and top three courses in cement mortar 1:6 (1 cement : 6 sand) and the intermediate courses being in dry honey comb masonry as per design complete:	each	800.00
28.17		Edging (bricks)	Edging with bricks laid dry length wise, including required excavation, refilling, consolidating with hand packing and spreading surplus earth neatly within a lead of 50 m:		
	28.17.1	Burnt clay	Common burnt clay modular bricks	meter	31.00
	28.17.2	Fly ash	Fly ash bricks	meter	34.00
28.18		Filling mixture of earth and sludge or manure	Filling mixture of earth and sludge or manure in the desired proportion in trenches, flooding with water and levelling (cost of supplying earth and sludge or manure and mixing excluded).	cum	16.00
28.19		Excavation in dumped stones or malba	Excavation in dumped stones or malba including stacking of serviceable and unserviceable material separately and disposal of unserviceable material lead upto 50 m and lift upto 1.5 m disposed material to be neatly dressed.	cum	155.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
28.20		Flooding water and making kiaries	Flooding the ground with water including making kiaries and dismantling the same.	100 sqm	102.00
28.21		Tree guard 45 cm square (M. S.)	Providing and fixing M. S. tree guard 45 cm square in plan, height 1.20 metre above ground level and 0.40 metre below ground level. The vertical members shall consist of four nos. angle iron of size 25x25x3 mm, 1.8 m long, one at Each corner and 8 nos. flat iron of size 25x3 mm, 1.2 m long. The vertical members shall be welded to 4 nos. 25x6 mm M. S. flats placed horizontally around the vertical member of the cage. One name plate of 1 mm thick M.S. sheet of size 250x100 mm shall be welded to the tree guard near the middle height and lettered PWD/ any other approved name. The tree guard shall be fixed to the ground by making suitable holes and by embedding four corners leg in the ground, including refilling the earth, compaction etc. complete. The tree guard shall be painted with two or more coats of synthetic enamel paint of approved brand and manufacture over a coat of primer, complete in all respect.	each	1426.00
28.22		Tree guard 50 cm square in M. S.	Providing and fixing M. S. tree guard 50 cm square in plan, height 1.40 metre above ground level and 0.50 metre below ground level. The vertical members shall consist of four nos. of angle iron of size 25x25x5 mm 1.9 long, one at Each corner and 8 nos. flat iron of size 25x5 mm 1.4 long. The vertical members shall be welded to 4 nos. 25x6 mm M. S. flats placed horizontally around the vertical member of the cage. One name plate of 1 mm thick M.S. sheet of size 250x100 mm shall be welded to the tree guard near the middle height and lettered PWD/ any other approved name. The tree guard shall be fixed to the ground by making suitable holes and by embedding four corners leg in the ground, including refilling the earth, compaction etc. complete. The tree guard shall be painted with two coats of paint of approved brand and manufacture over a coat of primer, complete in all respect.	each	2245.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
28.23		Preparation of mounds	Preparation of mounds of various size and shape by available excavated /supplied earth in layers not exceeding 20 cm in depth, breaking clods, watering of Each layer, dressing etc. lead upto 50 metre and lift upto 1.5 m complete as per direction of Engineer-in-Charge.	cum	138.00
28.24		Providing Circular Cement Concrete pots	Providing Circular Cement Concrete pots of specified size, cast with cement concrete of nominal mix 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 6 mm nominal size), reinforced with 7 Nos. (3 nos. horizontal and 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 and height, all complete as per direction of Engineer-in- Charge.		
	28.24.1	35cm dia	Top inside dia 35 cm, outer bottom dia 25 cm, total height 35 cm with wall thickness of 25.4 mm.	each	137.00
	28.24.2	30 cm dia	Top inside dia 30 cm, outer bottom dia 20 cm, total height 30 cm with wall thickness of 25.4 mm.	each	100.00
28.25		Providing square cement concrete pots	Providing Square Cement Concrete pots of specified size, cast with cement concrete of nominal mix 1:2:4 (1 cement: 2 sand: 4 graded stone aggregate 6 mm nominal size), reinforced with 7 Nos. (3 nos. horizontal and 4 nos. vertical "V" 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 and height, all complete as per direction of Engineer-in- Charge. Top inner width 35 cm, outer bottom width 25 cm, total height 35 cm and wall thickness 25.4 mm.	each	165.00
28.26		Rotomoulded Circular Planter	Providing of Rotomoulded circular planters of different sizes.		
	28.26.1	30 cm dia	Upper dia 30cm and height 24cm	each	405.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	28. 26.2	40 cm dia	Upper dia 40cm and height 31cm	each	675.00
	28. 26.3	50 cm dia	Upper dia 50cm and height 37cm	each	1147.00
	28. 26.4	60 cm dia	Upper dia 60cm and height 47cm	each	1665.00
	28. 26.5	70 cm dia	Upper dia 70cm and height 55cm	each	2700.00
	28. 26.6	80 cm dia	Upper dia 80cm and height 62cm	each	3510.00
	28. 26.7	90 cm dia	Upper dia 90cm and height 69cm	each	4552.00
	28. 26.8	100 cm dia	Upper dia 100cm and height 74cm	each	5805.00
	28. 26.9	120 cm dia	Upper dia 120cm and height 95cm	each	8910.00
28.27		Rotomoulded Square Planters	Providing of rotomoulded planters of square shape of different sizes.		
	28. 27.1	40cm x 40 cm x 37cm	40cm x 40 cm x 37cm	each	1260.00
	28. 27.2	50cm x 50cm x 45cm	50cm x 50cm x 45cm	each	2700.00
	28. 27.3	60cm x 60cm x 53cm	60cm x 60cm x 53cm	each	3600.00
	28. 27.4	70cm x 70cm x 65cm	70cm x 70cm x 65cm	each	5490.00
28.28		Asbestos cement pots	Providing circular Asbestos cement pots of specified size, stacking in required rows a height all complete as per direction of Engineer-in-Charge		
	28. 28.1	25cm dia	Upper dia: 25cm, Lower dia: 20cm, Height: 25cm	each	108.00
	28. 28.2	30cm dia	Upper dia: 30cm, Lower dia: 23cm, Height: 30cm	each	144.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	28. 28.3	35cm dia	Upper dia: 35cm, Lower dia: 26cm, Height: 35cm	each	270.00
	28. 28.4	40cm dia	Upper dia: 40cm, Lower dia: 30cm, Height:40cm	each	360.00
28.29		Floral foam bricks	Supplying of floral foam brick premium quality /high density (Oasis or equivalent) proper packing box (one box containing 20 bricks of size 22.5cmx10.5cmx7.5cm) at site of work including loading, unloading, carriage with all taxes paid etc.and as per direction of Engineer-in-Charge.	each	1080.00
	28.29.1	River pebbles	Providing and fixing of White River (stone) pebbles of size 2”to 2.50” dia in natural colour at site of work including loading, unloading, carriage with all taxes paid etc and as per direction of Engineer-in-Charge.	kg	10.00
	28.29.2	Marbles pebbles	Providing and fixing of White Marbles circular/oval in shape (stone) pebbles of size 2”to 2.50” dia in natural colour at site of work including loading, unloading, carriage with all taxes paid etc. and as per direction of Engineer-in-Charge.	kg	22.00
28.30		Floral stage decoration	Stage decoration with arrangement of cutflower height 15cm to 75cm with 6 to 8 rows offlowers and fillers on the oasis (flower foam) in presentable manner in the tray as per design approved by authority including clearing of site (Cost of Tray, Oasis and Cut flowers shall be paid separately) as per direction of Engineer in charge.	per metre	139.00
28.31		Anti termite treatment of trees	Providing and applying Anti Termite treatment of infected areas i/c branches/leaves by spraying chemical emulsion 0.5% (Chloropyriphos 20%EC) concentration through power spray machine (@100ml Chloropyriphos per Tree i/c cost of chemical) and as per the direction of Engineer-in-Charge.	each	70.00
28.32		Anti termite treatment of grass	Anti Termite treatment of Lawn area through premise 30.5%I.P, one liter premise diluted in 499 litres water and applying solution @1.00 liter solution per sq.m lawn or bed area. (Two application) i/c cost of chemical and as per direction of Engineer-in-Charge.	sqm	10.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
28.33		Green agro shade net	Providing and fixing of Green Agro Shade net of make: Tuflex or equivalent, of 75% permeability, of green colour having contents (Weight grams/sqm: 510 (+/-8%)) in width of 75cms with bamboo of 90 cm length. The bamboo should be painted with green colour paint of approved brand and manufacture (two or more coats) and fixed 30 cm below ground level and 60 cm above ground level at a distance of 1.5 mtrs. The net and bamboo should be binded with 2 mm G.I wire at three places properly as per the direction of Engineer-in-Charge.	sqm	243.00
28.34		Artificial grass for landscape	Providing of Artificial Grass of make: TigerTurf or equivalent with following specifications:		
	28.34.1	Artificial grass of 35mm	Yarn Characteristics: All yarns should be heavy metal free and UV Stabilised. Yarn Type: Texturised monofilament, Material: 100% Polyethylene, Standard Dtex: 7200, Colours: Field Green/Lime Green/Brown, Line Colours: Any Backing Characteristics: Primary Backing-100% woven polypropylene, UV resistant. Backing Compound: A concentrated latex compound optimised for tuft lock. Product Specification: (Pre Coating +/-10%), Pile Weight : 1361 gm/sq.m, Tufted Pile Height 35mm, Total product weight 2413 g/sq m, Machine Gauge: 3/8th, Roll Width: 4.00m, Shipping weight: 9.6kg/LM Particulate Infill: Sand Type- Sub Angular Silica, Sand Size: Upon request, Sand Infill Height: 15mm, Total Infill Height: 15mm. Recommended Base Construction: Timber/ Crushed Rock/ Asphalt/ Concrete(porous or non porous)	sqm	288.00
	28.34.2	Artificial grass of 25mm	Yarn Characteristics: All yarns should be heavy metal free and UV Stabilised. Yarn Type: Texturised monofilament, Material: 100% Polyethylene, Standard Dtex: 7200, Colours: Field Green/Lime Green/Brown, Line Colours: Any Backing Characteristics: Primary Backing-100% woven polypropylene, UV resistant. Backing Compound: A concentrated latex compound optimised for tuft lock. Product Specification: (Pre Coating +/-10%), Pile Weight : 1021 gm/sq.m, Tufted Pile Height 25mm, Total product weight 2073 g/sq.m, Machine Gauge: 3/8th, Roll Width: 4.00m,	sqm	261.00



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			Shipping weight: 8.3kg/LM Particulate Infill: Sand Type-Sub Angular Silica, Sand Size: Upon request, Sand Infill Height: 10mm, Total Infill Height: 10mm. Recommended Base Construction: Timber / Crushed Rock / Asphalt / Concrete (porous or non porous)		
28.35		Stone bench	Providing and fixing of 3 seater stone bench made of 75mm thick stone slab finished by different numbers of ambry stone and two coats of 124 no sealer coat to prevent fromweather including fixing on a pedestal (cost of pedestal to be paid separately)etc. complete as per direction of engineer in charge. Size: length 1500mm, width 600mm, legs height 500 mm, back support height 500mm.	each	9700.00
28.36		Stone planter	Providing and fixing of stone planter (bench) made of 75mm thick stone slab finished by different numbers of ambry stone and two coats of 124 no sealer coat to prevent fromweather including fixing on a pedestal (cost of pedestal to be paid separately)etc. complete as per direction of engineer in charge. Size: length 1200mm, width 500mm, legs height 500 mm.	each	6200.00
28.37		Stone table	Providing and fixing of stone table made of 75mm thick stone slab finished by different numbers of ambry stone and two coats of 124 no sealer coat to prevent from weather including fixing on a pedestal (cost of pedestal to be paid separately)etc. complete as per direction of engineer in charge. Size: length1000mm, width 600mm, legs height 750 mm.	each	7900.00
28.38		M-25 C.C. Pavement	Providing and laying C.C. pavement of mix M-25 with ready mixed concrete from batching plant including centering and shuttering complete. The ready mixed concrete shall be laid and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, with wire brush etc. complete as per specifications and directions of Engineer- in-Charge. <b>Note:</b> Cement content considered in this item is @ 330 kg/cum.	cum	6936.00

**CHAPTER – 29.0**  
**DPR PREPARATION**

**PREAMBLE  
DPR PREPARATION  
(CHAPTER-29)**

SOR items in this chapter has been included to enable preparation of DPR including detailed estimate of a building project. The architect shall participate in the bidding process in which special condition appended with this chapter shall be made applicable. Standard format for preparation of estimate to be appended with the DPR as per Appendix-7. Terms and conditions for scope of work for work of preparation of DPR and bifurcation of fee payable to the architect at various stage of DPR work shall be as below:-

**Terms and Conditions**

**(For Comprehensive Architectural Services and preparing DPR of a Building Project)**

**SCOPE OF WORK**

The architect shall provide services for preparation of master plan of the project area, architectural working drawings, reports, estimates, DPR to obtain administrative sanction and thereafter statutory submission drawings, BOQ, detail drawings structural drawings and at last as constructed drawings in respect of following:

- 1.1 Taking client's instruction and preparation project brief & Finalise functional requirement.
- 1.2 Site visit and preparation of master plan of project area.
- 1.3 Details Survey & Investigation.
- 1.4 Architectural work
- 1.5 Foundation and Structural engineering work
- 1.6 Site development
- 1.7 Sanitary, plumbing, drainage, water supply, sewerage and STP work
- 1.8 Electrical, electronics, communication system
- 1.9 Lift, elevator, escalators etc
- 1.10 Heating, ventilation and air conditioning (HVAC)
- 1.11 Acoustical, light & sound
- 1.12 Fire detection, fire protection and security systems
- 1.13 Green building concept
- 1.14 Utility shifting
- 1.15 Interior designing and graphic signage
- 1.16 Landscaping
- 1.17 Construction stage planning

- 1.18 Building management system
- 1.19 Parking
- 1.20 Medical Gas pipeline, Operation theatres
- 1.21 Access Control, CCTV
- 1.22 Solar Power, Solar Heating
- 1.23 LAN, EPBX
- 1.24 Preparation of B/S Coordinated model to detect clashes
- 1.25 Any other services as desired by the client

## **2. SERVICES FOR DPR**

For each of the items included in the scope of work the architect shall render the services sequentially as below:

### **2.1 Concept Design**

**2.1.1** Plans and concept design shall be prepared by the architect for approval of the department owning building. Modification in the concept plan that was presented before the selection jury, may be modified at the stage to accommodate functional requirement of the project.

However plans and concept design, duly approved, shall be provided to the DPR consultant, who is preparing DPR in accordance with SOR.

### **2.2 Master Planning**

Visit site and prepare master plan of the project area (campus) i/c double line plan of existing buildings/structures to be retained / demolished, exact details of all features inside and adjoining the campus such as poles, overhead lines, underground utilities, cables, wells, handpumps, trees, roads, nallah, river, drains, underground water lines, sewer lines, adjoining land owners, overhead tanks etc. The architect shall verify contours and directions (E-W-N-S) etc at the project site and if contours are found not truly representing the ground realities, the architect shall engage a surveyor and get site plan prepared afresh for which payment shall be made separately according to relevant SOR item. Google plan showing project boundaries shall also be provided in support of master plan.

### **2.3 Architectural Working Drawing (For obtaining AA)**

Prepare architectural working drawings as per **List-1** on scale 1:100 according to applicable standards / norms such as NBC, IS, MCI, M.P. Bhumi Vikas Adhiniyam, IPHS, local self govt. guidelines &

rules etc and submit as **DPR Appendix-1** Prepare guidelines and plans for the phased (staged) construction of the project , if required and submit as **DPR Appendix-1**

#### **2.4 Estimating (for obtaining AA)**

Prepare specifications and detailed estimate of cost based on current specifications and SOR Format – **T1, T2, T3** and **A, B, C, D, E, F & G, P1, P2** prescribed and as amended form time to time .Detail estimate in prescribed format shall be submitted in the SOR as **DPR Vol-1** Details of standard formate such need, contents, formatting & directives to use/preparation formats are also given in the SOR.

#### **2.5 Utilities (for obtaining AA)**

Prepare plans and estimates for utility shifting and tree cutting ,if required .Obtain estimates from other agencies such as electricity companies /telephone companies, PHE department, municipal governments forest department etc and include cost in DPR as external works .However, if required, utility plans & estimate shall be prepared separately also for submission to other department for the there permission or forgiving them these work as deposit work and submitted as **DPR Vol-2**.

#### **2.6 Rate Analysis (for obtaining AA)**

Prepare rate analysis in standard format of C.P.W.D. For non SOR items, if included, in the estimate and submit as **DPR Vol-3**

#### **2.7 BOQ (After AA is received)**

Prepare Bill of Quantities (BOQ) upon grant of administrative approval of the project by the administrative department comprising of two parts, ‘**BOQ Part A-SOR items**’ and ‘**BOQ Part B-Non SOR items**’ for inviting tenders. It is to be submitted as **DPR Vol-4**.

#### **2.8 Statutory Approval (After AA is received)**

Prepare, if required upon getting AA, all **Preliminary Working Drawings** as per List-2 on scale 1:100 in required number of sets for clients/statutory approvals and ensure compliances with codes, standards and legislations, as applicable and assist the client in obtaining clearances /NOC/ approvals from statutory bodies such as municipal govt. environmental clearance bodies. In case of statutory approval not warranted for the project, Department’s approval shall be granted at this stage. Drawings to be submitted as **DPR Appendix-2** mentioning "**Preliminary working For Statutory Submission Only and Not for Construction**". Coordinate with various agencies such as Town and Country Planning, Municipal Corporation, fire department, electricity board, P.H.E.D., EPCO, C.P.A. Airport Authority and planning agency, environmental clearance authority etc. and assist department in obtaining

approval. Necessary fee, if required to be paid to these agencies, shall be paid by the department. However consultant engaged for preparing submission and making/presenting before these agencies shall be paid by the architect and not the department.

**2.9 Model (After AA is received):-** Prepare model of building on a suitable made from fiber acrylic sheet. The model shall be enclosed by 5mm thick glass and mounted on portable base.

### **2.10 Detail Drawings (Construction Stage)**

**Prepare Architectural Detail Drawings** as per **List 3** on scale 1:50 or larger and submit as **DPR Appendix-3**. Coordinate and prepare modified architectural working drawings if required, as per structural design.

### **2.11 Structural Design (Construction Stage)**

Prepare structural design, drawings, Tables for bar-bending schedule, concrete consumption and steel consumption as per List-4 and submit as **DPR Appendix-4**

### **2.12 Completion Drawing (Project Completion Stage):-**

Prepare as constructed drawings up to completion of the project but before preparation of final bill of the contractor.

## **3. Professional Fees Payable**

### **3.1 Fees payable**

Fees payable to the Architect/Consultant at various stages of all the services for DPR defined in clause-2 of this **Annexure** are shown in the ‘**Activity Sheet No. 1**’ for DPR and Drawings and ‘**Activity Sheet-2**’ for Structural Design and Drawings.

**3.2** Total professional fees shall be computed on the basis of percentage of cost of project in fixed fee Format or percentage cost of DPR preparation quoted in Design pmc format. However building area shall be basis for payment in case of assignment of DPR as SOR cost of project means project cost for which AA is granted.

**3.3** If a working drawing such as standard drawing prepared/approved by the Chief Architect is made available to the consultant/architect for customization/modification customization work under this assignment, payment for activities/professional services shall be made only for the modification part (built-up area shall be the basis) of the project and not for the whole project.

### **3.4 Bifurcation of Fee:-**

Bifurcation of professional fee related to various stages as per Activity Sheet No -1 & 2 shall be according to the drawings submitted as per List-1, List-2, and List-3 & List-4.

### 3.5 Schedule of Payment:-

The payment to the Architect/Consultant during various stages mentioned in Activity Sheet No 1. & 2 is subject to its prior scrutiny and approval by the competent officer of the department and shall be running account payments and adjusted in the final payment.

### 4. Time Allowed:-

Architectural/consulting services (scope of work) shall be rendered by the Architect/ Consultant as per Activity Sheet No 1. and 2. In case of delay in obtaining administrative approval and statutory approval, the time period will accordingly be relaxed. Once a project is awarded/assigned to a architect/consultant, work of all stages given in activity sheet shall be done by the same architect/consultant for smooth continuity and in the interest of the project and time allowed shall be deemed to have been extended proportionately.

#### **ACTIVITY SHEET-1** **(For item of preparation of DPR and Drawings as per SOR)**

<b>S. No.</b>	<b>Activity</b>	<b>Time Period</b>	<b>Start of Time Period</b>	<b>Action by</b>	<b>% of total Fee Payable for Activity</b>	<b>Cummulative fee payable upto Activity</b>	<b>Penalty for Late Submission ( in Terms of % of Fee of col 6) Per day P</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>
1	Make available concept design (concept plan)	Within one week of work order.	Activity-1	Department	Nil	Nil	Nil
2	Visit site and submission of master plan of project area based on concept plan	1 weeks	After concept plan is made available	Architect / Consultant	Nil	Nil	Nil
3	Comments/ suggestion on master plan	1 week	After submission of master plan	Department	Nil	Nil	Nil
4	Submission of master plan	1 week	After receiving comments/ suggestions on master plan	Architect / Consultant	<b>5% Ref List-1</b>	<b>5%</b>	<b>5%</b>
<b>Working Drawing Stage (for optaining AA)</b>							

S. No.	Activity	Time Period	Start of Time Period	Action by	% of total Fee Payable for Activity	Cummulative fee payable upto Activity	Penalty for Late Submission ( in Terms of % of Fee of col 6) Per day P
1	2	3	4	5	6	7	8
5	Submission of architectural working drawings as per "List-1".	3 weeks	After master plan is approved	Architect / Consultant	Nil	5%	Nil
6	Checking/ suggestions on working drawings	1 week	After submission of architectural working drawings	Department	Nil	5%	Nil
7	Submission of all architectural working drawings with compliances, if any, as per "List-1" as part of <b>DPR Appendix-1</b> in 6- sets (hard copies) and soft copy)	1 week	After receiving suggestions on working drawings	Architect / Consultant	20% Refer "List 1"	25%	5%
<b>DPR Stage (for obtaining AA):-</b>							
8	Submission of specification, estimate & rate analysis of Non SOR items	2 week	After approval of working drawings	Architect / Consultant	Nil	25%	Nil
9	Checking /suggestions on specification, estimates & rate analysis of Non SOR items	1 week	After submission of specification, estimates and rate analysis	Department	Nil	25%	Nil
10	Submission of DPR as below:- <b>DPR Vol-1:-</b> • Front page	1 week	After approval of specification estimate and rate analysis	Architect / Consultant	Nil	25%	Nil



S. No.	Activity	Time Period	Start of Time Period	Action by	% of total Fee Payable for Activity	Cummulative fee payable upto Activity	Penalty for Late Submission ( in Terms of % of Fee of col 6) Per day P
1	2	3	4	5	6	7	8
	<ul style="list-style-type: none"> <li>• Index sheet</li> <li>• SFC/EFC Formats</li> <li>• Master plan of Project Area</li> <li>• Approved Concept plans &amp; 3D views of building</li> <li>• Estimates in A, B, C, and D.... Formats A,B,C,D... format)</li> </ul>						
	<p><b>DPR Vol-2:-</b></p> <ul style="list-style-type: none"> <li>• Utility shifting estimates (if required separately despite included in site development component of estimate in <b>DPR Vol-3;-</b></li> <li>• Rate Analysis of Non SOR items</li> </ul>						
11	Technical Sanction	1 week	After submission of DPR (Vol-1 + Vol-2 +Vol-3)	Department	For DPR Vol-1 = 15% DPR Vol-2 = 2% DPR Vol-3=3% Refer List 1	40 % 42% 45%	5% 5% 5%

S. No.	Activity	Time Period	Start of Time Period	Action by	% of total Fee Payable for Activity	Cummulative fee payable upto Activity	Penalty for Late Submission ( in Terms of % of Fee of col 6) Per day P
1	2	3	4	5	6	7	8
<b>BOQ Stage (After AA is received)</b>							
12	Submission of BOQ	1 week	After AA	Architect / Consultant	Nil	45%	Nil
13	Checking/suggestion on BOQ	1 week	After submission of	Department	Nil	45%	Nil
14	Submission of BOQ (Part A-SOR items + Part B-Non SOR items) as part of <b>DPR</b>	1 week		Architect / Consultant	5% Refer List-1	50%	5%

<b>Statutory Approval Stage (After AA is received)</b>							
15	Submission of working drawings, PPT as per " <b>List-2</b> " as part of <b>DPR Appendix- 2</b> for clearance/NOC/ approval from statutory bodies.	2 weeks	After AA	Architect/ Consultant	2% Refer "List-2"	52%	
<b>Model stage (after AA is received)</b>							
16	Preparation of one model of building from fibre acrylic sheet mounted on suitable portable base covered with 5mm thick glass on top & all sides.	4 weeks	After AA	Architect/ Consultant	1% Refer "List-2"	53%	
<b>Detail Drawings Stage (During Construction)</b>							
17	Submission of detail drawings as per list-3.	4 weeks	After AA	Architect/ Consultant	Nil	53%	
18	Checking/Suggestions on detail drawings	2 weeks	After submission of detail drawings	Department	Nil	53%	

19	Submission of detail drawings after compliances as per " <b>List-3</b> " as part of <b>DPR Appendix-3</b> in 6 sets.	1 weeks	After checking/ suggestion by department	Architect/ Consultant	37% Refer List-3	90%
	<b>As Constructed Drawings (Project Completion Stage)</b>					
20	Submission of 'As Constructed Drawings of all buildings as part of <b>DPR Appendix- As Built Drawings.</b>	4 weeks	On completion of building & before final bill payable to the contractor.	Architect/ Consultant	10%	100%

**ACTIVITY SHEET-2**  
(For item of preparation of DPR and Drawings as per SOR)

S. No.	Activity	Time Period	Start of Time Period	Action by	% of total Fee Payable for activity	Cummulative fee payable upto Activity	Penalty for Late Submission ( in Terms of % of Fee of col 6) Per day P
1	2	3	4	5	6	7	8
<b>Structural Design Stage(During Construction):-</b>							
1	Submission of Structural Design & Drawings as per "List-4: along with structural calculation and analysis in Staad Pro or equivalent software.	2 weeks	Work order or after AA is received	Architect/ Consultant	Nil	Nil	Nil
2	Proof checking	2 weeks	After submission of structural design & drawings	Department/ Structural Engineer (proof checking) on behalf of department	Nil	Nil	Nil
3	Compliance in Structural Drawings as required in proof checking and submission of final Structural Drawings as part of <b>DPR Appendix-4</b> in six sets as per "List-4" .All drawings & designs shall be duly signed by a empanelled structural engineer	1 week	After submission of structural design drawings	Architect/ Consultant	100% Refer " <b>List-4</b> "	100%	5%

## NOTE FOR ACTIVITY SHEET No 1& 2

- 1 The Architect shall submit DPR volumes and Appendices to the concerned Divisional Project Engineer, PWD, PIU as below:-

**(a) Volumes:-**

DPR Vol-1; (i) Front page

(ii) Index sheet

(iii) All SFC/EFC Formats

(iv) Master plan of Project Area

(v) Approved Concept plans & 3D views

(vi) Estimates in A, B, C, D.... Formats

DPR Vol-2 Utility shifting estimates

DPR Vol-3 Rate Analysis of Non SOR items

DPR Vol-4 BOQ (Part-A SOR items + Part-B Non SOR items)

**b) Appendices**

- DPR Appendix 1 – (Architectural Working Drawings as per “**List-1**”)

- DPR Appendix 2 – (Statutory Drawings as per “**List-2**”)

- DPR Appendix 3 –( Detail Drawings as per “**List-3**”)

- DPR Appendix 4 –( Structural Design and Drawings as per “**List-4**”)

- 2 All Architecture drawings shall be signed by the authorised/lead person of the consultant/architect mandatorily before submission otherwise payment shall not be released. Merely signing by any other person/employee of the consultant/architect shall not be accepted for release of payment.
- 3 All detailed drawings should be supported by fixing detail, plan, elevation, section and detailed information like specification etc. as per requirement.
- 4 Structural drawing & design calculation, analysis (In STAAD Pro or equivalent software) shall be duly signed by an empanelled Structural Engineer only.
- 5 Submission of approved architectural drawing of plan, section, and elevation and approved layout plan is compulsory with the submission of structural design for proper coordination
- 6 Plumbing drawing is needed before casting of plinth and floor beam with opening details.
- 7 Structural consultant / structural proof checking consultant should submit Structural Safety Certificate for each individual project as per National Building Code 2016. Annexure “C” and “J”.

**List-1**

**Fee Bifurcation (Ref Activity sheet No-1 and item for preparation of DPR)**

<b>S. No</b>	<b>Particular of drawings/Detail</b>	<b>Category of Empanelled Consultant Competent to sign drawings/document</b>	<b>% of total fee payable for activity</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
	<b>Master Planning Stage:-</b>		
1	Site visit the architect for verification of all features and contours. Submission of master plan of project area showing all existing features, structures to be dismantled/retained over head/underground utilities roads, directions, contours, adjoining land owners submission of google plans with project. Boundaries in support of master plan.	Architect	5%
	<b>Architecture Working Drawing Stage:-</b>		
2	Architectural working drawings having all floor plans, all elevations and all sectional elevations	Architect	5%
3	3D views, at least 4 number from all sides.	Architect	2%
4	Layout plan for internal electrical services	Electrical, Electronics, Communications and Security system	1%
5	Layout plan for external electrical services including tapping point, substation panels etc.	Electrical, Electronics, Communications and Security system	1%
6	Layout plan for mechanical services (HVAC, lift etc) with details	HVAC and other Mechanical System	1%
7	Layout plan for communication electronic.	Electrical, Electronics, Communications and Security system	1%
8	Layout plan for ceiling, paneling, acoustic, light & sound services	Electrical, Electronics, Communications and Security system	1%
9	Layout plan for roof drainage with water proofing, roof slopes, spout and rainwater pipes.	Sanitary, Plumbing Drainage, Water Supply and Sewerage	1%

10	Layout plan for rainwater harvesting	Sanitary, Plumbing Drainage, Water Supply and Sewerage	1%
11	Layout plan for fire fighting	Fire Detection and Fire Protection	1%
12	Layout plan for water supply lines, storage tanks, source.	Sanitary, Plumbing Drainage, Water Supply and Sewerage	1%
13	Layout plan for sanitary pipes/lines & sewerage, septic tanks, STP/ETP, inspection chambers, soakpit.	Sanitary, Plumbing Drainage, Water Supply and Sewerage	1%
14	Solid waste management and incinerator layout, if any	Sanitary, Plumbing Drainage, Water Supply and Sewerage / Environmental Engineer	1%
15	layout plan for furniture	Interior Architect	1%
16	Layout plan for parking and landscaping.	Architect/ Arboriculture/Landscape Architect	1%
	<b>Total % of fee payable at Architectural Working Drawing Stage (item 2 to 16)</b>		<b>25%</b>

	<b>DPR stage:-</b>		
17	<b>For submission of DPR as below</b>  <b>DPR vol-1:-</b> <ul style="list-style-type: none"> <li>• Front page</li> <li>• Index sheet</li> <li>• SFC/EFC Formats</li> <li>• Master plan of Project Area</li> <li>• Approved Concept plans &amp; 3D views of building</li> <li>• Estimates in A,B,C,D.... Formats</li> </ul> <b>DPR Vol-2:-</b> <ul style="list-style-type: none"> <li>• Utility shifting estimates (if required separately despite included in site development component of estimate in A,B,C,D... format)</li> </ul> <b>DPR Vol-3:-</b> <ul style="list-style-type: none"> <li>• Rate analysis of Non SOR items</li> </ul>	Lead Person	10%
		Lead Person	2%
		Lead Person	3%
	<b>Total % of fee payable at DPR stage(item 17)</b>		<b>15%</b>
	<b>BOQ Stage (after AA is received) :-</b>		
18	<b>Submission of BOQ :-</b>  BOQ (Part-A SOR items + Part-B Non SOR items) as <b>DPR Vol-4</b>	Lead Person	<b>5%</b>
	<b>Total % of fee payable at master planning, architectural working drawings, DPR and BOQ stage(list-1,Item 1 to 18)</b>		<b>50%</b>



<b>List-2</b>			
<b>Fee Bifurcation (Ref Activity sheet No-1 and item for prepration of DPR)</b>			
<b>S. No</b>	<b>Particular of Drawings/Detail-</b>	<b>Category of Empanelled Consultant Competent to sign drawings/document</b>	<b>% of total fee payable for activity.</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<b>Statutory Approval Stage:-</b>			
1	Submission of all necessary drawings & details for approval of Govt. & Semi Govt. Departments, Municipal Corporations/ Municipality/Gram Panchayat / Town & Country Planning/M.P. Electricity Distribution Companies / Environment Departments, SEIAA, SEAC /Airport Authority / Fire Department etc as <b>DPR Appendix-2.</b>	Lead person	Nil
2	After permission granted from all concerned authorities for construction of building.	Concerned authority	2%
<b>Model Stage :-</b>			
3	Submission of one model on suitable scale made form acrylic sheet & enclosed with 5mm thick glasses	Lead person	1%
<b>Total % of fee payable at statutory approval and model stage as part of DPR-Appendix-2 (List -2)</b>			<b>3%</b>

**List-3**

**Fee Bifurcation (Ref Activity sheet No-1 and item for preparation of DPR)**

<b>Construction stage:-</b>			
1	Good for Construction (GFC) detail drawings (Scale 1:50) with all dimensions (refer Activity Sheet-1) as part of <b>DPR Appendix-3</b> after getting administrative approval as below:-  Visit site to verify layout and submit GFC working drawings along with layout plan, all floor plans, all elevations, all sections special features and any other necessary drawings & information with all dimensions.	Architect	5%
2	3D Views, if different than that submitted at working drawing stage.	Architect	2%
3	GFC design and detail of Flooring, Dado, Sill & Skirting, Layout plan for labs and details of Platform etc.	Architect	5%
4	GFC details of doors, windows, ventilators, grills, railing and glazing.	Architect	2%
5	GFC Details of staircases, ramps with railing and handrails	Architect	2%
6	GFC Layout plan for roof drainage with, water proofing, slopes, spout and rainwater pipe details and Expansion Joint	Sanitary, Plumbing Drainage, Water Supply and Sewerage	3%
7	GFC Layout plan for rainwater harvesting with design and details	Sanitary, Plumbing Drainage, Water Supply and Sewerage	2%
8	GFC Layout plan for water supply & storage tanks design details	Sanitary, Plumbing Drainage, Water Supply and Sewerage	2%
9	GFC Layout plan for sanitary fittings & plumbing, sewerage, , inspection chamber with design & details such as slopes, dia etc.	Sanitary, Plumbing Drainage, Water Supply and Sewerage	2%
10	GFC Layout plan for, septic tanks, STP/ETP with design & details	Sanitary, Plumbing Drainage, Water Supply and Sewerage	1%

11	GFC Solid waste management details and incinerator details, if any	Sanitary, Plumbing Drainage, Water Supply and Sewerage / Environmental Engineer	1%
12	GFC Design and Details for fire fighting with layout.	Fire Detection and Fire Protection	3%
13	GFC Design and Detail of communication services , Layout and Detail of Security System Layout plan for electronics services with design and details	Electrical, Electronics, Communication and Security System	2%
14	GFC Design and Detail of internal electrical working drawing including electrical point wiring, circuit wiring, mains & sub-mains, electrical & power conduit plan, L.V. (CCTV, LAN, Telephone, Fire Alarm), S.L.D. for panels & DBs, electrical load calculation	Electrical, Electronics, Communication and Security System	3%
15	GFC Design and Detail of external electrical working drawing including substation design, H.T./L.T. panel S.L.D. & design, Outer H.T./L.T. cable layout, street light design layout, electrical feeder details for water pump, STP, WTP,	Electrical, Electronics, Communication and Security System	2%
	<b>Total % of fee payable at Construction Stage (List-3, Item 1 to 15)</b>		

<b>List-4</b>			
<b>Fee Bifurcation at structural design and drawing stage (Ref Activity sheet No-2 and item for preparation of DPR)</b>			
<b>S.No</b>	<b>Particular of drawings/Detail</b>	<b>Category of Empanelled Consultant Competent to sign drawings/document</b>	<b>% of Total fee payable for activity.</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
	<b>Structural Design Stage:-</b>		
1.	Visiting site for verification of S.B.C and contours at site. Getting soil testing done again if warranted by an empanelled geotechnical engineer (paid separately for soil testing)	Structural Engineer	10%
2.	Submission and obtaining approval of design Analysis and calculation in STAAD Pro or Equivalent software included all correction suggested (including wind and earthquake loading with static and dynamic analysis as applicable) and calculation of foundation in excel sheets or at appropriate software (with wind and earthquake loading) and there output in hard and soft copy.	Structural Engineer	25%
3	Submission and obtaining approval of structural drawing of Column index plan with all floor framing plans, details of column footing, foundation (combined raft etc.), piles, pile caps, plinth beam, grade beam, curtain walls and retaining walls etc. Drawing in six set in hard and soft copy (AUTOCAD files) in C.D., which shall be vetted/coordinated with sanitary and plumbing drawing.	Structural Engineer	15%
4.	Submission and obtaining approval of structural drawing of Ramps (internal/external), stair, stair cases, porch, lintel, chajjas , shear wall and tower, mumty floor, lifts block lift well and lift machine room according to the type of lift to be used. septic tank, sump well, overhead tank, in six set of hard and soft copy (AUTOCAD files) in C.D	Structural Engineer	10%

	<p style="text-align: center;">or</p> <p>Finalized Special provision if sloppy terrain or any other site specific problem and all related detailed drawing</p> <p style="text-align: center;">or</p> <p>Any other structural design drawing provided in the DPR and as and when Required/ desired by the Engineer in charge.</p>		
5.	<p>Submission and approval of structural drawing of All Floor beams and slabs at different level, with calculation of slab in excel at appropriate software, in six set of hard and soft copy (AUTOCAD files) in C.D. And vetted/coordinated with electrical layout of slab.</p> <p style="text-align: center;">or</p> <p>Truss analysis and detail's of component and there connection with all calculation detail in excel, STAAD Pro equivalent software and all related detailed drawing in in six set of hard and soft copy (AUTOCAD files) in C.D</p> <p style="text-align: center;">or</p> <p>Finalized Pre-stressing or Post tensioning (if required in any part of structure) with calculation details in excel, ADAPT, RAM CONCEPT P.T or equivalent software and Submission and approval of structural drawing in six set of hard and soft copy (AUTOCAD files) in C.D</p>	Structural Engineer	15%
6.	<p>Submission and approval of Bar Bending Schedule as per finalized structure design(after proof checking), in hard and soft copy (in any software or Excel programs) dully signed with structure engineer, and Finalized quantity of Concrete and steel in the preserved form of steel &amp; concrete consumption table.</p>	Structural Engineer	25%
	<b>Total % of fee payable at structural design stage (List-4, item 1 to 6)</b>	<b>Total</b>	<b>100%</b>

## **NOTE:- For SOR items for preparation of DPR**

1. Competent officer to approve drawings shall be:
  - i. Architectural Drawings : Chief Architect
  - ii. Structural Drawings:
    - DPE for building with area upto 500 sqm.
    - APD for building with built-up area more than 500 sqm & upto 3000 sqm.
    - Design cell in the office of the chief architect for buildings with built up area >3000 sqm and any other building (even less than 3000 sqm.) referred to design cell
2. Structural design, drawings and calculations analysis (In STAAD Pro or Equivalent software) shall be duly signed by empanelled Structural Engineer only.
3. Submission of approved architectural plan, section, and elevation and layout plan is compulsory with the submission of structural design for good coordination.
4. Plumbing drawing with opening details is needed before casting of plinth and floor beams.
5. Structural consultant/ Structural proof checking consultant should submit structural safety certificate for each individual project as per National Building Code-2016 Annexure “C” and “J”.
6. If an architect/consultant is assigned a work of customisation of a project work in which a already prepared/approved drawing of repetitive project is used, then payment for only services provided by the architect/ consultant shall be made. Built up area shall be the basis for such calculation of fee payable.

## **Special Condition for Work/Assignment for inviting bid for preparation of D.P.R. as per Items in SOR**

1. Bidder for work/assignment for preparation of D.P.R. as per Items in SOR shall be an Architect only, who is empanelled with the Chief Architect M.P. P.W.D., Bhopal.
2. In case bid document 2.10 of PWD Work Manual is used for inviting bid for preparation of DPR, then "work" shall be read as "assignment" and "bidder" or "contractor" shall be read as "architect".
3. This work/assignment includes several activities/components that can be done only by other consultants who are empanelled with the Chief Architect M.P. P.W.D., Bhopal and therefore an Architect bidding for this work/assignment is expected to have a legally binding joint venture (J.V.) agreement with other consultants.
4. In case of Architect winning this assignment does not have J.V. before bidding and submit bid in lone capacity, other activities/works such as land survey, geotechnical investigation, preparation of geotechnical reports, estimation, quantity surveying, HVAC, sanitary, plumbing, acoustic, fire detection/protection, structural design etc. shall be got done by the Architect only through the consultants empanelled with the Chief Architect M.P. P.W.D., Bhopal. Under appropriate category given in schedule 1 of the "Document for Empanelment" issued by government of Madhya Pradesh vide letter No. F 17-1/2010/G/19 Bhopal dated 07.06.2014 and subsequent addendums.
5. In both the cases, J.V. prior to bidding (as per Clause 2 above) or engaging other consultants after winning the bid (as per Clause 3 above) provisions for black listing and suspension as per Clause 5 of letter No. F 17-1/2010/G/19 Bhopal, dated 07.06.2014 and subsequent addendums issued by Government of M.P. P.W.D. shall be applicable jointly and severally both successful bidding Architect and the Consultants.
6. Payment for services rendered by the other consultants shall be done by the Architect awarded the work at rates mutually agreed between them. The department shall not be held responsible for any dispute between them. Payment for work done by the department shall be made only to the Architect who has been awarded the work.
7. Payment to the Architect shall not be done for the non S.O.R. items for which rate analysis as per C.P.W.D. pattern has not been submitted along with the estimate. Similarly payment to the Architect for those works which are required to be done by the Consultants empanelled with the Chief Architect, M.P. P.W.D., Bhopal shall not be made if such documents, reports, drawings, estimates, design and etc. are not signed and sealed/stamped by the authorized persons of such empanelled Consultant.
8. The Architect is required to appoint a suitable technical person with computer, printer, stationery and wireless internet internet connection in the office of the Divisional Project Engineer (Nodal Agency) during office days to coordinate between the Architect and various consultants on his behalf and the department. This technical person shall have to working knowledge of computer and should be capable of taking instruction from the Divisional Project Engineer in regards to works to be done or compliances/correction in report drawing etc.
9. Zonal work/assignment for preparation of D.P.R. shall include several works located within the districts which may be assigned to the PIU by other departments in the financial year for

which bids have been invited. But this will not entitle the Architect to claim allotment of assignment which have been put for architectural competition or identified for in house design in the office of the Chief Architect.

10. In case the Architect is allotted a project of which architectural drawing are already prepared/approved by the Chief Architect, only prorated payment of modification work shall be made.
11. The D.P.R. consultant empanelled with the chief Architect shall have to submit all details drawings duly signed by him/her and also by their associate expert/consultant empanelled with Chief Architect in their respective field/stream/areas of expertise such as structural design/S.Q.C./landscape/water supply and sanitary/ electrical/ fire fighting/ interior design. Payment to the Architect shall be made only for percentage of fee (component of total fee) mentioned in preamble, which shall further be prorated to the extent of modification in allotted work/assignment while customizing previously/already prepared/approved project by the Chief Architect.



Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
29.1		Site plan and location plan with total station	Preparation of site plan and location plan with total station surveying showing all individual structures and features like trees, roads, culverts, nallas, electric poles, telephonepoles, sewer lines, chambers, water supply lines, hand pumps, well etc. complete along with showing location of roads proposed in master plan. i/c Contours of entire area at 0.5 m. intervals using auto level, preparing of site plan in soft copy (using autocad) in suitable scale as desired by engineer-in-charge duly indicating north direction. Rate includes providing 1 digital copy and six hard copies, one print on tracing film, khasra map duly showing the land and location plan (index plan) and google image of the land. Rates are inclusive of transportation charges. (Work shall be got done through consultants duly empanelled with chief Architect MP P.W.D.)		
	29. 1.1	Upto 1 Hectare	Upto 1 Hectare	each	13000.00
	29.1.2	1 to 2 Hectare	1 Hectare to 2 Hectare	each	16000.00
	29.1.3	Extra for additional Hectare	Add extra for each additional one Hectare or part there off	each	2250.000
	29.1.4	Trial Pit	Excavation of trial pit of size 1.20 m X 1.20 m with minimum depth of 0.9 m and maximum depth of 3.5m as directed by the Engineer in Charge. Trial pit shall be taken at suitable location/ locations as directed by Engineer in charge and shall be indicated on the site plan showing details of soil strata.	each	2450.00
29.2		Detail Double line plan of existing buildings structures	Preparation of double line plan after measurement of internal as well as external dimensions of existing buildings/structures and plotting the same in suitable scale as directed by Engineer-in-charge.	per sqm	18.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
29.3		Double line plan for planning of addition and alteration work	Preparing of double line plan for planning of addition and alteration work after measurement of internal as well as external dimensions and details of existing door window, ventilator openings and partitions, addition /alteration done previously in buildings/structures and plotting the same separately showing sectional elevations (minimum two numbers) and all elevations along with all relevant details like doors, windows stairs etc in suitable scale as directed by Engineer-in-charge. The consultant shall also submit detailed condition survey report.	per sqm	45.00
29.4		S.B.C. by Plate load test	Performing Plate Load Test (P.L.T.) for Determining soil bearing capacity (SBC) at site including submission of Geotechnical Report and recommending bearing capacity in accordance with IS-1888-1982 (Without Conveyance).	per pit	32580.00
29.5		S.B.C. by S.P.T.	Performing Standard Penetration Test for determining soil bearing capacity (SBC) in accordance with IS-2131-1981 and submission of Geotechnical Report on bearing capacity based on SPT in accordance with IS-6403-1981 (Without Conveyance)	per bore	16497.00
29.6		Transportation charges for plate load test or S.P.T.	Transportation charges for transportation of Geotechnical testing equipments for plate load test or standard penetration test upto a distance of 100km. (upto 100km going and 100km returning from district H.Q. both way) Rates are inclusive of Loading and unloading of testing equipments and other incidental charges during both journeys to be paid only once for one set (separate for PLT or SPT) of testing.		

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	29.6.1	Up to 100km	Up to 100km (both way)	upto 100km both way	3150.00
	29.6.2	Extra km from 100 to 150km	Add extra for distance beyond 100km and upto 150km. (both way)	per km.	27.00
	29.6.3	Additional km beyond 150km	Add extra for every additional km beyond 150km (both way)	per km.	22.00
29.7		Preparing detailed estimate based on working drawing of the department	Preparation of detailed estimate on the basis of the working drawing supplied by the department and current SOR applicable, including computation of bill of quantities (BOQ) of material and supplying the same in six hard copies and one soft copy to the Engineer-in-Charge and if required revision of the same without any additional charges. (Work shall be got done through consultants duly empanelled with chief Architect MP P.W.D.) The estimate shall be prepared only in standard format prescribed as per appendix 14 of this SOR.	per estimate	0.15% of the total estimated amount
29.8		DPR Preparation including site visit	Preparation of DPR including site visit to verify contours & soil reports and preparation of master plan of campus including architectural working drawings and estimates in prescribed format as per appendix 14 of this SOR to obtain AA; and there after architectural drawings for statutory approvals and detail drawings at construction stage; and as constructed drawings on completion of work the DPR (excluding structural design) shall be prepared according to "Terms & Conditions", Activity Sheet No-1" , List-1" , List-2 and List-3" given in Annexure-14 as amended from time to time appended with SOR. In addition to civil drawings, the	per sqm	160.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>architectural work shall include preparation of MEP drawings of Heating Ventilation and Air Conditioning (HVAC), Mechanical system (elevators/escalators etc), acoustics, sanitary, plumbing drainage, water supply, rain water harvesting, sewage, STP, ETP electrical, electronic, communication system, interior design, graphics signage, fire detection, fire protection, security systems, arboriculture, parking and landscaping based on the concept plan supplied by the department. All drawings shall be prepared according to soil condition, topographical condition surface &amp; subsoil water levels at site, relevant codes/manuals, bylaws, green building and GRIHA norms. The work shall also include preparation of model of the building made of acrylic fiber sheet, on a suitable scale, mounted on a portable base and 3D views on flex on plain sheet as directed by the Engineer in charge. It will be the responsibility of the architect to collect the sub soil reports (Bearing Capacity for soil) from the department, if available. However, if bearing capacity of soil is not available with the department, then it will be responsibility of the architect to engage a geotechnical engineer empanelled with the Chief Architect and get the investigation done and collect the report for which payment shall be made separately according to geotechnical testing items in SOR. The work shall also include revision of the drawings, obtaining statutory approvals, obtaining utilities shifting estimates from owners of the utilities at site and other approvals such as GRIHA rating.</p>		

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>Environmental clearance etc, if required, within time stipulated by the Engineer in Charge. All drawings shall be duly stamped &amp; signed by the Architects and Consultants empanelled with the Chief Architect MP PWD Bhopal in relevant category. The drawings shall be submitted to the Engineer- in-charge in six hard copies and one soft copy.</p> <p>Note:-1. Lead person for this work/assignment shall be only architect empanelled with the chief architect MP PWD Bhopal. The Architect may retain a in house team of other engineers/consultants or may hire other consultants, as required, for which no extra payment shall be made by the department. 2. Bifurcation of professional fee payable in stages as per this item shall be in accordance with List-1, List-2 &amp; List-3. Given in preambles of this chapter 3. All work such as preparation of DPR, working drawings, statutory drawings, details drawings and as constructed drawings shall be done by the same architect/consultant to ensure consistency in services, even if time required to complete all stages as per Activity sheet exceeds the contract period.</p>		
29.9		Structure Design & Drawings	Preparation of the structure design & drawings by a structural engineer empanelled with the Chief Architect MP PWD on the basis of architectural drawings supplied/approved by the department, in accordance with relevant codes/manuals and according to the "Terms & Conditions", prescribed in Activity		

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			Sheet No-1", List-4" given in Annexure-14 appended with SOR. The work shall include site visit, verification of soil testing report, topography, contours etc. made available to the structural engineer. The structural engineer is not satisfied with adequacy of geotechnical reports, he may engage a geotechnical engineer and get the soil investigation done, for which charges are payable separately, according to relevant item of SOR, to satisfy himself that the design is optimal. If design work pertains to a work to be done over an existing structural, the structural engineer shall get structural soundness study done for which payment shall be made separately. The structural engineer shall do revision/ compliances of the structural design and drawings, if required, without any additional cost within stipulated time and obtain approval from the competent authority. Design and drawing shall also include 'Tables' for the bar-bending schedules (BBS) and concrete/steel consumption. The design and drawing shall be submitted to the Engineer-in-Charge in six hard copies and one soft copy for execution. The payment shall be done in accordance with relevant stage in activity sheet and list.		
	29.9.1	First time design work	First time design work		
	29.9.1.1	Up to 500 sqm	Built up area upto 500 sqm	per sqm	55.00
	29.9.1.2	500sqm to 3000sqm	Built up area more than 500 sqm and upto 3000 sqm	per sqm	45.00
	29.9.1.3	More than 3000sqm	Built up area more than 3000 sqm.	per sqm	35.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	29.9.2	Repetition Design work	Repetition of structural design of a structural design done by the structural himself or by any other structural engineer at different site, where S.B.C. or seismic zone is different.(only plinth area payment to be paid)		
	29.9.2.1	Up to 500sqm	Plinth area upto 500 sqm	per sqm	22.00
	29.9.2.2	500sqm to 3000sqm	Plinth area more than 500 sqm and upto 3000 sqm	per sqm	18.00
	29.9.2.3	More than 3000sqm	Plinth area more than 3000 sqm	per sqm	14.00
29.10		Load carrying capacity of existing R.C.C. structure	Assessment of load carrying capacity and structural soundness of existing building mainly comprising of R.C.C. structure using existing information such a existing drawing, design and footing details, if available. The consultant shall carry out destructive/non destructivetesting of structure at site including site investigation which may require opening of footings by digging adjoining ground fill and restore backfill structure after testing is done. The work may include consultation with the geotechnical consultant/expert. The report shall contain express recommendation on capacity/ ability of the structure to carry extra loads of next floor proposed on the building. The report shall also include recommendation on rehabilitation measures like as strengthening of structural elements such as column, footing, beam, slab, lintels etc. This work shall be performed by a structural engineer (proof checking) empanelled with the chief Architect MP PWD Bhopal or any government engineering college. The rate shall include all charges for labour, testing,	per sqm	260.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			consultation of geotechnical consultant and site visit to carry out site testing Per Sqm (built up area of wing/block of existing building where construction is proposed).		
29.11		Drafting structural drawing	<p>Drafting structural drawing on the basis of the structural design supplied by the department in accordance with all relevant codes/manuals and as per IS: 1893-2002 and IS: 13920-1993 with updation. The work shall include making revision/compliance if any and obtaining approval of drafting work, without any additional cost within time specified by the Engineer-in-Charge or from the competent authority. The drawings for approval shall be submitted to the Engineer- in- Charge in two hard copies (minimum size A-2) and there after fair drawings on 100 micron film along with seven copies of amonia prints (minimum size A- 1) and one soft copy. Drawings shall be stamped and signed with the statement that "Drafted by me as per structural design done or got done by the department."</p> <p><b>Note:-</b> This work can be done only through a person having qualification of Diploma in civil engineering/BE (civil engineering) and having certificate in AutoCAD issued by AutoDesk or by it's authorized institution.</p>	sqm	26.00
29.12		BIM (Campus)	Providing and prebuilding information modeling (BIM) conversion of 2D or 3D engineering drawing(Hard or Soft copy) of a campus showing building, roads, tunnel culverts, landscapes over head/under ground services such as electrical lines, cables, water lines,	hectare	35000.00



Item No.	Sub Item No.	Item name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			sewer lines, gas pipe lines, telecom lines, optical fiber lines, fire pipe lines, hydrants etc. to virtual 3D building model using Building modeling software 'REVIT' and extraction of MEP 2D format drawing from this 3D model incorporating landscape details of the campus for visualization with finishing and true texture and colors and submission of soft copies(6 sets of CD) of the model as well as hard copies (6 sets of) 2-D drawings extracted from 2-D model.		
29.13		BIM (Buildings)	Building information modeling (BIM) conversion of architectural, structural and MEP (mechanical, electrical and plumbing) services 2-D/AutoCAD/pdf/hardcopy drawings to virtual 3 D building model using Building Modeling REVIT software and extraction of MEP 2-D format drawings from this 3-D model, incorporating interior as well as exterior architectural details of building for visualization with finishing and true texture and colors and submission of soft copies(6 sets of CD) of the model as well as hard copies (6 sets of) 2-D drawings extracted from 3-D model. Payment shall be based on builtup area.		
	29.13.1	Upto 10,000 sqm	Upto 10,000 sqm	sqm	35.00
	29.13.2	10,000 sqm to 25,000 sqm	10,000 sqm to 25,000 sqm	sqm	32.00
	29.13.3	25,000 sqm to 50,000 sqm	25,000 sqm to 50,000 sqm	sqm	30.00
	29.13.4	More than 50, 000 sqm	More than 50, 000 sqm	sqm	27.00

**CHAPTER – 30.0**  
**SEWAGE TREATMENT**

## **CHAPTER NO – 30.0 SEWAGE TREATMENT PREAMBLE**

With the increase in urbanization, fresh water resources are becoming stressed due to increase in domestic, industrial and commercial usage and are attaining the maniacal proportion where as safe water supply and hygienic sanitation facilities are the two basic essential amenities the community needs on top priority for healthy living.

While provision of safe drinking water takes precedence in the order of provision of basic amenities to community, the importance of hygienic sanitation facilities through low cost on – site sanitation, conventional sewerage and sewerage treatment can no longer be allowed to lag behind, as about 80% of water used by the community comes out of houses in the form of waste water which unless properly collected, conveyed, treated and safely disposed off may eventually pollute our precious water resources and cause environmental degradation.

The national urban sanitation policy 2008, envisions, “All Indian cities and towns become totally sanitized, healthy and livable and ensure and sustain good public health and environmental outcomes for all their citizens, with a special focus on hygienic and affordable sanitation facilities for the urban poor and women”.

Thus there is an urgent need to have proper sewage treatment at the point of generation thru De-Centralized sewage treatment plants based on effective and proven treatment process as defined in CPHEEO manual on sewage treatment, 2013 with effluent conforming to the defined Parameters as MOEF, notification dated 13.10.2017 but according to the national green tribunal New Delhi guideline related to discharge standards for sewage treatment plant has been revised ( dated 30-04-2019) and making it mandatory to recycle, reclaim and reuse of effluent for various end usage applications viz: gardening, flushing, irrigation, landscaping to name a few, which in turn will lead to reduction in precious fresh water intake along with scientific sludge handling, treatment and disposal .

Above will help

- To Protect Public Health
- To protect the Environment and States Water Resources
- To Promote Recycle, Reclaim and Reuse of Treated Sewage Water for Non-Potable Drinking Purposes
- Increase in the Adequate Sewerage Coverage to all Population.
- Reuse of treated sewerage can provide incremental supply for non – potable applications and thus reduce need for augmenting supplies. In other words, water reuse promotes environmental sustainability by reducing burden on already stressed basin and aquifers and preventing their depletion.

The major aim of waste water treatment is to remove as much of the suspended solids as possible before the remaining water, called effluent is discharged the environment. Treated wastewater to ported public health prevent disease causes environment, prevent pollution of water bodies and can be reused in flushing or horticulture purposes.

All electromechanical equipment (used in STP/ETP) shall not produce operational sound as per the noise pollution (Regulation and Control) Rules 2000.

(The Principal Rules were published in the Gazette of India, vide S.O. 123(E), dated 14.2.2000 and subsequently amended vide S.O. 1046(E), dated 22.11.2000, S.O. 1088(E), dated 11.10.2002, S.O. 1569 (E), dated 19.09.2006 and S.O. 50 (E) dated 11.01.2010 under the Environment (Protection) Act, 1986.) Ambient Air Quality Standards in respect of Noise)

TABLE – I  
Proposed Sewage Treatment need to be designed based on the following Parameters

S. No	Parameter	Incoming sewage	Desired sewage discharge standard
A	pH	6.5 -9	5.5 -9
B	BOD	250-450	10
C	TSS	150– 400	20
D	COD	300-500	50
E	Fecal Coli form[MPN/ 100 ml]	-	<230
F	Nitrogen Total	40-100	10
G	Phosphorus Total (For Discharge into ponds lakes)	5-10	1.0

SEPTIC TANK SIZE -  
TABLE - II  
RECOMMENDED SIZES OF SEPTIC TANKS FOR 5-20 USERS

No. of users	Length	Breadth	Liquid depth (Cleaning interval of)	
			1 year	2 year
	M	M	M	m
05	1.5	0.75	1.0	1.05
10	2.0	0.90	1.0	1.40
15	2.0	0.90	1.3	2.00
20	2.3	1.10	1.3	1.80

NOTES:

1. The capacities are recommended on the assumption that discharges from only WC will be treated in the septic tank.
2. A provision of 300 mm should be made for free board.
3. The sizes of septic tanks are based on certain assumptions, while choosing the size of septic tank exact calculation shall be made.

**TABLE - III**  
**RECOMMENDED SIZES OF SEPTIC TANKS FOR RESIDENTIAL COLONIES**

No. of users	Length M	Breadth M	Liquid depth (Cleaning interval of)	
			1 year M	2 year m
050	05.0	2.0	1.0	1.24
100	07.5	2.65	1.0	1.24
150	10.0	3.0	1.0	1.24
200	12.0	3.3	1.0	1.24
300	15.0	4.0	1.0	1.24

NOTES:

1. A provision of 300 mm should be made for free board.
2. The sizes of the septic tank are based on certain assumptions while choosing the size of septic tank, exact calculation shall be made.
3. For population over 100, the tank may be divided into independent parallel chambers for ease of maintenance and cleaning.

**TABLE - IV**  
**RECOMMENDED SIZES OF SEPTIC TANKS FOR HOSTEL AND BOARDING SCHOOLS**

No. of users	Length M	Breadth M	Liquid depth (D) for stated Intervals of sludge withdrawal	
			Once in a year M	Once in 2 year m
50	5.0	1.6	1.3	1.4
100	5.7	2.1	1.4	1.7
150	7.7	2.4	1.4	1.7
200	8.9	2.7	1.4	1.7
300	10.7	3.3	1.4	1.7

NOTES:

- 1- A provision of 300 mm should be made for freeboard.
- 2- The sizes of the septic tank are based on certain assumptions while choosing the size of septic tank exact calculation shall be made.
- 3- For population over 100, the tank may be divided into independent parallel chambers for ease of maintenance and cleaning.

STP (Sewage Treatment Plant) – In the Indian Environmental and Climatic Conditions, De-Centralized Sewage Treatment Plants are designed and installed based on depending on End Usage Applications. De-Centralized STP offers Added Advantages like –

- Minimum Turn Around Time for Quick Deploy ability
- Ease of Installation and Commissioning
- Less Treatment Cost /KLD
- Reduces the Cost of Sewerage and Energy consumed in Pumping to designated City STP.
- Ease of Maintenance and Monitoring
- Effluent can be Reclaimed and Reused for the Location specific End Usage Application.
- Minimum Civil Construction

#### Typical Sewage Treatment Scheme

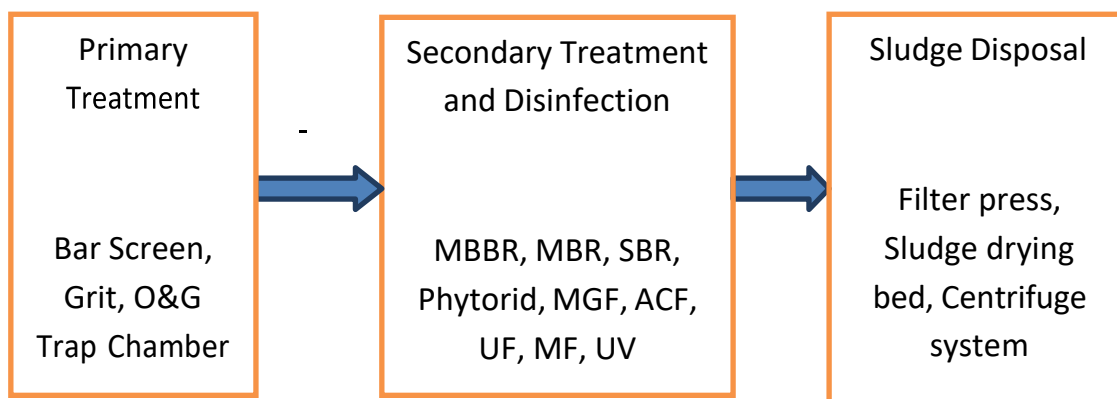


TABLE - V

Relationship between USER and KLD for STP -

Type of Building	Per Capita Load	Example		(LPD) Liter per day	KLD (Kilo liter per day )
For Residential Building	135L/PERSON	100 flats, consider 5 person in each flat	100 X 5 X135	67500	67.5

TABLE - VI

Typical Water Requirement/Supply across various END USERS -

S. No.	Description	Tentative Water Requirement
a.	Office	45 lpcd (liter per capita per day)
b.	Factories –Where Bathrooms are provided w/o Bathrooms	45 lpcd 30 lpcd
c.	Boarding Schools	135 lpcd
d.	Day Schools/Colleges	45 lpcd
e.	Hostels	135 lpcd

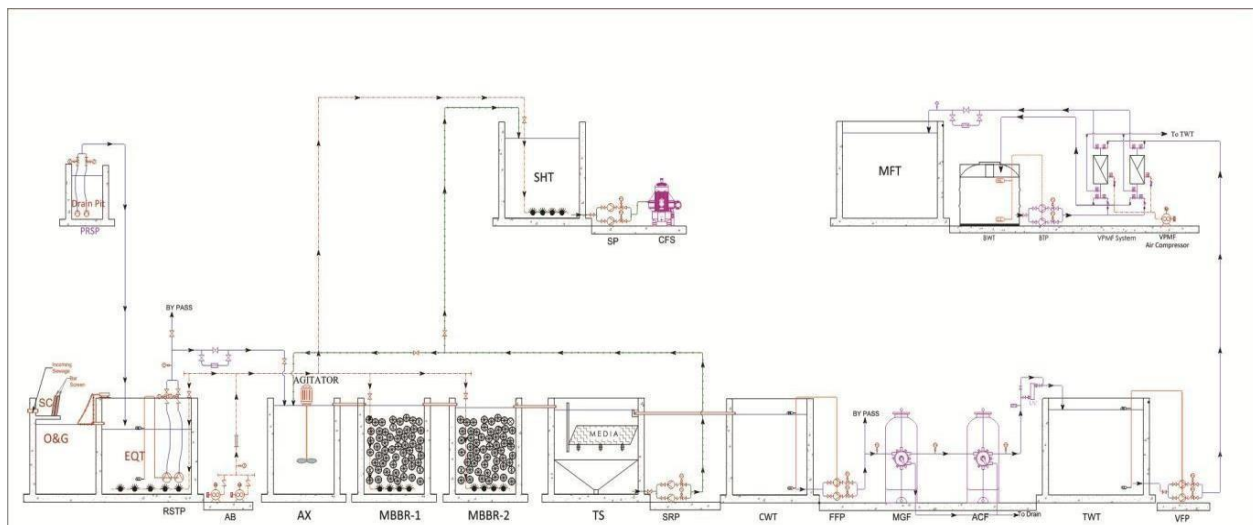
- f. Hotels
- g. Restaurants

180 l/bed  
70 l/seat

MBBR (Moving Bed Bio Reactor) –

Sewage from the collection tank is received to Equalization Tank (EQT) for dampening of flow variation and to equalize the concentration after passing through fine and coarse screen with suitable lifting arrangement. It shall be feasible to take out the screens from the chamber for periodical cleaning. Oil and grease trap air shall be supplied in EQT by means of diffused aeration to keep the sewage in suspension.

MBBR reactor for the biodegradation of dissolved organics by biomass attached on the surface of specific synthetic media (suitable capacity as per manufacturer recommendation). Air blowers Capable of delivering of free air at minimum 0.37 kg/cm<sup>2</sup> driven through “V” belt or directly coupled through flexible coupling to a TEFC motor of suitable HP, 50 cycles a/c supply .The biodegraded effluent from MBBR shall be let in to a Secondary Clarifier (tube/lamella settling media to be installed in Secondary tube/lamella Settler tank along with suitable sludge removal arrangement either by pumps) for separation of scoured bio-film.



Flow Schematic for Sewage Treatment Plant

List Of Electromechanical Unit			Legend	
Mark	Description	Unit	Mark	Description
RSTP	Raw Sewage Transfer Pump	2 No's	---	Air Line
FFP	Filter Feed Pump	2 No's	---	Sludge Line
PRSP	Plant Room Sump Pump	2 No's	---	Effluent Line
TVWTP	Treated Water Transfer Pump	2 No's	----	Water Level
AB	Air Blower	2 No's	⊗	Butterfly Valve
SRP	Sludge Recycling Pump	2 No's	⊘	Non Return Valve
MGF	Multigrade Filter	1 No	⊕	Pressure Gauge
ACF	Activated Carbon Filter	1 No	⊙	Pump
SP	Screw Pump	2 No's	⊗	Air Blower
CFS	Centrifuge System	1 No	⊕	Ball Valve
UV	Ultra Violet System	1 No	⊖	High Level
VPMF	VPMF Feed Pump	1 Set	⊖	Low Level
VPMFBP	VPMF Backwash Pump	2 No's	⊖	Air Rota Meter
HDPE	HDPE Backwash Tank	1 No	⊖	

List Of Civil Unit	
Mark	Description
SC	Screen Chamber
O&G	Oil & Grease Trap
EQT	Equalization Tank
AX	Anoxic Tank
MBBR-1	Moving Bed Bio Reactor-1
MBBR-2	Moving Bed Bio Reactor-2
TS	Tube Settler
CWT	Clear Water Tank
TWT	Treated Water Tank
MFWT	Micro Filtration Water Tank
SHT	Sludge Holding Tank

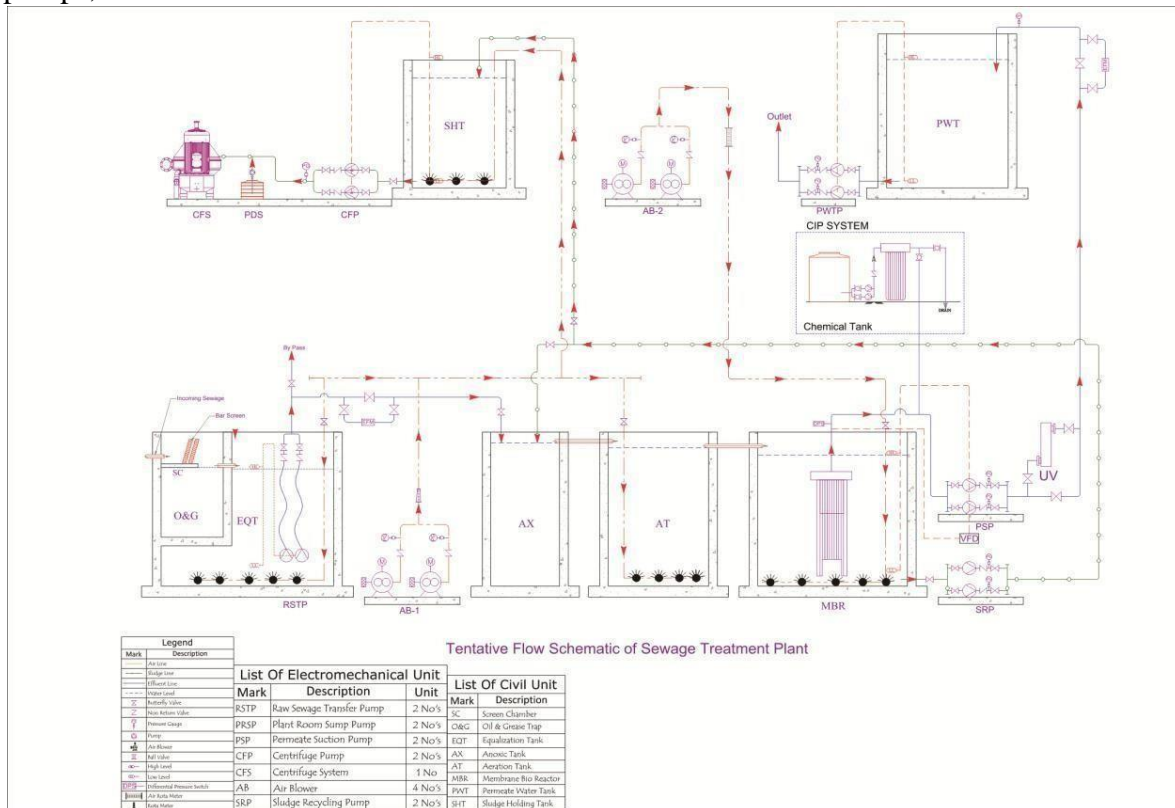
**MBR (Membrane Bio reactor) –**

Membrane = A thin sheet of natural or synthetic material that is permeable to substances in solution and Bio Reactor = Reactors for Biological treatment.

Sewage from the collection tank is received to equalization tank for dampening of flow variation and to equalize the concentration after passing through fine and coarse screens with suitable lifting arrangement. It should be feasible to take out the screens from the chamber for periodical cleaning and oil and grease, trap along with mechanically pre-screened wastewater-automatic fine screen with 3mm pore size than sewage treated biologically and separated from the activated sludge by ultra filtration plate membranes.

The air-purged sewage from equalization tank shall be pumped (non clogging type pumps, having CI casing CI impeller & CI Shaft complete with all accessories, motor of required capacity). Delivery header with isolation valve, pressure gauge on delivery line with isolation cock level controller with wiring to control the level of sump automatically. Pump shall have following duty, min Head = 12 Mtr, anoxic tank. Air blowers capable of delivering free air at min 0.37 kg/cm<sup>2</sup> driven through “V” belt or directly coupled through flexible coupling to a TEFC motor of suitable HP .The MBR system is a combination of biological wastewater treatment and high-efficient solids/liquid separation.

The surplus sludge removed from the filter chambers of the MBR system has a high concentration of approx. 1– 1.5 % MLSS (compared to 0.3 – 0.5 % MLSS achieved by conventional biological systems). This is a surplus sludge reduction of more than 50 %. Significantly reduced investment and operating costs for sludge thickening are therefore another positive aspect. . Instrument for the auto operation of system and safety of MBR modules, electro-magnetic flow meter of 40 mm at the sewage inlet and outlet of membrane suction pump of suitable size, pH meter at membrane suction pump outlet for measurement of pH, differential pressure switch for pressure alarm high and low, flow switch for flow alarm high and low, online turbidity meter for checking the health of membrane at the outlet of membrane suction pump, online rota meter for checking the air flow to the MBR module, VFD for permeate pumps, VFD & DO sensor for air blower.

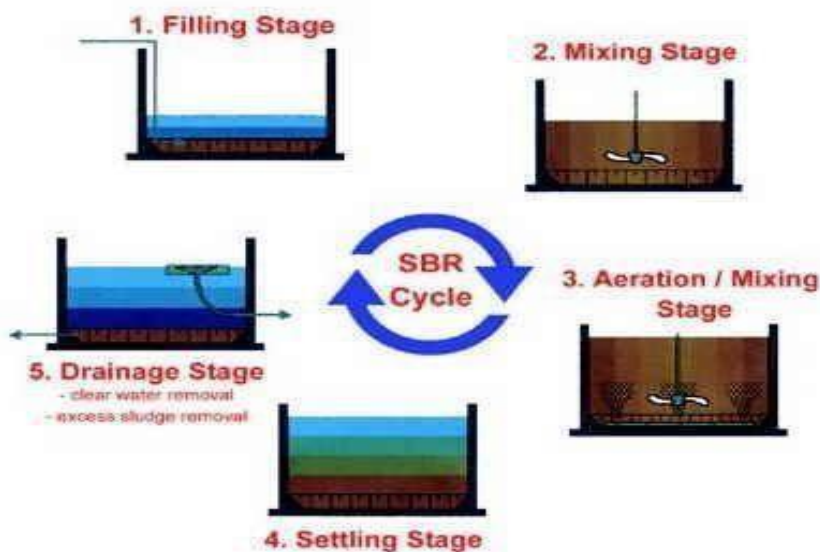




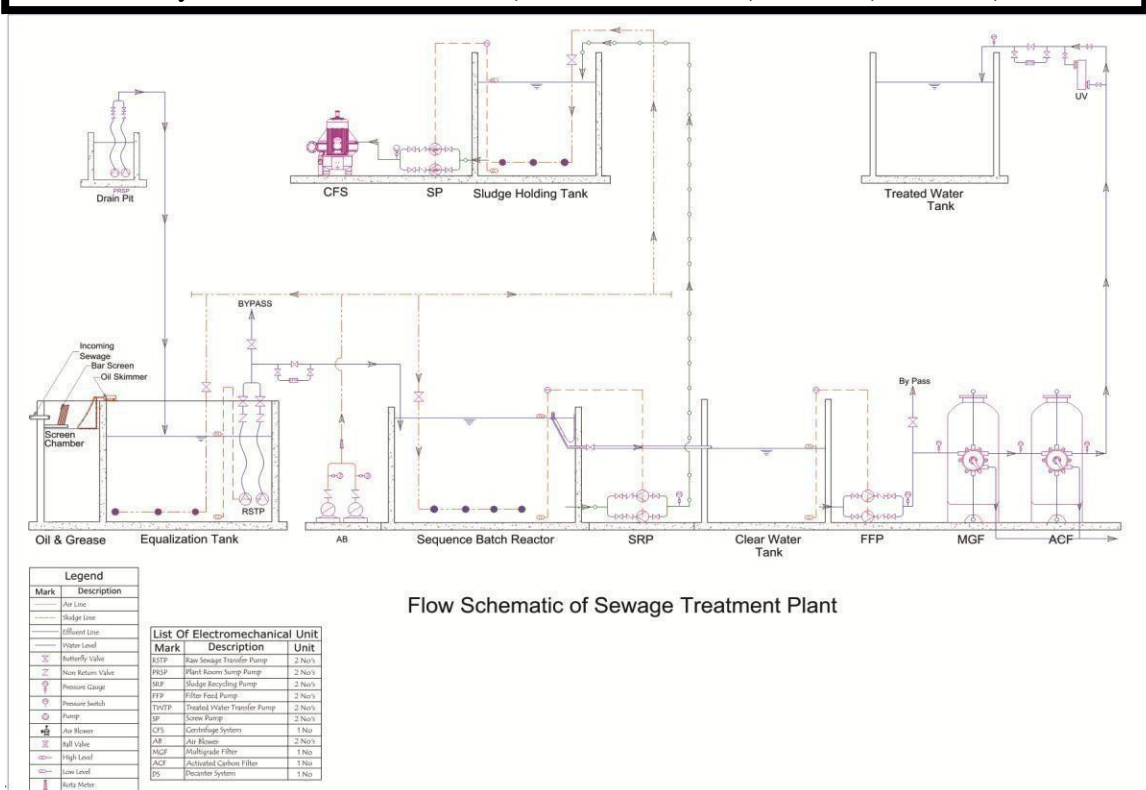
## SBR (Sequential Batch Reactor) –

The process operates on the continuous inflow and batch outflow principle. The phases of aeration, settling, decantation occur sequentially and are controlled by PLC. The tank is divided into main aeration & settler tank.

The sewage flows continuously into main aeration tank, which acts as a biological selector enhancing the growth of bacteria. Sewage from collection tank flows through openings at the bottom of the baffle wall and into the main aeration tank where BOD removal and nitrification occur. After aeration phase, sludge separation occurs in the settling phase. After settling, the clear water is removed. De-nitrification occurs during anoxic periods of settling and decants phases. The sludge is taken during decant phase.



## Process Cycles - Anoxic Fill, Aerated Fill, React, Settle, Decant.



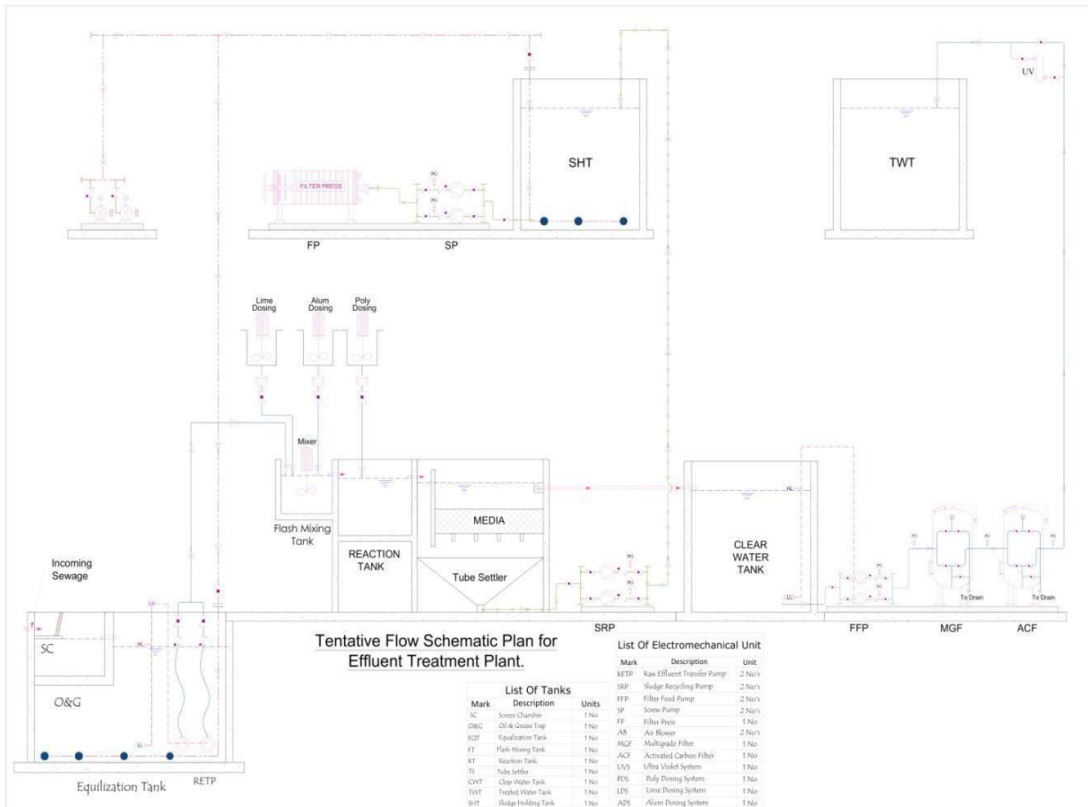
ETP (Effluent Treatment Plant) –

Effluent may contain large variety of potentially hazardous components including, microbiological pathogens, radioactive isotopes, disinfectants, sterilizant, drugs and their metabolites, chemical compounds, heavy metals and pharmaceuticals etc., at high concentrations.

The raw effluent will be first passed through a bar screen chamber where any extraneous/floating matter would be screened & trapped. Subsequently the raw effluent water shall be collected in oil & grease chamber wherein the floating oil shall be separated.

Acid dosing (depend upon capacity of plan as per design) since the effluent generated is mostly alkaline in nature an appropriate amount of acid is dosed for neutralizing the same in equalization tank. The effluent would then be collected in a receiving/equalization tank where the variations in flow and characteristics are dampened, which otherwise can lead to operational problems and moreover it allows a constant flow rate downstream. Flash Mixer is a chamber in which coagulants and other chemicals are blended with raw water prior to flocculation. The chemical and water mixture is vigorously agitated within the chamber resulting in almost instantaneous mixing. This tank should have 1-5 min of detention time with suitable velocity gradient.

Tube/Lamella Settler shall be provided for the effluent passed from flocculation tank along



with suspended solids to settle. The settled solids shall be recycled back to aeration tank as per requirement and excess biomass shall be transferred to sludge dewatering system.

**Bar screen:** This is the first unit of the plant in which large or floating materials in the sewage gets arrested and blockage or choking of the downstream equipments can be avoided.

Set of (SS304 - suitable for handling peak flow of raw sewage into the equalization tank) coarse and fine bar screen (stainless steel perforated corrugated screen) consisting of 1<sup>st</sup> screen 10 mm and 2<sup>nd</sup> screen, 03 mm manually punched holes (In MBR technology 3<sup>rd</sup> screen 03 mm manually punched holes followed by automatic type fine screen, 03 mm perforation screen without automatic self cleaning system) provide in bar screen chamber/tank to remove the large sized particles present in the sewage water associated with suitable SS angle/channel/flats of minimum 06 mm thickness mounted inside the bar screen chamber at an inclination. Bar rack fabricated from SS bars shall be provided to cover the width of the screen chamber with a racking arm for manual operation. Screen sizes are depends on the KLD.

**Oil, grease trap and grit removal system -** Oil & grease trap is provided after the bar screen, where free floating oil is arrested prior to entry in the plant. Accumulated oil will be removed periodically and disposed of properly. Electrically operated MOP/Tube/Belt, corrosion resistance static oil remover in oil/grease and grit chamber as per manufactures specification with suitable collection basin. Provide electronic type level indicator and controller for automatic operation of the system with high/low level alarm complete with auxiliary NO/NC contacts.

**Equalization cum collection tank –** To absorb variation in quantity and quality of sewage and to provide uniform flow at the downstream treatment process, a collection or equalization tank is provided.

**Raw sewage transfer pump –** To transfer sewage from equalisation tank to anoxic tank. Two numbers (one working and one standby) submersible/non submersible centrifugal type (pumping head 8-10 mtr.) raw sewage pumps with cutter version to pump sewage from equalization tank to anoxic tank Pumps should have vertex/non clogging impeller of SS304, coupled to suitable motors with SS 304 body with IP 68 protection. The pump shall have CI casing, CI impeller and SS shaft, TEFC induction motor suitable for 415+10% volt, 3 phase 50 cycle AC power supply, dry running protection NRV & vibration eliminators on delivery side of pumps. Capacity depends on KLD of plant.

**Air blower –** For supply of air into the diffusers. In STP two numbers (one working and one standby) twin type rotary acoustic type air blower complete with motors, pulleys, one piece rigid CI casing and side plates, silencer, base plate, anti-friction bearings, rotary oil sealing having horizontal configuration. Blower should be with acoustic enclosure to accommodate two number of twin lobe air blower, noise level reduction to the tune of 25-30% should be achieved, rubber gaskets should be provided to all doors and external joints to resist weathering air blower having TEFC motor of suitable HP suitable for 415+- 10% volts, 3 phase, 50 cycle A/C supply with all accessories complete in all respects. Flow rate depend on KLD of plant.

**Flash mixing tank with motor –** Provide vertical mounted gear box, motor and MSEP agitator

(Capacity depend upon KLD of plant) mechanism in the flash mixing tank. The mixture is agitated quickly and thoroughly in a process, called flash mixing. The chemicals introduced into the water stream will attract any very fine particles, such as silt, that will not readily settle or filter out and make them clump together. These larger, heavier formations are called flock.

Dosing system with reaction tank – Reaction tank (It is made as per vender's design based on capacity of ETP) in which Alum/Poly/Lime dosing are take place.

Dosing system consisting of one HDPE tank of required capacity (100 litres) with a positive displacement diaphragm dosing pump having variable flow rate of 0-6 lph. The motor (vertical mounted gear motor) shall be suitable for operation at 240 V/single phase/50 Hz. supply. The pump shall be supplied complete with necessary polypropylene piping, valve, strainers, and low level switch and injection fittings. The pump shall be speed and stroke control.

Anoxic tank- Anoxic tank is provided for de-nitrification process where nitrogen removal takes place without supply of oxygen in anoxic condition. Provide MSEP agitator (capacity as per KLD of plant) with gear box and motor to be provided in the anoxic tank along with its suitable mounting frame.

MBBR Media – This is the main section of the plant where degradation of organic pollutants with the help of aerobic micro-organism takes place. To provide higher surface area (not less than 25100SQMT/CUM) for micro-organism floating media MBBR media is provided on which micro-organism growth take place and to support the biomass in the aeration tank. Prefabricated MBBR systems (in two reactors) should be made of min 06 mm thickness of MS plate supported and strengthened with required supporting structure to make it a self supported structure and capable to take required water pressure, inner side coated with 03 mm FRP/anti corrosivecoating.

Diffuser system –For supply of fine air into the tank—EQT, MBBR and SHT. Coarse and fine bubble diffusers UPVC header, disc type, consisting of set of EPDM membranes, non clog type air dispersion system, SS304 clips, UPVC support pipe (10Kg/Sq cm pressure rating and minimum wall thickness 3.0 mm), UPVC fitting (like - elbows, tees, collars etc.) complete. Air dispersion grid shall be assembled in modular form so that they can be replaced / repaired easily from top plate form.

Tube/Lamella settler tank with tube/lamella media – Tube/Lamella media (as per design) to be installed in tube/lamella settler tank along with retainer plates and suitable sludge removal arrangement either by pumps or any other suitable arrangement. Capacities, length, width, depth of the media (depends upon KLD of plant) shall be enough for proper functioning of STP. Gravity overflow from the bioreactor is collected in the tube/lamella settler tank. In this settling tank, generated sludge from the bioreactor undergoes a gravity settling. Clear supernatant from settling tank will flow by gravity to a chlorine contact tank.

Chlorine dosing system with Clear water tank -

Chlorine dosing system —installed in clear water tank in which chlorine dosing to take place. This system consisting of one HDPE tank of required capacity (as per capacity of plant) with a positive displacement diaphragm dosing pump having variable flow rate of 0-6lph. The motor shall be suitable for operation at 240Vsingle phase50Hz supply. The pump shall be supplied complete with necessary polypropylene piping, valves, strainers, and low level switch and injection fittings and pump shall be speed & stroke control.

Plant Room with Sump Pump – Two numbers pumps (one working and one standby) to pump back to equalization tank over flown sewage from any tank collected in sump. Cost shall be inclusive of PVC flexible pipe 80 mm dia., rope for lifting pump from sump to outside. Capacity of flow rate depends on KLD of plant having pumping head 12-15mtr. All motors, valves, level indicator/controller, blowers, filter press, control panel etc. shall be providing in plant room.

Plant interconnecting piping and valves – All piping works for the STP consisting of interconnecting piping, valves within the battery limit of the sewage treatment plant MOC of the Piping: GI/MS/UPVC piping with valves. All inclusive necessary to finish the piping of STP. UPVC for sewage, filter water, backwash water, treated water and submerged air line, fittings, specials and other appurtenances, auxiliaries and accessories required as per process design and scope of work. All the piping, valves, specials shall be designed for peak flow. In case of pumping mains thrust blocks shall be provided whenever required. In case of buried pipes warning tapes shall be provided of the appropriate colours.

Manual/PLC based electrical control panel – It contains (all the knobs, switches, automation, timers of all nature associated with STP) suitable for 415V, 3 phase, 4 wire, and 50 Hz distribution system. The panel shall be wall stand mounted type; construction of panel should be 2 mm CRCA sheet with duly powder coated with 07 tank pre-treatment process. Separate earth bus shall be provided throughout the length of the panel. The incoming and the outgoing feeder breakers, switch fuse units, change over switches, indicating lamps, meters etc. shall be accommodated in a modular multi tier arrangement.

Incoming/outgoing feeder – depend upon the capacity of plant.

Cable laying with cable tray – Perforated type hot dip galvanized sheet steel cable tray with cable lying (used in connections as per vender's design) of different widths and delivered in standard lengths along with coupler plates and requisite number of hard wares.

Earthing systems - GI earth conductor of suitable sizes as per specification along the cable trenches or cable trays or fixing to walls or structures or below the slab, burries individually in paved/unpaved areas including supply of earthing strip and minor civil work finishing after laying of earthing strips etc. The installation shall include drilling of holes, connection and crimping of adequate lugs, clamping, hardware material, etc. All hardware shall be as per the MOC of earthing strip

Pressure gauges - Chemical sealed, glycerine filled, min dia. size 4 (one no). For each rotating equipments and filters with all necessary hardware, valves, drain valves, snubber etc. and pH meter at membrane suction pump outlet for measurement of pH and correction. Piping (CPVC for tank overflow pipeline and MS epoxy for air piping & pumped effluent riser in non submerged and SS304 for submerged air piping) and valving as per design.

Level switches - Float type level switches with three level set points except for sludge recirculation pumps. Each level switch should be with 01 NO and 01 NC contacts with weather proof enclose. Also provide differential pressure switch transmitter and pressure alarm high and low, flow switch for flow alarm high and low.

Flow Meter – To check the flow of sewage. One number electromagnetic flow meter shall be providing for treated water flow measurement. Electro-magnetic flow meter cum totalize at the sewage inlet and outlet of membrane suction pump of suitable size location inlet and outlet. Online rotameter for checking the air flow from air blower and for checking the air



flow to the MBR module. Air rotameter for biological air supply in MBBR, SBR tank and air scouring.

Sludge holding system— to dewater sludge.

Sludge recycling pump – Two numbers sludge recycling (one working and one standby) to pump the sludge from tube/lamella settler tank and from MBR tank (in MBR technology) and from SBR tank (in SBR technology) to sludge holding tank and transfer the sludge and recirculation of sludge to anoxic tank, necessary arrangement to be made in piping so that same pump can be use for both the purpose. The pump shall be horizontal centrifugal non- clog self priming pump with wetted parts in CI construction. . Capacity of flow rate depends on KLD of plant having pumping head 8-10mtr. The pump shall be coupled to the adequate H.P. electrical motor, mounted on a common base frame

Sludge feed screw pumps – Two numbers sludge feed pumps (one working and one standby) screw type to pump the sludge from sludge holding tank to filter press or feed secondary sludge to mechanical dewatering device like - filter press/ centrifuge /sludge drying bed. The pump shall be of mono block screw type press feed pump coupled to the adequate H.P. electrical motor, mounted on a common base frame of suitable capacity with CI body, SS- Impeller suitable for handling biological sludge

Filter press system – Plate and frame type mechanical sludge de-watering system, it should be with hydraulic closing mechanism. Filter press of suitable capacity depending upon as per design for handling sludge generated from the STP.

Centrifuge system/Bag filter- Basket type centrifuge system designed dia. for the sludge handling as per required capacity.

Sludge drying bed –A sludge drying bed is a common method utilized to dewater sludge via filtration and evaporation. Perforated pipes situated at the bottom of the bed are used to drain seepage water or filtrate. A reduction of about 35% or less in moisture content is expected after drying. A sludge drying bed usually consists of a bottom layer of gravel of uniform size over which is laid a bed of clean sand. Open jointed the under drains are laid in the gravel layer to provide positive drainage as the liquid passes through the sand and gravel.

Filter feed pump – Transfer water from clear water tank into filter vessels. Two numbers of centrifugal filter feed pumps (head 25-30mtrs- and capacity depend upon the KLD of plant - one working and one standby), CI body, and CI impeller motor, pressure gauge with isolation cock, isolation valve, NRV on delivery line. Isolation valve, stainer at suction. The pump shall be suitable for 415±10% volts 3 phase AC supply.

Multi grade sand filter (MGF) – Mild steel epoxy (MSEP) pressure type multi grade sand pressure filter (FRP) for filtration of suspended impurities in treated sewage water. The filter shall be fitted with inlet distribution and bottom collecting system. Filter shall include media such as - multi grade sand, shellac and complete set of valves, standard fittings like – cover, sampling cock, rinse drain (backwash) valve, air vent valve with piping, bolts, nuts and rubber gaskets, vacuum breaker, pressure gauge with needle valve and frontal pipe work done with GI 'B' class pipes. Flow rate depend upon KLD of plant and filtration velocity 18cumtr/hr/sqmtr. Filtering sand, anthracite, pebbles and gravel media.

Activated carbon filter (ACF) –Mild steel epoxy (MSEP) pressure type activated carbon filter (FRP) for filtration and removal of colour/odour in sewage water. The sizing/diameter of ACF shall be designed based on specific velocity. The vessel is painted externally and internally

with epoxy paint with primer with frontal piping & valves, back wash system & filter media like – activated carbon, multi grade sand and shellac etc. complete with standard fittings like cover, pressure gauge at inlet & outlet, sampling cock, rinse drain valve, air vent valve with piping, bolts, nuts & rubber gaskets. Flow rate depend upon KLD of plant and filtration velocity 14cumtr/hr/sqmtr. Filtering sand, anthracite, pebbles and gravel media.

Treated water transfer pump –

Two numbers of treated water transfer pumps (one working and one standby) to pump the Water from treated water tank to external drainage or outlet.

Treated water tank –

To collect treated water from activated carbon filter with inlet, outlet, and drain.

Micro and Ultra filtration system –Micro filtration and ultra filtration are both separation processes by which a contaminated liquid is passed through a semi permeable membrane that removes solids too large to fit through the membrane's pore size, yielding a purified liquid stream. In Micro filtration system piping and valves with all the required accessories & chemical cleaning system, complete in all respects. Module (fully back washable top to bottom filtration) including SS 304, Pneumatic Valve, PLC Electrical Panel, flow meter, compressor and all other accessories making the system complete.

The difference between microfiltration and ultra filtration is in the membrane pore size. Microfiltration pores are on the order 0.1 – 10 µm in size and are able to completely hold back bacteria and partially hold back viruses. Ultra filtration pores are on the order of 0.005 – 0.1 µm in size and can also completely remove viruses from the water.

Ultra violet system - UV dis-infection system for the complete disinfection of the finaleffluent of the following make or equal approved. The unit shall have over 99.9% bacterial reductions from inlet to outlet. The disinfection chamber shall be constructed of SS 316L on all weltd parts. The UV lamp shall be of low pressure mercury vapor type with hard glass enclosure, the sockets shall be water tight & vibration resistant. Flow rate depends upon the KLD of plant.

The UV unit shall have with reactor, cabinet housing, cabinet cooling, treatment chamber, electrical panel, temperature safety control, lamp out alert, UV radiometer along with UV monitoring system and UV monitoring readout panel. The UV dosage shall be > 60,000 uW Sec / sq.cm.

MBR Module – MBR module/package ultra filtration membranes with SS-304 skid for housing the membranes & air grid for scouring the sludge, permeate S.S.-304 piping and air blower etc. complete as required. Flux- 30 LMH, surface area (as per design) of each membrane. Membranes shall be reinforced hollow fiber capable of regular backwashing with and without cleaning chemicals to minimize pore fouling, respectively also having membrane lifting mechanism and membrane permeate pumps (1w+1s).

The material used for the manufacturing of the membrane in fibers chemically resistant to high concentrations of chlorine, low pH and high pH wash solutions for up to 24 hours.

Membrane clean-in-place (CIP) system- To clean the MBR membrane by back wash. Provided solution dosing pump with metering (0-100 LPH) and fixing of citric solution dosing pump with metering (0-50 LPH) comprising of required capacity FRP tank inlet/outlet connection, piping & valves along with pump for membrane cleaning system complete in all respects. Its design depends upon the KLD of plant.

Decanter – Decanter (as per design) for required capacity STP (in KLD) MOC- SS-304 (PLC controlled automatic decant mechanism) shall be floating type & decanter will be passed over the design top water level during aeration and settling phase, thereby eliminating any possibility of solid carry over during this phase.

SBR process shall work on batch mode in single step. It shall perform biological organic removal, nitrification, de-nitrification and phosphorous removal. It shall be capable of simultaneous sludge Stabilization.

The oxygen required shall be supplied through diffused aeration system with auto control of oxygen level in tank. The system shall be designed in such a way that growth of filamentous bacteria is restricted. Complete operation of SBR process including decanting rate, sludge recirculation and wasting of excess sludge shall controlled by PLC. Treated Sewage from SBR process units shall be collected in chlorination tank for its disinfection.

The maximum decanter loading at average dry water flow condition, shall not exceed 1.5 to 1.8 m<sup>3</sup>/m/min. The drive mechanism will be designed for continuous duty, variable speed mode of operation thereby producing a uniform effluent flow throughout the decant phase. The decanter drive will be configured such that the decanter weir reaches bottom water level at the end of the decant phase thereby maximizing settling time. Providing & fixing of motorized valve for decanters including required accessories (for decantation of water from SBR Tank) include timer controlled type system having required actuator and automation to decant treated water.

Constructed Wetland Based Technology -

Phytorid/constructed wetland technology is an up gradation of the existing technological concepts with respect to Indian climatic conditions.

This technology is based on principle of constructed wetland technology, these plant beds along the banks of the lake/river or as Sewage Treatment Plants would achieve waste water treatment by filtration, adsorption, nutrient uptake and decomposition.

Phytorid (developed by CSIR-National Environmental Engineering Research Institute (NEERI) that works on the principles of natural wetland) and Constructed wetland Technology is a self-sustaining technology and has been researched extensively at premium institution like IITs and implemented at multiple places across India and globally to treat the sewage effectively without any requirement of electricity except pumping from collection tank to constructed wetland bed which also can be avoided if the site terrain permit for the same.

Phytorid/ constructed wetland systems are based on natural treatment methods and have distinct advantages over conventional treatment plants. In this technology, treatment occurs via natural methods such as filtration, sedimentation, nutrient uptake by plants and microbial action in a constructed system which is filled with gravels. Specifically identified different species of plants which are known to have good nutrient uptake rates are planted in the gravel bed.

Phytorid/constructed wetland unit is essentially a civil structure. It comprises of screen chambers, collection chamber, Plant bed, treated water storage tank. The system includes screen cum sedimentation chamber and modified Plant beds. Solids are separated in the screen cum sedimentation chamber and broken down anaerobically. Wastewater from screen cum sedimentation chamber further flows into modified Plant bed by gravity. Plant bed is provided with different gradation of gravels/stone aggregate and hydrophytes.



The Plant bed is divided into compartments with baffles provided in such a way that the flow of wastewater is in sinusoidal manner. This unique design provides both the anaerobic and aerobic zones in the same Phytorid/ constructed wetland bed. Aerobic zone is near roots of the plants, as plants transports oxygen from air to the roots and In-turn into water for biochemical oxidation. The flow of wastewater is 6 inch below the top gravel layer and therefore no sewage is exposed thereby escaping mosquito problems. The plants in thePhytorid/ constructed wetland bed uptake nitrates and phosphates from the wastewater. Dueto several passages through gravel beds with both aerobic and anaerobic zones faecal coliformis also reduced by more than 99%. Phytorid/ constructed wetland do not require any electricity and skilled operators for its operation.

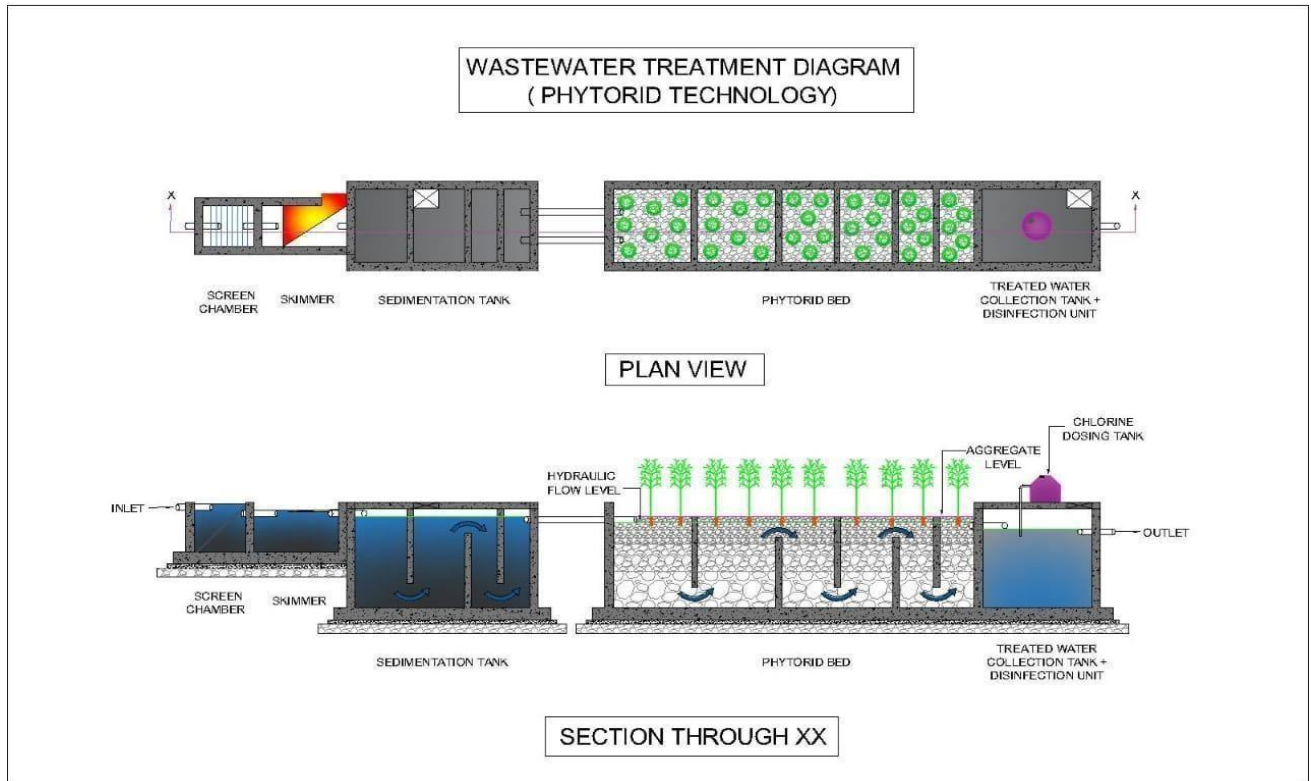
Collection-cum-Sedimentation tank –

The specified design of collection-cum-sedimentation system allows suspended solids to settle down in the tank and achieve simultaneous removal of BOD (by more than fifty per cent). This would require no pH adjustment and clarification system to remove settled solids if domestic wastewater treatment is being targeted.

Phytorid/constructed wetland chamber –

Phytorid/ constructed wetland bed comprises of gravel bed sown with wetland plants. The system is based on the specific natural “Wetlands plants” like Typh, Canna, etc. The plants in the Phytorid bed uptake nitrates and phosphates from the wastewater. Aerobic zone is near roots of the plants, as plants transports oxygen from air to the roots and in-turn into water for biochemical oxidation. Filling media i.e. the gravel bed serves the purpose of filtration.

Capacity of Plant (KLD)	Total Area required of phytorid technology (Sqm)
10	17.27
50	66.36
100	127.71
150	188.57
200	250.33
250	316.69
300	378.04
350	439.30
400	500.66
450	562.01
500	623.37
550	684.73
600	745.99
650	807.34
700	868.70



#### Use of Bio-culture in Treatment:

Phytoid/ constructed wetland is a natural non-conventional treatment phenomenon to treat the wastewater using plants and combined working of their root system in a designed ecosystem, along with the natural attenuation processes. Sewage itself has inherent bacteria's which have properties to form consortia that helps reduce Biological Oxygen Demand (BOD) when provided with particular condition. However, the quantity of these bacteria is not sufficient enough as well as these bacteria's are more or less anaerobic in nature due to the prevailing septic condition in sewage.

Anaerobic process usually being a very slow process; a Phytoid/ wetland system can't be dependent only on this process and existing bacteria as it will take a very long time for these bacteria to act on the required quality of purification of sewage.

This technology being a natural system, operation is mostly passive and requires least operator's intervention. Operational aspects include harvesting of the roots once in 6 months and loosening of the gravel after a year.

#### Types of plant species: -

A range of plants has shown their ability to breakdown wastewater contaminants. Some of the species are listed below:

Colocasia esculenta / Canna indica / Cyperus alternifolius / Yellow Cana / Red Cana / Pampas Grass / Cyperus Spp. / Spider Lily / Canna / Variegated / Typha spp. / Soft Rush / Bull Rush Spp. / Elephant Ear / Phragmites australis / Phragmites Australis / Typha Latifolia / Arundo donax / Calamagrostis / Scirpus Lacustris / Juncus ( Bulrush)

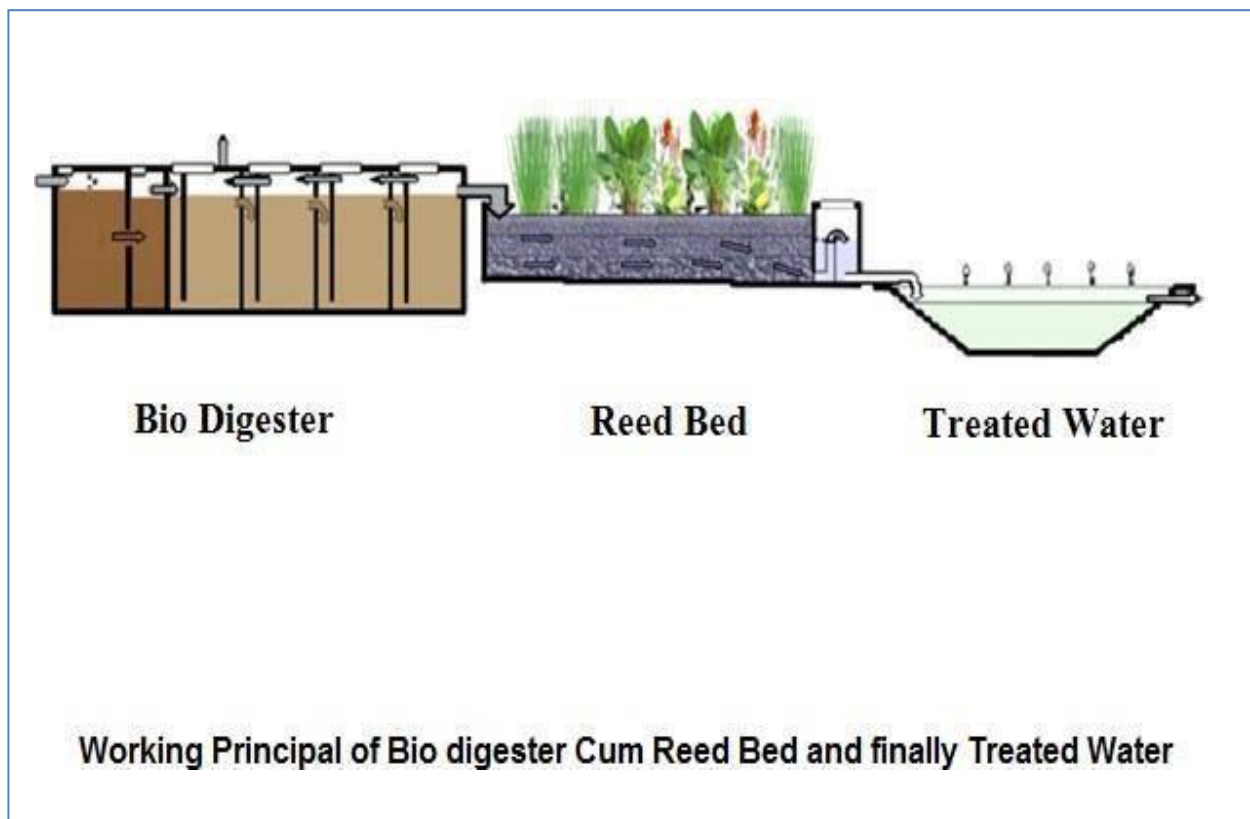
## BENEFITS OF IMPLEMENTING THE SYSTEM: -

- Negligible consumption of electric power.
- The technology is very simple in design and operation therefore needs no skilled manpower for operation and maintenance.
- Negligible sludge production
- No odour
- No application of chemicals for treatment process
- Lower costs of treating water
- Extra gardens and landscaping features not required for beautification

### Bio Digester Technology

DRDO based Bio Digester technology is a promising technology for conversion of fecal matter into water and methane gas as output. The technology uses anaerobic bacteria, developed by DRDO wing of ministry of defense, Government of India. Use Oil & Grease Trap for Separating Grease & Kitchen Waste from Water

Reed bed is a proven secondary treatment technology for combined grey water and black water. This technology is maintenance free. It uses available gradients in place of electrical or mechanical requirements and leads to zero carbon foot prints.



Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
30.1		Sewage Treatment Plant(STP)/Effluent Treatment Plant (ETP)	<p>Designing and preparing good for construction civil, mechanical and electrical shop drawings of conventional/package unit of a Sewage Treatment Plant(STP)/ Effluent Treatment Plant (ETP) as per manufacturer/vender's design and specification consisting of treatment units complete for meeting up to date/ target parameters of treated effluent conforming to Madhya Pradesh Pollution Control Board (MPPCB), MoEF GOI guidelines, National Green Tribunal guideline 30.4.2019 and technical specifications codes of practices as published by the Bureau of Indian Standard (BIS) and latest version of "Manual on Sewerage and Sewage Treatment" published by the Central Public Health And Environmental Engineering Organization (CPHEEO). The work shall include supplying, installing, testing and commissioning of electro-mechanical equipments, instruments, pipes, valves, pumps, and gauges etc. as per approved technical specifications, layout and drawing of STP/ETP.</p> <p>Most of the electro-mechanical unit will be placed below ground under road/greenarea/as per site condition, space available, equipment and pump room will be above the ground level and civil work RCC (M25) according to the approved shop drawings and direction of Engineer in charge. Civil work shall be paid separately.</p> <p>Rates are inclusive of cost of operation and maintenance (O&amp;M) for one year after completion of works which include periodical /monthly checking quality of treated sewage, checking of safety arrangements and routine maintenance of plant such as oiling, greasing, cleaning, operating, providing Consumable replacement of components within guarantee period, disposal of dried sludge and also ensuring safety against theft. The STP/ETP shall comprise of the units of required size as per detail process and hydraulic design.</p> <p>NOTE :- 1- If STP and ETP plant are situated in the same campus then only one O&amp;M</p>		

Item No.	Sub ItemNo.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<p>Contract shall be applicable.</p> <p>2- Treated water effluent testing shall be got done by the vender from Pollution Control Board (PCB) approved laboratory only covering parameters such as - BOD, COD, TSS, PH, O&amp;G, TKN, TP and E COLI etc.</p> <p>3- Main power supply with earthing up to main control panel of STP/ETP shall be provided by the owner/department. The electrical panel which will be supplied by the vender will also include all the required NO/NC contacts and provision for BMS connectivity.</p> <p>4- Detail specifications of components shall be as per manufacturer stipulation and preamble both.</p> <p>5- Tanks shall be made of MSFRP (mild steel fiber reinforced polymer/plastic)/HDPE (High Density Polyethylene)/FRP (Fiber reinforced plastic) anti corrosive in packaged unit.</p>		
	30.1.1	STP MBBR Conventional Technology	<p>Conventional MBBR STP Technology</p> <p>Primary Treatment –</p> <ul style="list-style-type: none"> <li>-Manual Bar Screen</li> <li>-Oil, Grease Trap and Grit Removal System</li> </ul> <p>Secondary Treatment –</p> <ul style="list-style-type: none"> <li>-Raw Sewage Transfer Pump (01set)</li> <li>- Air Blower (01set) and Diffuser System</li> <li>- Media</li> <li>-Tube Media/Lamella</li> <li>-Chlorine Dosing system with Chlorine Dosing Pump(01set)</li> <li>-Sump Pump (01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-Manual/PLC Based Electrical Control Panel</li> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray</li> <li>-Earthing Systems</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>-Pressure Gauges</li> <li>-Level Switches</li> <li>-Online Rota meter</li> <li>-Air Rota meter</li> <li>-Flow Meter</li> <li>-Filter Feed Pump (01set)</li> <li>-Multi Grade Sand Filter</li> <li>-Activated Carbon Filter</li> <li>-Micro Filtration system</li> <li>Sludge Handling System –</li> <li>-Sludge Recycling Pump (01set)</li> <li>-Sludge Feed Screw Pumps (01set)</li> <li>-Filter Press System</li> </ul>		
	30.1.1.1	50 KLD	50 KLD	each	2398521.00
	30.1.1.2	100 KLD	100 KLD	each	2910978.00
	30.1.1.3	150 KLD	150 KLD	each	3412593.00
	30.1.1.4	200 KLD	200 KLD	each	3795593.00
	30.1.1.5	250 KLD	250 KLD	each	4516459.00
	30.1.1.6	300 KLD	300 KLD	each	4978910.00
	30.1.1.7	400 KLD	400 KLD	each	5961113.00
	30.1.1.8	500 KLD	500 KLD	each	6152390.00
	30.1.2	STP MBBR Package Technology	Package MBBR STP Technology Primary treatment – <ul style="list-style-type: none"> <li>- Manual Bar Screen</li> <li>-Oil, Grease Trap and Grit Removal System</li> </ul> Secondary treatment – <ul style="list-style-type: none"> <li>-Raw Sewage Transfer Pump (01set)</li> <li>- Air Blower(01set) and Diffuser System</li> <li>- Anoxic Tank with Agitator</li> <li>- MBBR Tank with Media</li> <li>- Tube/Lamella settler tank with Tube Media</li> <li>-Clear water Tank With Chlorine Dosing system and Chlorine Dosing Pump(01set)</li> <li>-Sump Pump (01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-Manual/PLC Based Electrical Control Panel</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray</li> <li>-Earthing Systems</li> <li>-Pressure Gauges</li> <li>-Level Switches</li> <li>-Online Rota meter</li> <li>-Air Rota meter</li> <li>-Flow Meter</li> <li>-Filter Feed Pump (01set)</li> <li>-Multi Grade Sand Filter</li> <li>-Activated Carbon Filter</li> <li>-Micro Filtration system</li> <li>Sludge Handling System-</li> <li>-Sludge Recycling Pump (01set)</li> <li>-Sludge Feed Screw Pump (01set)</li> <li>-Filter Press System</li> </ul>		
	30.1.2.1	10KLD	10KLD	each	1968323.00
	30.1.2.2	30KLD	30KLD	each	2796448.00
	30.1.2.3	50 KLD	50 KLD	each	3025423.00
	30.1.2.4	100 KLD	100 KLD	each	4214291.00
	30.1.2.5	150 KLD	150 KLD	each	5263199.00
	30.1.2.6	200 KLD	200 KLD	each	6354750.00
	30.1.3	STP MBR Conventio nalTechn ology	Conventional MBR STP Technology Primary treatment – <ul style="list-style-type: none"> <li>- Manual Bar Screen</li> <li>-Oil, Grease Trap and Grit Removal System</li> </ul> Secondary treatment – <ul style="list-style-type: none"> <li>-Raw Sewage Transfer Pump (01set)</li> <li>- Air Blower (02set) and Diffuser System</li> <li>- Agitator</li> <li>-MBR Module</li> <li>-Membrane Clean-in-place (CIP) system</li> <li>-Chlorine Dosing system with Chlorine</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			Dosing Pump(01set)  -Permeate Suction and Transfer Pump (01set) -Sump Pump (01set) -Plant/Interconnecting Piping And Valves -Manual/PLC Based Electrical Control Panel -Incoming/Outgoing Feeder -Cable Laying With Cable Tray -Earthing Systems -Pressure Gauges -Level Switches -Online Rota meter -Air Rota meter -Flow Meter Sludge Handling System – -Sludge Recycling Pump (01set) -Sludge Feed Screw Pump (01set) -Filter Press System		
	30.1.3.1	50 KLD	50 KLD	each	2737457.00
	30.1.3.2	100 KLD	100 KLD	each	4627286.00
	30.1.3.3	150 KLD	150 KLD	each	5758429.00
	30.1.3.4	200 KLD	200 KLD	each	6736457.00
	30.1.3.5	250 KLD	250 KLD	each	7489171.00
	30.1.3.6	300 KLD	300 KLD	each	8527134.00
	30.1.3.7	400 KLD	400 KLD	each	9964529.00
	30.1.3.8	500 KLD	500 KLD	each	12407050.00
	30.1.4	STP MBR Package Technology	Package MBR STP Technology Primary treatment – - Manual Bar Screen -Oil, Grease Trap and Grit Removal System Secondary treatment – -Raw Sewage Transfer Pump (01set) -Air Blower (02set) and Diffuser System - Anoxic Tank with Agitator -Aeration tank		



Item No.	Sub ItemNo.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>- MBR tank with MBR Module</li> <li>-Membrane Clean-in-place (CIP) system</li> <li>-Chlorine Dosing Tank with Chlorine Dosing system and Pump(01set)</li> <li>-Permeate Suction and Transfer Pump (01set)</li> <li>-Sump Pump (01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-Manual/PLC Based Electrical Control Panel</li> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray</li> <li>-Earthing Systems</li> <li>-Pressure Gauges</li> <li>-Level Switches</li> <li>-Online Rota meter</li> <li>-Air Rota meter</li> <li>-Flow Meter</li> <li>Sludge Handling System-</li> <li>-Sludge Recycling Pump (01set)</li> <li>-Sludge Feed Screw Pump (01set)</li> <li>-Filter Press System</li> </ul>		
	30.1.4.1	30 KLD	30 KLD	each	3297700.00
	30.1.4.2	50 KLD	50 KLD	each	3651200.00
	30.1.4.3	100 KLD	100 KLD	each	5847367.00
	30.1.4.4	150 KLD	150 KLD	each	7663700.00
	30.1.4.5	200 KLD	200 KLD	each	9152683.00
	30.1.5	STP SBR Conventional Technology	Conventional SBR STP Technology Primary treatment – <ul style="list-style-type: none"> <li>-Manual Bar Screen</li> <li>-Oil, Grease Trap and Grit Removal System</li> </ul> Secondary treatment – <ul style="list-style-type: none"> <li>-Raw Sewage Transfer Pump (01set)</li> <li>-Air Blower (01set)</li> <li>-Decanting mechanism</li> <li>-Diffuser system</li> <li>-Chlorine Dosing system and Chlorine Dosing Pump(01set)</li> <li>-Sump Pump (01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-PLC Based Electrical Control Panel</li> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray</li> <li>-Earthing Systems</li> <li>-Pressure Gauges</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>-Level Switches</li> <li>-Online Rota meter</li> <li>-Air Rota meter</li> <li>-Flow Meter</li> <li>-Dissolved oxygen sensor and SS (Suspended solids sensor )</li> <li>-Filter Feed Pump (01set)</li> <li>-Multi Grade Sand Filter</li> <li>-Activated Carbon Filter</li> <li>Sludge Handling System -</li> <li>-Sludge Recycling Pump (01set)</li> <li>-Sludge Feed Screw Pump (01set)</li> <li>-Filter Press System</li> </ul>		
	30.1.5.1	50 KLD	50 KLD	each	2629971.00
	30.1.5.2	100 KLD	100 KLD	each	3070481.00
	30.1.5.3	150 KLD	150 KLD	each	3435509.00
	30.1.5.4	200 KLD	200 KLD	each	4157702.00
	30.1.5.5	250 KLD	250 KLD	each	5010374.00
	30.1.5.6	300 KLD	300 KLD	each	5352656.00
	30.1.5.7	400KLD	400KLD	each	6776663.00
	30.1.5.8	500 KLD	500 KLD	each	8610543.00
	30.1.6	STP SBR Package Technology	Package SBR STP Technology  Primary treatment – <ul style="list-style-type: none"> <li>- Manual Bar Screen</li> <li>-Oil, Grease Trap and Grit Removal System</li> </ul> Secondary treatment – <ul style="list-style-type: none"> <li>-Raw Sewage Transfer Pump (01set)</li> <li>-Air Blower (01set)</li> <li>-SBR tank with decanting mechanism (MS)</li> <li>-Diffuser System</li> <li>-Clear Water Tank With Chlorine Dosing system and Chlorine Dosing Pump(01set)</li> <li>-Sump Pump (01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-PLC Based Electrical Control Panel</li> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray- Earthing System</li> <li>-Pressure Gauges</li> </ul>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			<ul style="list-style-type: none"> <li>-Level Switches</li> <li>-Online Rota meter</li> <li>-Air Rota meter</li> <li>-Flow Meter</li> <li>-Filter Feed Pump (01set)</li> <li>-Multi Grade Sand Filter</li> <li>-Activated Carbon Filter</li> <li>Sludge Handling System –</li> <li>-“Sludge Recycling Pump (01set)</li> <li>-Sludge Feed Screw Pump (01set)</li> <li>-Filter Press System</li> </ul>		
	30.1.6.1	30 KLD	30 KLD	each	2280214.00
	30.1.6.2	50 KLD	50 KLD	each	3261445.00
	30.1.6.3	100 KLD	100 KLD	each	4575171.00
	30.1.6.4	150 KLD	150 KLD	each	6277751.00
	30.1.6.5	200 KLD	200 KLD	each	7048325.00
	30.1.7	ETP- Package Technology	<ul style="list-style-type: none"> <li>Primary treatment –</li> <li>- Manual bar screen</li> <li>- Oil, Grease Trap and Grit Removal System</li> <li>Secondary treatment –</li> <li>-Raw Sewage/Effluent Transfer Pump (01set)</li> <li>-Air blower (01set)</li> <li>-Flash Mixing tank with Motor</li> <li>-Alum/poly/lime Dosing System with Reaction Tank</li> <li>-Anoxic Tank with Agitator</li> <li>-Lamella Clarifier/Tube Settler Tank with Media</li> <li>-Diffuser System</li> <li>-Clear Water Tank with Chlorine Dosing System and pump(01set)</li> <li>-Sump Pump(01set)</li> <li>-Plant/Interconnecting Piping And Valves</li> <li>-Manual/PLC Based Electrical Control Panel</li> <li>-Incoming/Outgoing Feeder</li> <li>-Cable Laying With Cable Tray</li> <li>-Earthing Systems</li> <li>-Pressure Gauges</li> <li>-Level Switches</li> </ul>		

Item No.	Sub ItemNo.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			-Online Rota meter -Air Rota meter -Flow Meter -Filter Feed Pump (01set) -Multi Grade Sand Filter -Activated Carbon Filter Sludge Handling System - -Sludge Recycling Pump (01set) -Sludge Holding Tank -Sludge Feed Screw Pump (01set) -Filter Press System		
	30.1.7.1	5 KLD	5 KLD	each	1911829.00
	30.1.7.2	10 KLD	10 KLD	each	2013307.00
	30.1.7.3	20 KLD	20 KLD	each	2216235.00
	30.1.7.4	30KLD	30KLD	each	2431618.00
	30.1.7.5	40KLD	40KLD	each	2681893.00
	30.1.7.6	50 KLD	50 KLD	each	3035463.00
30.2		Ultra Violet System	Supply and fixing of ultra violet disinfection unit. The unit shall have over 99.9 %bacterial reduction from inlet to outlet. The disinfection chamber shall be constructed of SS 316L on all weltd parts. The UV lamp shall be of low pressure mercury vapor type with hard glass enclosure, the sockets shallbe water tight & vibration resistant. The unit shall be complete with temperature safety control, lamp out alert circuit & UV radiometer with 4 – 20 mA output. The UV unit shall have with reactor, cabinet housing, cabinet cooling, treatment chamber, electrical panel, temperature safety control, lamp out alert, UV radiometer along with UV monitoring system and UV monitoring readout panel. The lamps should be selected based upon the flow requirement of respective unit. As recommended by manufacturer complete in all respects.		
	30.2.1	30 KLD	30 KLD	each	41625.00
	30.2.2	50 KLD	50 KLD	each	61075.00
	30. 2.3	100 KLD	100 KLD	each	65250.00
	30. 2.4	150 KLD	150 KLD	each	73250.00
	30. 2.5	200 KLD	200 KLD	each	118000.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
	30. 2.6	250 KLD	250 KLD	each	123250.00
	30. 2.7	300 KLD	300 KLD	each	130250.00
	30.2.8	400 KLD	400 KLD	each	135800.00
	30.2.9	500 KLD	500 KLD	each	143700.00
30.3		O&M- STP&ET P (Non- Comprehensive )	<p>Operation and maintenance of Sewage Treatment Plant and Effluent Treatment Plant after successful commissioning as per item number 30.1 and sub item number 30.1.1, 30.1.2, 30.1.3, 30.1.4, 30.1.5, 30.1.6 and 30.1.7 for a period of one year, including cost of providing swift operators, periodical/monthly checking of the treated water quality and safety arrangement of plant, oiling, greasing, routine maintenance, necessary etc. O&amp;M shall include all cost involved in maintenance except for electricity, consumable, components (if to be changed for operation) and disposal of dried sludge.</p> <p>If STP and ETP plant in the same campus then only one O&amp;M contract shall be applicable. Treated water testing report shall be got done by the vender from PCB (Pollution Control Board) and approved laboratory. Parameters covered BOD, COD, TSS, PH, O&amp;G, TKN, TP and E COLI etc.</p>	per year	3,80,000.00
30.4		STP- Phytorid Bed/Constructed wetland	<p>STP With Phytorid Bed/Constructed wetland:- Designing and preparing good for construction (GFC) civil, mechanical and electrical drawings of phytorid/constructed wetland sewage treatment plant as per National Environmental Engineering Research Institute (NEERI) or specialized in constructed wetland technology, design, drawing and specification complete for meeting up to date design (target) parameters of treated effluent conforming to Madhya Pradesh Pollution Control Board (MPPCB), MoEF GOI guidelines, technical specifications codes of practices as published by the Bureau of Indian Standard (BIS) and latest version of “Manual on Sewerage and Sewage Treatment” published by the Central Public Health And Environmental Engineering Organization (CPHEEO).</p>		

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
			The work shall include supplying, installing, testing and commissioning of bio culture, plants (including replacement dead plants up to one year) etc. but cost of filter media, electro-mechanical equipments, instruments, pipes, valves and other civil works shall be paid separately, details specifications of components shall be as per preamble.  -Bar screen  -Oil, grease trap and grit removal system  -Bio culture  -Plants		
	30.4.1	10 KLD	10 KLD	each	135450.00
	30.4.2	50 KLD	50 KLD	each	197250.00
	30.4.3	100 KLD	100 KLD	each	274500.00
	30.4.4	150 KLD	150 KLD	each	351650.00
	30.4.5	200 KLD	200 KLD	each	428900.00
	30.4.6	250KLD	250 KLD	each	508150.00
	30.4.7	300 KLD	300 KLD	each	585400.00
	30.4.8	350KLD	350 KLD	each	662550.00
	30.4.9	400KLD	400 KLD	each	739800.00
	30.4.10	450KLD	450 KLD	each	825050.00
	30.4.11	500KLD	500 KLD	each	902300.00
	30.4.12	550KLD	550 KLD	each	989550.00
	30.4.13	600KLD	600 KLD	each	1066700.00
	30.4.14	650KLD	650 KLD	each	1143950.00
	30.4.15	700KLD	700 KLD	each	1221200.00

Item No.	Sub Item No.	Item Name	Description	Unit	Rate (in Rs.)
1	2	3	4	5	6
30.5		Bio culture	Supplying and spreading of bio culture at 0.1liter/sqm in phytoid bed/constructed wetland for additional requirement/maintenance purposes.	litre	6750.00
30.6		Plantation	Plantation (minimum 05 plants/sqm) in phytoid bed/ constructed wetland for replacement /maintenance purposes.	sqm	1000.00

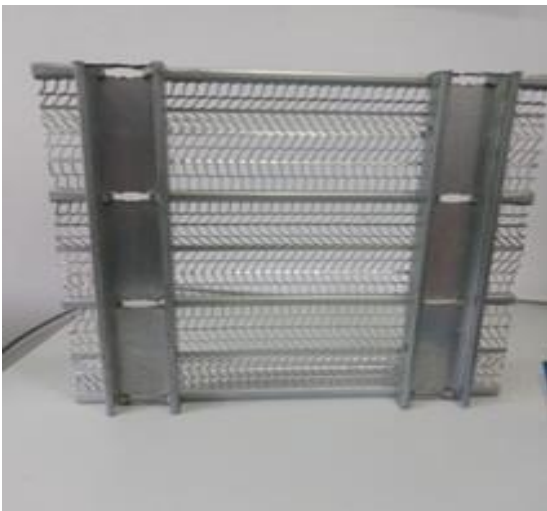
**CHAPTER – 31.0**  
**NEW TECHNOLOGY AND MATERIAL**



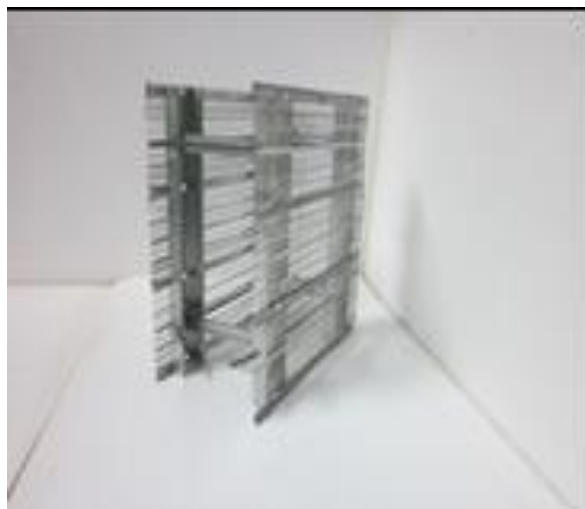
**PREAMBLE**  
**NEW TECHNOLOGIES AND MATERIAL**  
**(CHAPTER: 31.0)**

**About – Structural Stay-in-Place Formwork Systems:**

Structural Stay in place formwork system are used to build concrete load bearing monolithic wall structures like building , water tank retaining wall structure, drainage and all type of RCC structures. The formwork system comprises of two filtering grids (made from 0.42mm thick high galvanized sheet having 180gm/m<sup>2</sup> /275gm/m<sup>2</sup> zinc coating) reinforced by vertical stiffeners called ‘C’ channel made from 0.6mm Hot dip galvanized steel having 180 gm/m<sup>2</sup>/25gm/m<sup>2</sup> z8nc coating , c channel acts as equivalent to 8mm bar . All member of this has to confirm Hot dip galvanized steel in coil shall be as per IS 277:2003/ASTM A653/ASTM A653 M-00.The grids are connected by rebar which act as horizontal stiffeners and tie up with connector which act as a shear link. The grids on both faces act as sacrificial formwork in which concrete is poured in-situ. The vertical steel channels and horizontal steel bars act as steel reinforcement for load bearing wall. The connectors help to fold the formwork for easy transportation. Rebar are horizontal stiffeners placed at every 200/100mm centre to centre, these are 5mm Ø MS or galvanized bars and used as distribution bars. Structural design and analysis of the formwork shall be based on relevant Indian and International standards. The panel construction assembly shall be used for free standing walls when designed. Panels shall be tied up with scaffolding materials to maintain alignment. If necessary Additional reinforcement and cement plaster shall be provided as required by the design. Foundation shall be specifically designed in accordance with provisions given in IS 1904:2005. The details of construction methodology are available with BMPTC web site.



**Standard Single Panel**



**Standard Double Panel**

The incorporation of the openings make it possible to better fix the joinery to the structure ,the joinery is fixed with the aid of reinforced lugs or braces, with lengths such that the anchoring in the concrete extend beyond the vertical stiffening sections of the contiguous panel rim .

**EPS CORE PANEL SYSTEM**

Expanded Polystyrene (EPS) core Panel system is a modern, efficient, safe and economic construction system for the construction of buildings. These panels can be used both as load bearing as well as non-load bearing elements.

EPS core panel is a 3D panel consisting of 3- dimensional welded wire space frame provided with the polystyrene insulation core. Panel is placed in position and shotcrete on both the sides.

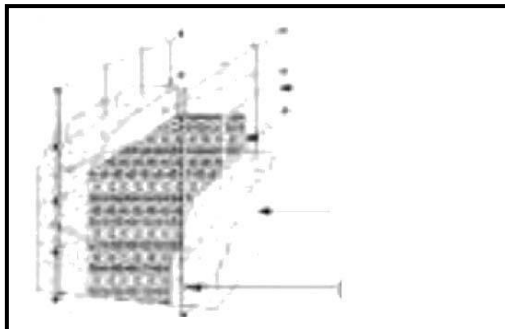
The EPS panels consist of a 3-dimensional welded wire space frame utilizing a truss concept for stress transfer and stiffness as shown in Fig. 1.1.

EPS panel includes welded reinforcing meshes of high strength wire, diagonal wire and self – extinguishing expanded polystyrene uncoated concrete, manufactured in the factory and shotcrete is applied to the panel

assembled at the construction site, which gives the bearing capacity of the structure. EPS panel after shotcrete has the following five components (as Fig. 1.1).

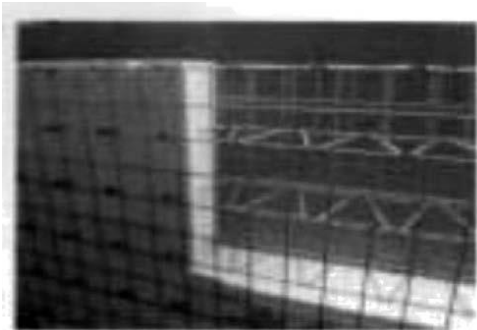
- i. The outer layer of shotcrete.
- ii. Welded reinforcing mesh of high wire.
- iii. The core of expanded polystyrene sheet.
- iv. Diagonal wire (stainless or galvanized wire).
- v. The inner layer of shotcrete.

The welded mesh fabric connected piercing polystyrene with truss of steel wire welded to the welded fabric at an angle. It gives a rigidity spatial structure and simultaneously prevents polystyrene core shifting. Individually welded internal strut wires of diagonals extend through the panel core between each surface. These galvanized strut wires are welded continuously in the required spacing so they form, with the welded wire fabric, into a triangulated truss system which greatly increases the panel strength.



**Fig. 1.1 : Typical cross section of wall panels.**

EPS panel is a versatile structural element designed for floors, walls, partitions, roof and stairs. Fig. 1.2 & Fig. 1.3 shows the welded reinforcing mesh of the EPS panels at different cross-sections.



**Fig. 1.2 : Reinforcing mesh expanded polystyrene core and diagonal wire.**



**Fig. 1.3 : Welded reinforcing mesh 3-D panel without expanded polystyrene core.**

The typical EPS panel is generally manufactured with dimensions of 1200 mm width, 3000 mm length and over all thickness range of 80-230 mm. The panels are finished at the site using minimum 30 mm thick shotcreting of cement & coarse sand in the ratio of 1:4 applied under pressure. The shotcreting coat encases the EPS Core with centrally placed steel welded wire mesh.

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
31.1		Phenol bonded Bamboowood flooring	Providing & fixing in position Phenol bonded Bamboowood flooring with planks of sizes 14 mm thick, 1800 mm length (minimum) and 130 mm wide (minimum), in approved colour, texture and finish, having Performance Appraisal Certificate (PAC) issued by Building Materials & Technology Promotion Council (BMTPC). The flooring shall be fixed with tongue and groove interlocking system, with underlayment of 4 mm thick expanded polyethylene foam sheets having density 40 kg/cum, over prepared surface with necessary quarter round planks of size 1900 mm x 18mm and door reducer of size 1900 mm x 44 mm, wherever required. The bamboowood planks shall have minimum density of 1000 Kg/cum & minimum Hardness 1000 kgf. with Eco friendly UV coating, all complete as per direction of the Engineer in-charge.	sqm	4297.00
31.2		Phenol bonded Bamboo wood wall skirting	Providing & fixing in position Phenol bonded Bamboo wood in wall skirting with planks of sizes 14 mm thick, 1900 mm length (minimum) and 85 mm wide (minimum), in approved colour, texture and finish, having Performance Appraisal Certificate (PAC) issued by Building Materials & Technology Promotion Council (BMTPC). The skirting shall be fixed with SS screws & rawl plugs, over underlayment of 4 mm thick, expanded polyethylene foam sheets having 40 kg/cum density over prepared surface. The bamboowood planks shall have minimum density of 1000 kg/cum & minimum Hardness 1000 kgf. with Eco friendly UV coating, all complete as per direction of the Engineer in-charge.	Sqm	4215.00

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
31.3		Phenol bonded Bomboowood wall cladding.	Providing & fixing in position Phenol bonded Bamboowood wall cladding at all height with planks of sizes 10 mm thick, 1800 mm length (minimum) and 130 mm wide (minimum), in approved colour, texture and finish, having Performance Appraisal Certificate (PAC) issued by Building Materials & Technology Promotion Council (BMTPC), with necesasary profiled edges fixed with 40 mm SS screws 5 nos in each tile to frame work made of second class teak wood of size 20 x 15 mm in centre of each tile and bottom and top of work height, 40 x 15 mm placed at ends of each tile. The cladding shall be laid over backlayment of 1.00 mm thick expanded polyethylene foam of density 40 kg/cum in two layers, first layer on wall surface before fixing wooden frame and second layer on frame under cladding. The bamboowood planks shall have minimum density of 1000 Kg/cum & minimum Hardness 1000 kgf. with Eco friendly UV coating, all complete as per direction of the Engineer in-charge.	sqm	4546.00
31.4		Phenol bonded Bomboowood Shutters	Providing & fixing in position Phenol bonded Bamboowood panelled or panelled and glazed shutters for doors windows, clerestorey windows with pre-molded 30mm thick planks, in approved colours, texture & finishe. It shall have 10mm wide, 25 mm deep groove to fit in panels. The bamboo wood shall have minimum density of 1000 Kg/cum, minimum Hardness 1000 kgf. All styles and rails shall have profiled interlocking system locked in place by bamboo pins, all complete as per direction of Engineer in charge. (The panelling will be paid for separately).	sqm	4248.22

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
31.5		Phenol bonded Bamboo wood panelling	Providing & fixing in position Phenol bonded Bamboo wood panelling of 10 mm thick, in 25 to 40 mm thick panelled or panelled & glazed shutters for doors, windows, clerestorey windows, in approved colour, texture & finish. The bamboowood planks shall have minimum density of 1000 Kg/cum & minimum Hardness 1000 Kgf. The panels shall have profiled interlocking system locked in place with bamboo pins all complete as per direction of the Engineer incharge. (area of opening for panel inserts excluding portion inside grooves or rebates to be measured)	sqm	2546.22
31.6		Phenol bonded Bamboo wood door frame	Providing & fixing in position 65 mm thick factory made door frame of Phenol bonded Bamboo wood (superior class, interior use), in approved colour, texture and finish. The bamboo wood shall have minimum density of 1000 Kg/cum, minimum hardness 1000 Kgf. The door frame shall have tenon & mortise interlocking system, to be fixed to the wall with 100 mm size G.I screws all a complete as per direction of Engineer-in charge.	sqm	197.00
31.7		Bamboo mat corrugated sheet (BMCS)	Providing, erecting, laying and fixing in position in 3.5 to 4 mm thick bamboo mat corrugated sheet (BMCS) as per IS: 15476-2004 in roofing with self drilling screws along with EPDM washers complete or with galvanized iron J or L hooks 8 mm dia G.I. plain and bitumen washers etc, all complete as per direction of Engineer-in-Charge.	sqm	4065.00
31.8		Bamboo mat ridge cap (BMRC)	Providing and fixing in position ridges of 3.5 to 4 mm thick bamboo mat ridge cap (BMRC) as per IS: 15476-2004 in roofing with self drilling screws along with EPDM washers complete or with galvanized iron J or L hooks 8 mm dia G.I. plain and bitumen washers etc, all complete as per direction of Engineerin-Charge	meter	3331.00

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
31.9		Phenol bonded Bamboo Mat board false ceiling	Providing and fixing at all height false ceiling of 4mm thick phenol bonded Bamboo Mat board (595x595mm) conforming to IS:13958-1994 including providing and fixing of frame work made of GI angle 25x25x0.4 mm thick all around suitably fixed to wall with the help of dash fastener and hanger frame (600x600 c/c) made GI slotted Tee having powder coating on bottom side (30x25x0.3 mm thick for main member & 25x25x0.3 mm for cross member) connected to ceiling with 2.64 mm GI wire and anchor fastener at every junction and also including cost of making openings for light fittings, grills, diffusers, cut outs made with frame of perimeter channels suitably fixed all complete as per direction of Engineer-in-charge.	sqm	2529.00
31.10		Bamboo Mat board for partition	Providing and fixing at Bamboo Mat board conforming to IS:13958-1994 for partition to frame by bucking or studding with screws etc. complete (Frames, backing or studding to be paid separately)		
	31.10.1	3 mm thickness	3 mm thickness	sqm	1847.00
	31.10.2	4 mm thickness	4 mm thickness	sqm	2173.00
	31.10.3	6 mm thickness	6 mm thickness	sqm	2672.00
	31.10.4	9 mm thickness	9 mm thickness	sqm	3175.00
	31.10.5	12 mm thickness	12 mm thickness	sqm	3810.00
31.11		Phenol bonded Bamboo Mat board all height wall panelling	Providing and fixing at all height wall panelling with phenol bonded Bamboo Mat board conforming to IS:13958-1994 including providing and fixing to frame work made of 50mm x 50mm hardwood plugs including cutting brick work and fixing in cement mortar and making good the wall etc. and also providing and fixing wooden moulded corner beading of triangular shape to the junction of panelling etc. with iron screws all complete as per direction of Engineer -in-Charge		

Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
	31.11.1	9 mm thickness	9 mm thickness	sqm	3427.00
	31.11.2	12 mm thickness	12 mm thickness	sqm	4063.00
31.12		Structural stay in place panels	Design, Supplying & Installation of factory made Structural stay in place panels of design specified thickness having width 1100 mm and height 3000 mm. Panel is composed of two filtering grids made of Net reinforced by vertical stiffeners called 'C' channel. The grids are connected by rebar act as horizontal stiffeners & connectors act as a shear link. Design specified concrete will be poured in between panels from the top of the wall and finally finished with 12 mm to 15 mm plaster. Net shall be made from 0.42 mm thick and 342 mm width 275 GSM galvanized plain steel with Net at 100 mm interval in horizontal directions ,mesh further strengthen by "C" channel made from 0.6 mm thick and 101 width 275 GSM galvanized plain steel with 8 mm hole at every 200 mm or 100 mm intervals along the length of the channel, combination of Net and "C" channel called single panels which remains on both face of the wall connected with the help of 5 mm dia 100 GSM galvanized wire at every 200 mm interval in vertical direction and connector made from 1.5 mm thick and 19 mm width 120 GSM galvanized plain steel placed at every 400 mm intervals in horizontal direction and 200 mm intervals in vertical direction in zig zag pattern. In wall elements structural stay in place double panels installed with "C" channel in vertical direction, Door and window lintel and bottom double panels with "C" in either vertical or horizontal direction. All corner covers with corner piece of "L" shape made with single panels. In slab, structural stay in place single panels used in replacement of shuttering plates supported by wood or steel runners with steel props. Both the outer faces of the panel shall be finished by applying the layer of 12 mm to 15 mm thick cement mortar 1:6 (1 cement: 6 coarse sand). Fixing operations of		



Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
			wall panels shall be completed in all respect as per drawings and specifications and under the overall direction of the Engineer-in-charge. Fixing of structural stay in place Panels of any thickness(110, 140, 160 mm) in walls in all floors using suitable scaffolding material as per instructions of Engineer-in-Charge, as per cutting drawings and structural drawings, in perfect line and plumb, above RCC plinth beam or Raft foundation and provide necessary lateral/ slanting support to keep the wall panel in safe position, providing & tieing of Reinforcement in all junctions, door and window lintels as per structural drawings and make ready for RCC work Including cost of shuttering material, scaffolding wherever required. (Cost of reinforcement, Reinforced Cement Concrete as per Structural details shall be paid separately).		
	31.12.1	Double Panel	Stay in Place Double Panel of Width 1100 mm, Height 3000 mm,		
	31.12.1.1	110 mm thickness	110 mm thickness	Sqm	3649.00
	31.12.1.2	140 mm thickness	140 mm thickness	Sqm	3661.00
	31.12.1.3	160 mm thickness	160 mm thickness	Sqm	3672.00
	31.12.1.4	200 mm thickness	200 mm thickness	Sqm	3706.00
	31.12.1.5	250 mm thickness	250 mm thickness	Sqm	3736.00
	31.12.2	Single Panel	Stay in Place single Panel Width 1100 mm, Height 3000 mm,	Sqm	1865.00
	31.12.3	'L' shape	Stay in Place corner piece of 'L' shape of Height 3000 mm		
	31.12.3.1	Width: (110+110) mm	Width: (110+110) mm	Sqm	2373.00
	31.12.3.2	Width: (140+140) mm	Width: (140+140) mm	Sqm	2538.00
	31.12.3.3	Width :(160+160) mm	Width :(160+160) mm	Sqm	2337.00
	31.12.3.4	Width :(200+200) mm	Width :(200+200) mm	Sqm	2218.00
	31.12.3.5	Width :(250+250) mm	Width :(250+250) mm	Sqm	2185.00



Item No.	Sub Item No.	Item name	Description	Unit	Rate (In Rs.)
1	2	3	4	5	6
31.13		Expanded Polystyrene (EPS) core Panel system	<p>Providing Expanded Polystyrene (EPS) core Panel system complete building elements, it is a modular panel composed of two electro welded galvanized steel meshes, reciprocally joined by and in the middle of which is a suitable shaped foam polystyrene sheet as per ASTM STD satisfying NBC Norms or having equivalent specification manufactured by ISO Certified company satisfying density, self extinguishing test as well as impact test, thermal insulation, termite proof, compressive strength satisfying IS 12436-1988 as per given ASTM Norms. E.P.S. panel are energy saving and comes under the Green Building concept and is also CFC free, (Expanded Polystyrene) EPS panel with salient features Heat resistant, Water resistant, Non-Toxic, Sound resistant, Self Extinguishing material for having panels Standard width of 1200mm standard length upto 5000mm. For Roofing panels having provision for hidden beam profile shape and generally used 50mm×50mm wiremesh with 2.5 mm thickness. With this panel as per your requirement you can create all architectural features and designs. This panel can be used for G+3 structure by minimizing column, beam, steel and labour. This product is also available in 100mm×100mm wiremesh, this will be useful for partition wall, fencing wall etc. EPS slab is having thickness of 50mm, 80mm, 100mm, 120mm and 150mm both side welded wiremesh have a gap of 12mm to 15mm either side, total thickness with wiremesh is approx. 50mm is 80mm and 80mm is 110mm etc. and after covering plaster 50mm will be 100mm and 80mm will be 130mm etc. These panels are tied with galvanized ancillaries and complete structure become a monolithic connected with each other and this structure is safe during earthquake and tested up to 7.2 Richter scale. All work done as per direction of Engineer in Charge.</p>		

<b>Item No.</b>	<b>Sub Item No.</b>	<b>Item name</b>	<b>Description</b>	<b>Unit</b>	<b>Rate (In Rs.)</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>
	31.13.1	Panel Without Load	EPS panel size 100mm including GI wiremesh bothside 2mm (Wiremesh Net 100×100mm)	Sqm	2972.00
	31.13.2	Panel Without Load	EPS panel size 100mm including GI wiremesh bothside 2mm (Wiremesh Net 100×100mm)	Sqm	3317.00
	31.13.3	Panel With Load	EPS panel size 100mm including GI wiremesh bothside 2.5mm (Wiremesh Net 50×50mm)	Sqm	3346.00
	31.13.4	Panel With Load	EPS panel size 150mm including GI wiremesh bothside 2.5mm (Wiremesh Net 50×50mm)	Sqm	3743.00
	31.13.5	Roofing Panel For Slab	EPS panel size 80mm including GI wiremesh bothside 2.5mm (Wiremesh Net 50×50mm)	Sqm	3321.00
	31.13.6	Roofing Panel For Slab	EPS panel size 100mm including GI wiremesh bothside 2.5mm (Wiremesh Net 50×50mm)	Sqm	3471.00
	31.13.7	Roofing Panel For Slab	EPS panel size 150mm including GI wiremesh bothside 2.5mm (Wiremesh Net 50×50mm)	Sqm	3885.00
	31.13.8		EPS panel 'C' Accessories for opening	Sqm	626.00

**ANNEXURE – 1 TO 7**

**Table-A**  
**Weight of Materials of Construction**

S.No.	Material	Unit			Weights	
		British	Metric	Kg./Metric Unit	Lbs British Unit	Kg/british Unit
1	2	3	4	5	6	7
1.	Cement	Cft	Cum.	1440	89.8422	40.752
2.	Steel					
	(a)Mild Steel	Cubic inch	Cu.cm.	0.0078	0.2830	0.12883
	(b) Cast Steel	-''-	-''-	0.0078	0.2830	0.1283
	(c) H.T. Steel	-''-	-''-	0.0078	0.2830	0.1283
3.	Stainless Steel	-''-	-''-	0.0078	0.2830	0.1283
4.	Lead	-''-	-''-	0.0113	0.4100	0.1850
5.	Plain cement concrete or R.C.C.	Cubic foot	Cum. m	2306 to 2400	144 to 150	66.5 to 68.0
6.	Stones					
	(a) Lime	Cubic foot	Cum m	2650	162	74.00
	(b) Sand	-''-	-''-	2800	174	79.2
7.	Stone masonry rubble	-''-	-''-	2100	131	59.43
8.	Bricks	-''-	-''-	1600	100	45.50
9.	Brick masonry	-''-	-''-	1920	100 to 120	45.50 to 54.33
10.	Timber	-''-	-''-	650 to 720	40.5 to 45.00	18.4 to 20.4
11.	Copper alloy (70:5:25)	Cubic Inch	Cubic Cm.	0.0101	0.3660	0.1660

**Table-B**  
**Useful Conversion Factors**

<i>S.No.</i>	<i>To convert</i>	<i>Into</i>	<i>Multiply by</i>	
1	Meters	Yards	1.09631	0.9144
2	Meters	Feet	0.28083	0.3048
3	Meters	Inches	39.37014	0.0254
4	Kilometers	Miles	0.62137	1.609344
5	Milimeters	Inches	0.03937	25.4
6	Square Kilometers (100 mects)	Squaare Miles	0.386101	2.58999
7	Square Meters	Square yard	1.19599	0.83613
8	Square Meters	Square Feet	10.7639	0.092903
9	Square Meters	Square inches	1550.00	0.00064516
10	Square Centimeters	Square inches	0.155	9.4516
11	Hectare (10000 Sq. Meters)	Acres	2.47105	0.404686
12	Cubic Meters	Cubic Feet	35.3147	0.028317
13	Cubic Meters	Gallons (Imp.)	219.969	0.0045609
14	Cubic Centimeters	Cubic inches	0.061024	16.3871
15	Liters	Gallons	0.219976	4.54596
16	Kilograms	Pounds (Avoirdupois)	2.20162	0.4535924
17	(100 Kgs.) Quintal	Maund	2.67923	0.373242
18	(100 Kgs.) Quintal	Hundred weight	1.9684	0.50802
19	Tonnes (Metric ton)	Tons (British)	0.9842	1.01605
20	Tonnes (Metric ton)	Maunds	26.7923	0.0373242
21	Kilometers per Hour	Miles per hour	0.62137	1.60934
22	Kilometers per Hour	Feet per second	0.91134	1.09728
23	Gram per Cubic Cm.	Pounds per Cu. Foot	62.428	0.0160185
24	Gram per Cubic Cm.	Pounds per Cu. Inch	0.0361273	27.6799
25	Gram per Litre	Pounds per Cu. Foot	0.062426	16.0189
26	Kilograms per Cum.	Pounds per Cu. Foot	0.0624	16.018
27	Kilograms per Litre	Pounds per Cu. Foot	62.426	0.0160189
28	Kilograms per Metre	Pounds per Foot	0.67179	14.8816
29	Tonne per Sqm.	Ton per Sq. inch	0.09143	10.937
30	Kilograms pe Sq. Cm	Pounds per Sq. inch	14.2233	0.07037
31	Kilograms pe Sq. Metre	Pounds per Sq. Foot	0.20482	4.8825
32	Kilograms Metre	Foot pounds	7.231	0.1382
33	Inch pounds	Kilogram centimeters	1.152	0.867962
34	Ton foot	Ton metre	0.3098	3.2278
35	Pounds per Cu. Ft.	Kg. per cu. M.	16.0185	0.06243

**Table-C**  
**Weight, Perimeter and sectional Area of Metric Steel Bars.**

Diameter (mm)	Weight per meter in kg	Perimeter Cm	Sectional Area of steel bars in Sq. Cms.
5	0.154	1.571	0.196
6	0.222	1.887	0.282
7	0.302	2.2	0.385
8	0.395	2.514	0.503
10	0.617	3.143	0.786
12	0.888	3.771	1.131
14	1.208	4.4	1.54
16	1.578	5.028	2.011
18	1.998	5.657	2.546
20	2.466	6.286	3.143
22	2.984	6.914	3.803
24	3.551	7.543	4.526
25	3.853	7.857	4.911
26	4.163	8.171	5.311
28	4.834	8.8	6.16
30	5.549	9.428	7.071
32	6.31	10.057	8.046
34	7.13	10.686	9.083
36	7.99	11.314	10.183
40	9.87	12.571	12.571
45	12.5	14.143	15.911
50	15.41	15.714	19.643

**Table-D**

**Weight of Flats per meter**

Width in mm.	Thickness in MM.														
	5	5.5	6	7	8	9	10	11	12	14	16	18	20	22	25
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>
12	0.471	0.518	0.565	0.659	0.753	0.848	0.942	1.036	1.130	1.319	1.507	1.695	1.884	2.072	2.355
16	0.628	0.691	0.753	0.879	1.005	1.130	1.256	1.381	1.507	1.759	2.009	2.261	2.512	2.763	3.140
20	0.785	0.863	0.942	1.099	1.256	1.413	1.570	1.727	1.884	2.198	2.512	2.826	3.140	3.454	3.925
25	0.981	1.079	1.177	1.374	1.570	1.766	1.962	2.158	2.355	2.747	3.140	3.532	3.924	4.317	4.906
32	1.256	1.381	1.507	1.758	2.009	2.360	2.512	2.763	3.014	3.516	4.019	4.521	5.023	5.526	6.279
40	1.570	1.727	1.884	2.198	2.512	2.826	3.140	3.453	3.768	4.395	5.023	5.651	6.279	6.907	7.849
50	1.962	2.158	2.355	2.747	3.140	3.532	3.924	4.317	4.709	5.494	6.279	7.064	7.849	8.634	9.811
63	2.472	2.720	2.967	3.461	3.956	4.450	4.945	5.439	5.934	6.923	7.912	8.901	9.890	10.879	12.362
80	3.139	3.454	3.768	4.395	5.023	5.651	6.279	6.907	7.535	8.791	10.470	11.303	12.585	13.814	15.398
100	3.924	4.317	4.709	5.494	6.279	7.064	7.849	8.634	9.419	10.989	12.558	14.128	15.698	17.268	19.622
125	4.905	5.396	5.887	6.868	7.849	8.830	9.811	10.792	11.773	13.736	15.698	17.660	19.622	21.585	24.520
160	6.275	6.907	7.536	8.791	10.047	11.303	12.558	13.814	15.07	17.582	20.093	22.605	25.117	27.628	31.396

**Appendix2**

**Quantity of materials required for various building item of works.**

<b>S.No.</b>	<b>Description of Items (Mortar)</b>	<b>Materials</b>	<b>Unit</b>	<b>Quantity per unit</b>
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
1	Cement Mortar (1.2)	Sand Cement	Cum. Cum.	1.00 Cum. 14.40 Bags
2	Cement Mortar (1.3)	Sand Cement	Cum. Cum.	1.00 Cum. 9.40 Bags
3	Cement Mortar (1.4)	Sand Cement	Cum. Cum.	1.00 Cum. 7.20 Bags
4	Cement Mortar (1.5)	Sand Cement	Cum. Cum.	1.00 Cum. 5.70 Bags
5	Cement Mortar (1.6)	Sand Cement	Cum. Cum.	1.00 Cum. 4.70 Bags
6	Cement Mortar (1.8)	Sand Cement	Cum. Cum.	1.00 Cum. 3.50 Bags
7	1 Cement : 1 Lime : 6 Sand	Sand Hydrated lime Cement	Cum. Cum. Cum.	1.0Cum. 0.166 cum. 4.74 Bags
8	1 Cement : 2 Lime : 9 Sand	Sand Hydrated lime Cement	Cum. Cum. Cum.	1.0Cum. 0.222 cum. 3.17 Bags
9	1 Cement : 3 Lime : 12 Sand	Sand Hydrated lime Cement	Cum. Cum. Cum.	1.00 Cum. 0.249 cum. 2.37 Bags
10	1 Cement : 1 Lime : 12 Surkhi : 18 Sand	Sand Hydrated lime Surkhi Cement	Cum. Cum. Cum. Cum.	1.00 Cum. 0.055 cum. 0.110 Cum. 1.57 Bags
11	1 Cement : 4 Lime : 6 Surkhi : 18 Sand	Sand Hydrated lime Surkhi Cement	Cum. Cum. Cum. Cum.	1.00 Cum. 0.220 cum. 0.330 Cum. 1.57 Bags
12	Lime Mortar 1:2	Sand Unslaked Lime	Cum. Cum.	1.00 cum. 0.50 cum.
13	Lime Mortar with R.O.H. Lime	Sand Hydrated lime	Cum. Cum.	1.00 cum. 0.33 cum.
14	Filling foundations: Rammed moorum and metal	Metal Moorum	Cum. Cum.	1.00 cum. 0.33 cum.
15	Rammed moorum and boulders	Boulders Moorum	Cum. Cum.	1.00 cum. 0.40 cum.
16	Lime Concrete	Metal Lime Mortar	Cum. Cum.	1.00 cum. 0.50 cum.
17	Brick Bat lime Concrete	Lime Mortar Brick Bats	Cum. Cum.	0.50 cum. 1.00 cum.



18	Cement Concrete 1:1:2	Metal Sand Cement	Cum. Cum. Cum.	0.775 cum. 0.387 cum. 11.15 Bags.
19	Cement Concrete 1:1 1\2:3	Metal Sand Cement	Cum. Cum. Cum.	0.856 cum. 0.428 cum. 8.20 Bags.
20	Cement Concrete 1:1:2	Metal Sand Cement	Cum. Cum. Cum.	0.810 cum. 0.540 cum. 7.75 Bags.
21	Cement Concrete 1:2:4	Metal Sand Cement	Cum. Cum. Cum.	0.880 cum. 0.450 cum. 6.35 Bags.
22	Cement Concrete 1:2½ :5	Metal Sand Cement	Cum. Cum. Cum.	0.905 cum. 0.452 cum. 5.20 Bags.
23	Cement Concrete 1:3:6	Metal Sand Cement	Cum. Cum. Cum.	0.906 cum. 0.453 cum. 4.35 Bags.
24	Cement Concrete 1:4:8	Metal Sand Cement	Cum. Cum. Cum.	0.960 cum. 0.480 cum. 3.45 Bags.
25	Cement Concrete 1:5:8	Metal Sand Cement	Cum. Cum. Cum.	0.85 cum. 0.530 cum. 3.20 Bags.
26	Cement Concrete 1:6:10	Metal Sand Cement	Cum. Cum. Cum.	0.900 cum. 0.540cum. 2.60 Bags.
27	Cement Concrete 1:8:15	Metal Sand Cement	Cum. Cum. Cum.	0.900 cum. 0.480 cum. 1.75 Bags.

**PLUM CEMENT CONCRETE**

28	Plum cement concrete 1:5:8 with 60% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.60 cum. 0.34 cum. 0.21 cum. 1.20 Bags.
29	Plum cement concrete 1:5:8 with 40% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.40 cum. 0.51 cum. 0.32cum. 1.85 Bags.
30	Plum cement concrete 1:5:8 with 25% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.25 cum. 0.64 cum. 0.40 cum. 2.40 Bags.
31	Plum cement concrete 1:4:8 with 60% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.60 cum. 0.34 cum. 0.17 cum. 1.20 Bags.

32	Plum cement concrete 1:4:8 with 40% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.40 cum. 0.51 cum. 0.26cum. 1.85 Bags.
33	Plum cement concrete 1:4:8 with 25% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.25 cum. 0.64 cum. 0.32cum. 2.40 Bags.
34	Plum cement concrete 1:3:6 with 60% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.60 cum. 0.36 cum. 0.18cum. 1.75 Bags.
35	Plum cement concrete 1:3:6 with 40% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.40 cum. 0.54 cum. 0.27 cum. 2.60 Bags.
36	Plum cement concrete 1:3:6 with 25% plum	Plum Metal Sand Cement	Cum. Cum. Cum. Cum.	0.25 cum. 0.67 cum. 0.34 cum. 3.55 Bags.

**MASONRY**

37	Random rubble masonry	Stones Mortar	Cum. Cum.	1.00 cum. 0.33 cum.
38	Coursed rubble masonry	Stones Mortar	Cum. Cum.	1.00 cum. 0.33 cum.
39	Fine ashlar Stone masonry	Stones Mortar	Cum. Cum.	1.00 cum. 0.12 cum.
40	Cut Stone masonry	Stones Mortar	Cum. Cum.	1.00 cum. 0.16 cum.
41	Cut Stone work for lintels beams etc.	Stones Mortar	Cum. Cum.	1.00 cum. 0.75 cum.
42	Brick Masonry	Bricks Mortar	Cum. Cum.	500 Nos. 0.75 cum.
43	Honey comb brick masonry	Bricks Mortar	Cum. Cum.	360 Nos. 0.05 cum.

**PLASTERING AND POINTING**

44	6mm. thick plastering	Mortar	100 sqm.	0.90 cum.
45	13mm. thick plastering	Mortar	100 sqm.	1.50 cum.
46	20mm. thick plastering	Mortar	100 sqm.	2.40 cum.
47	Neat Finishing	w.w. lime	100 sqm.	4.28 Bags
48	Neat cement plaster	Cement	100 sqm.	4.28 Bags
49	Rough cast cement plaster			
	(a)Base Coat	Mortar	100 sqm.	1.377 cum.
	(b)Rough cast mixture	Aggregate Sand Cement	100 sqm. 100 sqm. 100 sqm.	1.377 cum. 0.688 cum. 13.11 Bags
50	Pebble dashing cement rendering	Mortar Pebble	100 sqm. 100 sqm.	0.30 cum. 1.50 cum.
51	Sand faced plastering base coat 13 mm thick Finishing coat 8mm. thick Sand facing	Mortar Pebble	100 sqm. 100 sqm.	2.70 cum. 4.28 Bags.
52	Rubbing on brick work	Mortar	100 sqm.	0.60 cum.
53	Grooved or flush pointing			
	(a) Brick work	Mortar	100 sqm.	0.90 cum.
	(b) Stone work	Mortar	100 sqm.	0.45 cum.
54	Tuck pointing			
	(a) Brick work	Mortar	100 sqm.	0.90 cum.
	(b) Stone work	Mortar	100 sqm.	0.45 cum.
55	Raised Pointing to stone work	Mortar	100 sqm.	0.50 cum.
56	Flush Cum. raised pointing to stone work	Mortar	100 sqm.	0.40 cum.
57	Pointing to flag stone	Mortar	100 sqm.	0.30 cum.
58	Drip course			
	(a) 4 cm.x10 cm	Bricks Mortar	100 R.M. 100 R.M.	0.40 cum. 0.37 Cum.
	(b) 10cm. x10 cm.	Bricks Mortar	100 R.M. 100 R.M.	1.00 cum. 0.70 Cum.
59	25x20 mm. Projected Patta	Mortar	100 R.M.	0.075 cum.
60	25x25 mm. groove	Mortar	100 R.M.	0.12 cum.
61	Throating of chajja	Mortar	100 R.M.	0.06 cum.
62	20 mm. thick Architectural molding or cut back Plaster	Mortar	100 sqm.	3.00 cum.

**FLOORING**

63	Brick on edge paving with moorum or cement mortarbedding & Joint	Bricks Moorum Mortar	100 sqm. 100 sqm. 100 sqm.	10.00 cum. 5000 Nos. 4.50 cum.
	C.M. pointing for a above	Mortar	100 sqm.	0.90 cum.
64	Flag stone Flooring with moorum or mortar bedding	Flag Stone Moorum or mortar	100 sqm. 100 sqm.	120 sqm. 2.00 cum.
	C.M. pointing for a above	Mortar	100 sqm.	0.30 cum.
65	Machine Polished Red Stone slabs Flooring	Red Stone Slabs Mortar for Bedding Cement for Slurry	100 sqm. 100 sqm. 100 sqm.	120 sqm. 2.00 sqm. 8.50 cum.
66	15 C.M. thick masonry stone paving	Masonry Stone Moorum Mortar for Bedding and joints Mortar for Pointing	100 sqm. 100 sqm. 100 sqm.	15.00 cum. 7.00 cum. 0.45 cum.
67	20 C.M. thick masonry stone paving	Masonry Stone Moorum Mortar for Bedding and joints Mortar for Pointing	100 sqm. 100 sqm. 100 sqm.	20.00 cum. 8.60 cum. 0.45 cum.
68	25 to 30 C.M. thick grouted Pitching	Rubble Stones Mortar	Cum. Cum.	1.00 cum. 0.20 Cum.
69	I.T. Flooring 75 mm thick with C.C. 1:3:6	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	6.80 cum. 3.40 cum. 36.86 Bags
70	I.T. Flooring 75 mm thick with C.C. 1:2:4	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	6.60 cum. 3.40 cum. 51.84 Bags
71	I.T. Flooring 40 mm thick with C.C. 1:3:6	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	3.60 cum. 1.80 cum. 21.59 Bags
72	I.T. Flooring 40 mm thick with C.C. 1:2:4	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	3.50 cum. 1.80 cum. 29.55 Bags
73	I.T. Flooring 40 mm thick with C.C. 1:2:3	Metal Sand	100 sqm. 100 sqm.	3.24 cum. 2.16 cum.
		Cement	100 sqm.	35.12 Bags
74	I.T. Flooring 25 mm thick with C.C. 1:2:4	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	2.20 cum. 1.12 cum. 20.09 Bags
75	I.T. Flooring 25 mm thick with C.C. 1:2:3	Metal Sand Cement	100 sqm. 100 sqm. 100 sqm.	2.02 cum. 1.35 cum. 25.88 Bags
76	6 mm. thick mosaic topping with 40 mm thick under layer C.C. 1:2:4	Mosaic Chips Marble Power 12.5mm Metal Sand Cement	10 sqm. 10 sqm. 10 sqm. 10 sqm. 10 sqm.	108 Kg. 0.368 Bags 0.35 Cum. 0.18 Cum. 3.65 Bags

77	10 mm. thick mosaic topping with 40 mm thick under layer C.C. 1:2:4	Mosaic Chips Marble Power 12.5mm Metal Sand Cement	10 sqm. 10 sqm. 10 sqm. 10 sqm. 10 sqm.	180 Kg. 0.61 Bags 0.35 Cum. 0.18 Cum. 4.38 Bags
78	6 mm. thick mosaic or terrazo for dado/ skirting on 13 mm thick Plaster	Mosaic Chips Marble Power 12.5mm Metal Cement Topping	10 sqm. 10 sqm. 10 sqm. 10 sqm. 10 sqm.	108 Kg. 0.368 Bags 0.368 Cum. 0.15 Cum. 1.11 Bags
79	10 mm. thick mosaic or terrazo for dado/ skirting on 13 mm thick Plaster	Mosaic Chips Marble Power Mortar Cement for Topping	10 sqm. 10 sqm. 10 sqm. 10 sqm.	180 Kg. 0.61 Bags 0.15 Cum. 0.84 Bags
80	20 mm. thick precast coloured cement titles/mosaic/terra marble titles on 20 mm. thick bedding and cement slurry	Precast Title Mortar Cement for slurry and joint	10 sqm. 10 sqm. 10 sqm.	170 Nos. 0.24 cum. 1.72 bags
81	Laying Glazed ceramic tiles 152x152x6mm. on C.M. bedding	Ceramic Tile Mortar for Bedding Cement for Slurry	1 sqm. 1 sqm. 1 sqm.	48 Nos. 0.015 cum. 0.080 Bags
82	Laying Glazed ceramic tiles 108x1190x4mm. on C.M. bedding	Ceramic Tile Mortar for Bedding Cement for Slurry	1 sqm. 1 sqm. 1 sqm.	110 Nos. 0.015 cum. 0.080 Bags
83	Kotah/Ginno/Red sand for dado/Skirting over 13 mm thick plaster	Stones Mortar Cement for Slurry and joint	10 sqm. 10 sqm. 10 sqm.	11 sqm. 0.15 cum. 1.72 Bags
84	Kotah/Ginnor/Cuddapah stone Flooring over 20 mm thick mortar bedding	Stones Mortar Cement for Slurry and joint	10sqm. 10 sqm. 10 sqm.	11 sqm. 0.24 Cum. 1.72 Bags
85	Marble stone for flooring on 20 mm. thick mortar bedding	Marble Stones Mortar Cement for Slurry and joint	10sqm. 10 sqm. 10 sqm.	11 sqm. 0.24 Cum. 1.30 Bags
86	Marble stone for dado/skirting on 13 mm. thick plaster.	Marble Stones Mortar Cement for Slurry and joint	10 sqm. 10 sqm. 10 sqm.	11 sqm. 0.15 Cum. 1.30 Bags
87	Polished red stone slab for shelves etc.	Stone slab Mortar	1 sqm 1 sqm.	1.1 sqm. 0.025 bags.

**ROOFING**

88	Single wheel Tiling	Tiles Mortar	10 sqm 10 sqm	1300 Nos. 0.030 cum.
89	Double wheel Tiling	Tiles Mortar	10 sqm 10 sqm	2600 Nos. 0.060 cum.
90	Mangalore Pattern Tiling	Tiles Mortar Hip or Ridge	10 sqm 10 sqm	172 Nos. 0.096 cum.
91	Mangalore Pattern hip or Ridge Tiling	Tiles Mortar	10 sqm 10 sqm	92 Nos. 0.121 cum.
92	Cut stone slab roofing	Cut stone slab Mortar for Joints Mortar for pointing	1 cum. 1 cum. 1 cum.	1.00 cum. 0.20 cum. 0.04 cum.
93	Fixing 100 mm. thick precast R.C.C. Jali	Cement Sand	10 sqm. 10 sqm.	2.90 Bags 0.30 cum.
94	Fixing 40 mm. thick R.C.C. Jali	Cement Sand	10 sqm. 10 sqm.	1.62 Bags 0.15 cum.

**PAINTING WHITE WASHING AND DISTEMPERING**

95	White washing 3 coats	W.W. lime	10 sqm.	0.03 Qtl.
96	White washing 2 coats	W.W. lime	10 sqm.	0.02 Qtl.
97	White washing 1 coats	W.W. lime	10 sqm.	0.01 Qtl.
98	Colour washing	Add. Ramraj equal to 10% W.W. lime		
99	Chalk washing 3 coats	Chalk whitening	10 sqm.	0.03 Qtl.
100	Chalk washing 2 coats	Chalk whitening	10 sqm.	0.02 Qtl.
101	Chalk washing 1 coats	Chalk whitening	10 sqm.	0.01 Qtl.
102	Cement washing 3 coats	Cement	10 sqm.	3.21 kg.
103	Cement washing 2 coats	Cement	10 sqm.	2.14 kg.
104	Cement washing 1 coats	Cement	10 sqm.	1.07 kg.
105	Distempering washing 2 coat	Dry. Distempering	10 sqm.	1.00 kg
106	Distempering washing 1 coat	Dry. Distempering	10 sqm.	0.50 kg
107	Distemper	Distemper Primer	10 sqm.	0.81 Lit
108	Oil Bound Distempering 2 coat	Distemper	10 sqm.	1.50 kg.
109	Oil Bound Distempering 1 coat	Distemper	10 sqm.	0.75 kg.
110	Water Proofing cement paint 2 coats	W.P. cement paint	10 sqm.	3.00 Kg.
111	Water Proofing cement paint 1 coats	W.P. cement paint	10 sqm.	1.80 Kg.
112	Plaster Emulsion paint 2 coat	Plastic Emulsion paint	10 sqm.	1.21 Litr.
113	Plaster Emulsion paint 2 coat	Plastic Emulsion paint	10 sqm.	0.73 Litr.
114	Priming coat over steel and other metal surface with red oxide paint.	Ready mixed Red lead Paint	10 sqm.	0.90 Lit.

115	Priming coat with Zinc Chromite over steel and other surface.	Zinc Chromite Paint	10 sqm.	0.54 Lit.
116	Priming coat with wood pink primer	Primer	10 sqm.	0.90 Lit.
117	Priming coat with Aluminum brushing primer	Aluminum paint primer	10 sqm.	1.00 Lit.
118	Ready mixed primer coat on concrete/masonry/A.C./Plastered surface.	Ready mixed Primer	10 sqm.	0.84 Lit.
119	Priming coat with linseed oil on concrete/masonry etc.	Linseed Oil	10 sqm.	1.16 Lit.
120	Steel/concrete/masonry etc. surface 2 coats.	Enamel paint	10 sqm.	1.25 Lit.
121	Steel/concrete/masonry etc. surface 2 coats.	1 cost	10 sqm.	0.60 Lit.
122	Synthetic enamel painting on old steel/concrete/masonry etc. surface 2 coats.	enamel paint	10 sqm.	1.00 Lit.
123	Varnishing 2 cost on new wood work.	Varnish	10 sqm.	1.45 Lit.
124	Do. 1 cost on old wood work.	Varnish	10 sqm.	1.45 Lit.
125	Polishing with French polish on new wood work.	French polish	10 sqm.	1.60 Lit.
126	Do on old wood work.	French polish	10 sqm.	0.95 Lit.
127	Linseed oiling on new wood work	Linseed oil	10 sqm.	1.16 Lit.
128	Linseed oiling on old wood work	Linseed oil	10 sqm.	0.7 Lit.
129	Coal tarring 2 coat.	Coal tar Kerosen oil	10 sqm. 10 sqm.	2.80 Lit. 0.50 Lit.
130	Coal tarring 1 coat.	Coal tar Kerosen oil	10 sqm. 10 sqm.	1.20 Lit. 0.20 Lit.
131	Fixing R.C.C. N.P. 2 pipes and collars in cement mortar			
	a) Diameter up to 30 C.M.	Mortar	each collar	0.0054 cum.
	b) Do above 35 and up to 40 cm	Mortar	each collar	0.0072 cum.
	c) Do above 40 cm up to 40 cm	Mortar	each collar	0.0090 cum.
	d) Do above 50 cm up to 60 cm	Mortar	each collar	0.0108 cum.
	e) Do above 60 cm up to 70 cm	Mortar	each collar	0.0126 cum.
	f) Do above 70 cm up to 80 cm	Mortar	each collar	0.0144 cum.
	g) Do above 80 cm up to 95 cm	Mortar	each collar	0.0171 cum.

**TABLE -A**  
**STEEL TUBES FOR STRUCTURAL PURPOSES**

Nominal Bore (mm)	Outside Diameter (mm)	Class	Wall Thickness (mm)	Weight (kg/m)
15	21.3	H	3.2	1.44
20	26.9	H	3.2	1.87
25	33.7	M	3.2	2.41
		H	4.0	2.93
32	42.4	L	2.60	2.54
		M	3.2	3.10
		H	4.00	3.79
40	48.3	L	2.90	3.23
		M	3.2	3.56
		H	4.0	4.37
50	60.3	L-1	2.9	4.08
		M	3.6	5.03
		H	4.5	6.19
65	76.1	L	3.2	5.71
		M	3.6	6.42
		H	4.50	7.93
80	88.9	L	3.2	6.72
		M	4.00	8.36
		H	4.8	9.9
90	101.6	L	3.6	8.7
		M	4.0	9.63
		H	4.8	11.50
100	114.3	L	3.6	9.75
		M	4.5	12.2
		H	5.4	14.5
110	127.0	L	4.5	13.6
		M	4.8	14.50
		H	5.4	16.2
125	139.7	L	4.50	15.00
		M	4.8	15.90
		H	5.4	17.90
135	152.4	L	4.50	16.40
		M	4.8	17.50
		H	5.40	19.60
150	165.1	L	4.50	17.80
		M	4.8	18.90
		H	5.40	21.30
150	168.3	L	4.50	18.20
		M	4.8	19.40
		H-1	5.40	21.70
		H-2	6.3	25.20
175	193.7	L	4.8	22.40
		M	5.40	25.10
		H	5.9	27.30
200	219.1	L	4.8	25.40
		M	5.60	29.50
		H	5.90	31.00



225	244.5	H	5.90	34.70
250	273	H	5.90	38.90
300	323.90	H	6.30	49.30
350	355.60	H	8.00	68.60

**TABLE –B**

<b>SECTION PROPERTIES</b>				
<b>Properties of Tata Structural</b>		<b>(Square Hollow Sections) YST 310 Grade</b>		
<b>SHS B x B mm</b>	<b>Thickness mm</b>	<b>Sec Area A cm<sup>2</sup></b>	<b>Unit W</b>	<b>kg/m</b>
25 x 25	2.00	1.74	1.36	
	2.60	2.16	1.69	
	3.20	2.53	1.98	
32 x 32	2.00	2.30	1.80	
	2.60	2.88	2.26	
	3.20	3.42	2.69	
38 x 38	2.60	3.51	2.75	
	3.20	4.19	3.29	
	4.00	5.03	3.95	
40 x 40	2.60	3.72	2.92	
	3.20	4.45	3.49	
	4.00	5.35	4.20	
50 x 50	2.60	4.76	3.74	
	2.90	5.25	4.12	
	3.60	6.35	4.98	
	4.50	7.67	6.02	
60 x 60	2.60	5.80	4.55	
	3.20	7.01	5.50	
	4.00	8.55	6.71	
	4.80	10.01	7.85	
72 x 72	3.20	8.54	6.71	
	4.00	10.47	8.22	
	4.80	12.31	9.66	
80 x 80	3.20	9.57	7.51	
	4.00	11.75	9.22	
	4.80	13.85	10.87	
91.5 x 91.5	3.60	12.32	9.67	
	4.50	15.14	11.88	
	5.40	17.85	14.01	
100 x 100	4.00	14.95	11.73	
	5.00	18.36	14.41	

**SECTION PROPERTIES**

<b>Properties of Tata Structural (Square Hollow Sections) YST 310 Grade</b>			
<b>SHS B x B mm</b>	<b>Thickness mm</b>	<b>Sec Area A cm<sup>2</sup></b>	<b>Unit W kg/m</b>
	6.00	21.63	16.98
113.5 x 113.5	4.80	20.28	15.92
	5.40	22.60	17.74
132 x 132	4.80	23.83	18.71
	5.40	26.60	20.88
150 x 150	4.00	22.95	18.01
	5.00	28.36	22.26
	6.00	33.63	26.40
	8.00	43.79	34.38
180 x 180	4.00	27.75	21.78
	5.00	34.36	26.97
	6.00	40.83	32.05
	8.00	53.39	41.91
220 x 220	5.00	42.36	33.25
	6.00	50.43	39.59
	8.00	66.19	51.96
	10.00	81.43	63.92
250 x 250	6.00	57.63	45.24
	8.00	75.79	59.50
	10.00	93.43	73.34

**TABLE –C**  
**SECTION PROPERTIES**

<b>SECTION PROPERTIES</b>							
<b>Properties of Tata Structural</b>				<b>(Rectangular Hollow Sections) YST 310 Grade</b>			
<b>RHS</b>	<b>D x B</b>	<b>mm</b>	<b>Thickness mm</b>	<b>Sec Area A cm<sup>2</sup></b>	<b>Unit</b>	<b>W</b>	<b>kg/m</b>
50 x 25			2.00	2.74		2.15	
			2.60	3.46		2.71	
			3.20	4.13		3.24	
			4.00	4.95		3.88	
60 x 40			2.60	4.76		3.73	
			2.90	5.25		4.12	
			3.60	6.35		4.98	
66 x 33			4.50	7.67		6.02	
			2.60	4.70		3.69	
			2.90	5.19		4.07	
			3.60	6.28		4.93	
80 x 40			4.50	7.58		5.95	
			2.60	5.80		4.55	
			3.20	7.01		5.50	
			4.00	8.55		6.71	
96 x 48			4.80	10.01		7.85	
			3.20	8.54		6.71	
			4.00	10.47		8.22	
122 x 61			4.80	12.31		9.66	
			3.60	12.32		9.67	
			4.50	15.14		11.88	
145 x 82			5.40	17.85		14.01	
			4.80	20.28		15.92	
172 x 92			5.40	22.60		17.74	
			4.80	23.83		18.71	
200 x 100			4.80	26.59		20.88	
			4.00	22.95		18.01	
			5.00	28.36		22.26	
			6.00	33.63		26.40	
			8.00	43.79		34.38	

TABLE -C			
240 x 120	4.00	27.75	21.78
	5.00	34.36	26.97
	6.00	40.83	32.05
	8.00	53.39	41.91
300 x 150	6.00	51.63	40.53
	8.00	67.79	53.22
	10.00	83.43	65.49
300 x 200	6.00	57.63	45.24
	8.00	75.79	59.50
	10.00	93.43	73.34

**TABLE –D**  
**SECTION PROPERTIES**

<b>SECTION PROPERTIES</b>			
<b>Properties of Tata Structural</b>		<b>(Circular Hollow Sections) YST 310 Grade</b>	
<b>Nominal Bore</b>	<b>Outside Diameter</b>	<b>Thickness</b>	<b>Weight</b>
<b>mm</b>	<b>mm</b>	<b>mm</b>	<b>mm</b>
15	21.3	2.00	0.95
		2.60	1.21
		3.20	1.44
20	26.9	2.30	1.38
		2.60	1.56
		3.20	1.87
25	33.7	2.60	1.98
		3.20	2.41
		4.00	2.93
32	42.4	2.60	2.54
		3.20	3.01
		4.00	3.79
40	48.3	2.90	3.23
		3.20	3.56
		4.00	4.37
50	60.3	2.90	4.08
		3.60	5.03
		4.50	6.19
65	76.1	3.20	5.71
		3.60	6.42
		4.50	7.93
80	88.9	3.20	6.72
		4.00	8.36
		4.80	9.90
100	114.3	3.60	9.75
		4.50	12.20
		5.40	14.50
125	139.7	4.50	15.00
		4.80	15.90
		5.40	17.90
150	165.1	4.50	17.80
		4.80	18.90
		5.40	21.30

200	219.1	4.80	25.38
		6.00	31.51
		8.00	41.67
		10.00	51.59
250	273	6.00	39.51
		8.00	52.30
		10.00	64.89
300	323.9	6.30	49.36
		8.00	62.35
		10.00	77.44

**Table-E**  
**Sections and weights of I.S. Rolled Steel Beams Dimension**

Designation		Weight per Metre W Kg.	Sectional Area a Cm. 2	Depth of Section h mm.	Width of Flange b mm.	Thickness Flange tf. Mm.	Thickness of Web. Tw mm.
1		2	3	4	5	6	7
I.S.J.B.	150	7.1	9.01	150	50	4.6	3.0
I.S.J.B.	175	8.1	10.28	175	50	4.8	3.2
I.S.J.B.	200	9.9	12.64	200	60	5.0	3.4
I.S.J.B.	225	12.8	16.28	225	80	5.0	3.7
I.S.L.B.	75	6.1	7.71	75	50	5.0	3.7
I.S.L.B.	100	8.0	10.21	100	50	6.4	4.0
I.S.L.B.	125	11.9	15.12	125	75	6.5	4.4
I.S.L.B.	150	14.2	18.08	150	80	6.8	4.8
I.S.L.B.	175	16.7	21.30	175	90	6.9	5.1
I.S.L.B.	200	19.8	25.27	200	100	7.3	5.4
I.S.L.B.	225	23.5	29.92	225	100	8.6	5.8
I.S.L.B.	250	27.9	35.53	250	125	8.2	6.1
I.S.L.B.	275	33.0	42.02	275	140	8.8	6.4
I.S.L.B.	300	37.7	48.08	300	150	9.4	6.7
I.S.L.B.	325	43.1	54.90	325	165	9.8	7.0
I.S.L.B.	350	49.5	63.01	350	165	11.4	7.4
I.S.L.B.	400	56.9	72.43	400	165	12.5	8.0
I.S.L.B.	450	65.3	83.14	450	170	13.4	8.6
I.S.L.B.	500	75.0	95.50	500	180	14.1	9.2
I.S.L.B.	550	86.3	109.97	550	190	15.0	9.9
I.S.L.B.	600	99.5	126.69	600	210	15.5	10.5
I.S.M.B.	100	11.5	14.60	100	75	7.2	4.0
I.S.M.B.	125	13.0	16.60	125	75	7.6	4.4
I.S.M.B.	150	14.9	19.00	150	80	7.6	4.8
I.S.M.B.	175	19.3	24.62	175	90	8.6	5.5
I.S.M.B.	200	25.4	32.33	200	100	10.8	5.7
I.S.M.B.	225	31.2	39.72	225	110	11.87	6.5
I.S.M.B.	250	37.3	47.55	250	125	12.5	6.9
I.S.M.B.	300	44.2	56.26	300	140	12.4	7.5
I.S.M.B.	350	52.4	66.71	350	140	14.2	8.1
I.S.M.B.	400	61.6	78.46	400	140	16.0	8.9
I.S.M.B.	450	72.4	92.27	450	150	17.4	9.4
I.S.M.B.	500	86.9	110.74	500	180	17.2	10.2
I.S.M.B.	550	103.7	132.11	550	190	19.3	11.2
I.S.M.B.	600	122.6	156.21	600	210	20.8	12.0
I.S.W.B.	150	17.0	21.67	150	100	7.0	5.4
I.S.W.B.	175	22.1	28.11	175	125	7.4	5.8
I.S.W.B.	200	28.8	36.71	200	140	9.0	6.1
I.S.W.B.	225	33.9	43.24	225	150	9.9	6.4
I.S.W.B.	250	40.9	52.05	250	200	9.0	6.7

Designation		Weight per Metre W Kg.	Sectional Area a Cm. 2	Depth of Section h mm.	Width of Flange b mm.	Thickness Flange tf. Mm.	Thickness of Web. Tw mm.
1		2	3	4	5	6	7
I.S.W.B.	300	48.1	61.33	300	200	10.0	7.4
I.S.W.B.	350	56.9	72.50	350	200	11.4	8.0
I.S.W.B.	400	66.7	85.01	400	200	13.0	8.6
I.S.W.B.	450	79.4	101.15	450	200	15.4	9.2
I.S.W.B.	500	95.2	121.22	500	250	14.7	9.9
I.S.W.B.	550	112.5	143.34	550	250	17.6	10.5
I.S.W.B.	600	133.7	170.38	600	250	21.3	11.2
I.S.W.B.	600	145.1	184.86	600	250	23.6	11.8
I.S.H.B.	150	27.1	34.48	150	150	9.0	5.4
I.S.H.B.	150	30.6	38.98	150	150	9.0	8.4
I.S.H.B.	150	34.6	44.08	150	150	9.0	11.8
I.S.H.B.	200	37.3	47.54	200	200	9.0	6.1
I.S.H.B.	200	40.0	50.94	200	200	9.0	7.8
I.S.H.B.	225	43.1	54.94	225	225	9.1	6.5
I.S.H.B.	225	46.8	59.66	225	225	9.1	8.6
I.S.H.B.	250	51.0	64.96	250	250	9.7	6.9
I.S.H.B.	250	54.7	69.71	250	250	9.7	8.8
I.S.H.B.	300	58.8	74.85	300	250	10.6	7.6
I.S.H.B.	300	63.0	80.25	300	250	10.6	9.4
I.S.H.B.	350	67.4	85.91	350	250	10.6	8.3
I.S.H.B.	350	72.4	92.21	350	250	11.6	10.1
I.S.H.B.	400	77.4	98.66	400	250	12.7	9.1
I.S.H.B.	400	82.2	104.66	400	250	12.7	10.6
I.S.H.B.	450	87.2	111.14	450	250	13.7	9.8
I.S.H.B.	450	92.5	117.89	450	250	13.7	11.3



**Table-F**  
**Sizes and weights of I.S. Rolled Steel channels**

Designation		Weight per Metre W Kg.	Sectional Area a Cm. 2	Depth of Section h mm.	Width of Flange b mm.	Thickness Flange tf. Mm.	Thickness of Web. Tw mm.
1		2	3	4	5	6	7
I.S.J.C.	100	5.8	7.41	100	45	5.1	3.0
I.S.J.C.	125	7.9	10.07	125	50	6.6	3.0
I.S.J.C.	150	9.9	12.65	150	55	6.9	3.6
I.S.J.C.	175	11.2	14.24	175	60	6.9	3.6
I.S.J.C.	200	13.9	17.77	200	70	7.1	4.1
I.S.L.C.	75	5.7	7.26	75	40	6.0	3.7
I.S.L.C.	100	7.9	10.02	100	50	6.4	4.0
I.S.C.L.C.	125	10.7	13.67	125	65	6.6	4.5
I.S.L.C.	150	14.4	18.36	150	75	7.8	4.8
I.S.L.C.	175	17.6	22.40	175	75	9.5	5.1
I.S.L.C.	200	20.6	26.22	200	75	10.8	5.5
I.S.L.C.	225	24.0	30.53	225	90	10.2	5.8
I.S.L.C.	250	28.0	35.65	250	100	10.7	6.1
I.S.L.C.	300	33.1	42.11	300	100	11.6	6.7
I.S.L.C.	350	38.8	49.47	350	100	12.5	7.4
I.S.L.C.	400	45.7	58.25	400	100	14.0	8.0
I.S.M.C.	75	6.8	8.67	75	40	7.3	4.1
I.S.M.C.	100	9.2	11.70	100	50	7.5	4.7
I.S.M.C.	125	12.7	16.19	125	65	8.1	5.0
I.S.M.C.	150	16.4	20.88	150	75	9.0	5.4
I.S.M.C.	175	19.1	24.38	175	75	10.2	5.7
I.S.M.C.	200	22.1	28.21	200	75	11.4	6.1
I.S.M.C.	225	25.9	33.01	225	80	12.4	6.4
I.S.M.C.	250	30.4	38.67	250	80	14.1	7.1
I.S.M.C.	300	35.8	45.64	300	90	13.6	7.6
I.S.M.C.	350	52.1	43.66	350	100	13.5	8.1
I.S.M.C.	400	49.4	62.93	400	100	15.3	8.6

**Appendix G**  
**Weights and Sizes of I.S. Rolled Steel Equal Angles**

Designation	Size AXB mm.	Thickness T mm	Sectional area A Cm.2	Weight Per Metre W Kg.
1	2	3	4	5
I.S.A. 2020	20x20	3.0	1.12	0.0
		4.0	1.45	1.1
I.S.A. 2525	25x25	3.0	1.41	1.1
		4.0	1.84	1.4
		5.0	2.25	1.8
I.S.A. 3030	30x30	3.0	1.73	1.4
		4.0	2.26	1.8
		5.0	2.77	2.2
I.S.A. 3535	35x35	3.0	2.03	1.6
		4.0	2.66	2.1
		5.0	3.27	2.6
		6.0	3.86	3.0
I.S.A. 4040	40x40	3.0	2.34	1.8
		4.0	3.07	2.4
		5.0	3.78	3.0
		6.0	4.47	3.5
I.S.A. 4545	45x45	3.0	2.64	2.1
		4.0	3.47	2.7
		5.0	4.28	3.4
		6.0	5.07	4.0
I.S.A. 5050	50x50	3.0	2.95	2.3
		4.0	3.88	3.0
		5.0	4.79	3.8
		6.0	5.68	4.5
I.S.A. 5555	55x55	5.0	5.27	4.1
		6.0	6.26	4.9
		8.0	8.18	6.4
		10.0	10.02	7.9
I.S.A. 6060	60x60	5.0	5.75	4.5
		6.0	6.84	5.4
		8.0	8.96	7.0
		10.0	11.00	8.6
I.S.A. 6565	65x65	5.0	6.25	4.9
		6.0	7.44	5.8
		8.0	9.76	7.7
		10.0	12.00	9.4
I.S.A. 7070	70x70	5.0	6.77	5.3
		6.0	8.06	6.3
		8.0	10.58	8.3
		10.0	13.02	10.2
I.S.A. 7575	75x75	5.0 6.0	7.27	5.7 6.8
		8.0	8.66	8.9
		10.0	11.38	11.0
			14.02	

Designation	Size AXB mm.	Thickness T mm	Sectional area A Cm.2	Weight Per Metre W Kg.
1	2	3	4	5
I.S.A. 8080	80x80	6.0	9.29	7.3
		8.0	12.21	9.6
		10.0	15.05	11.8
		12.0	17.81	14.0
I.S.A. 9090	90x90	6.0	10.47	8.2
		8.0	13.79	10.8
		10.0	17.03	13.4
		12.0	20.19	15.8
I.S.A. 100100	100x100	6.0	11.67	9.2
		8.0	15.39	12.1
		10.0	19.03	14.9
		12.0	22.59	17.7
I.S.A. 110110	110x110	8.0	17.02	13.4
		10.0	21.06	16.5
		12.0	25.02	19.6
		15.0	30.81	24.2
I.S.A. 130130	130x130	8.0	20.22	15.9
		10.0	25.06	19.7
		12.0	29.82	23.4
		15.0	36.81	28.9
I.S.A. 150150	150x150	10.0	29.03	22.8
		12.0	34.59	27.2
		15.0	42.78	33.6
		18.0	50.79	39.9
I.S.A. 200200	200x200	12.0	46.61	36.4
		15.0	57.80	45.0
		18.0	68.81	54.6
		25.0	93.80	73.6

**Table- H**  
**Sizes and Weights of I.S. Rolled Steel Unequal Angles**

Designation	Size AXB mm.	Thickness T mm	Sectional area A Cm.2	Weight Per Metre W Kg.
1	2	3	4	5
I.S.A. 3020	30x20	3.0	1.41	1.1
		4.0	1.84	1.4
		5.0	2.25	1.8
I.S.A. 4025	40x25	3.0	1.88	1.5
		4.0	2.46	1.9
		5.0	3.02	2.4
		6.0	3.56	2.8
I.S.A. 4530	45x30	3.0	2.18	1.7
		4.0	2.86	2.2
		5.0	3.52	2.8
		6.0	4.16	3.3
I.S.A. 5030	50x30	3.0	2.34	1.8
		4.0	3.07	2.4
		5.0	3.78	3.0
		6.0	4.47	3.5
I.S.A. 6040	60x40	5.0	4.76	3.7
		6.0	5.65	4.4
		8.0	7.37	5.8
I.S.A. 6545	65x45	5.0	5.26	4.1
		6.0	6.25	4.9
		8.0	8.17	6.4
I.S.A. 7045	70x45	5.0	5.52	4.3
		6.0	6.56	5.2
		8.0	8.58	6.7
		10.0	10.52	8.3
I.S.A. 7550	75x50	5.0	6.02	4.7
		6.0	7.16	5.6
		8.0	9.38	7.4
		10.0	11.52	9.0
I.S.A. 8050	80x50	5.0	6.27	4.9
		6.0	7.46	5.9
		8.0	9.78	7.7
		10.0	12.02	9.4
I.S.A. 9060	90x60	6.0	8.65	6.8
		8.0	11.37	8.9
		10.0	14.01	11.0
		12.0	16.57	13.0
I.S.A. 10065	100x65	6.0	9.55	7.5
		8.0	12.57	9.9
		10.0	15.51	12.2
I.S.A. 10075	100x75	6.0	10.14	8.0
		8.0	13.36	10.5
		10.0	16.50	13.0
		12.0	19.56	15.4
I.S.A. 12575	125x75	6.0	11.66	9.2
		8.0	15.38	12.1
		10.0	19.02	14.9

Designation	Size AXB mm.	Thickness T mm	Sectional area A Cm.2	Weight Per Metre W Kg.
1	2	3	4	5
I.S.A. 12595	125x95	6.0	12.86	10.1
		8.0	16.98	13.3
		10.0	21.02	16.5
		12.0	24.98	19.6
I.S.A. 15075	150x75	8.0	17.42	13.7
		10.0	21.56	16.9
		12.0	25.62	20.10
I.S.A. 150115	150x115	8.0	20.58	16.2
		10.0	25.52	20.0
		12.0	30.38	23.8
		15.0	37.52	29.5
I.S.A. 200100	200x100	10.0	29.03	22.8
		12.0	34.59	27.2
		15.0	42.78	33.6
I.S.A. 200150	200x150	10.0	34.00	26.7
		12.0	40.56	31.8
		15.0	50.25	39.4
		18.0	59.76	46.9

**Table-I**  
**Weights and Sizes of Rolled Steel Tee Bars**

Designation		Weight per Metre W Kg.	Sectional Area a Cm. 2	Depth of Section h mm.	Width of Flange b mm.	Thickness Flange tf. Mm.	Thickness of Web. Tw mm.
1	2	3	4	5	6	7	
I.S.N.T.	20	0.9	1.13	20	20	3.0	3.0
I.S.N.T.	30	1.4	1.75	30	30	3.0	3.0
I.S.N.T.	40	3.5	4.48	40	40	6.0	6.0
I.S.N.T.	50	4.5	5.70	50	50	6.0	6.0
I.S.N.T.	60	5.4	6.90	60	60	6.0	6.0
I.S.N.T.	80	9.6	12.25	80	80	8.0	8.0
I.S.N.T.	100	15.0	19.10	100	100	10.0	10.0
I.S.N.T.	150	22.8	29.08	150	150	10.0	10.0
I.S.H.T.	75	15.3	19.49	75	150	9.0	8.4
I.S.H.T.	100	20.0	25.47	100	200	9.0	7.8
I.S.H.T.	125	27.4	34.85	125	250	9.7	8.8
I.S.H.T.	150	29.4	37.42	150	250	10.6	7.6
S.S.T.	1001	8.1	10.37	100	50	10.00	5.8
I.S.S.T.	150	15.7	19.96	150	75	11.6	8.0
I.S.S.T.	200	28.4	36.22	200	165	12.5	8.6
I.S.S.T.	250	37.5	47.75	250	180	14.1	9.2
I.S.L.T.	50	4.0	5.11	50	50	6.4	4.0
I.S.J.T.	75	7.01	9.04	75	80	6.8	4.7
I.S.L.T.	100	12.7	16.16	100	100	10.8	5.8
I.S.L.T.	75	3.5	4.50	75	50	4.6	3.0
I.S.J.T.	87.5	4.0	5.14	87.5	50	4.8	3.2
I.S.J.T.	100	5.0	6.32	100	60	5.0	3.4
I.S.J.T.	112.5	6.4	8.14	112.5	80	5.0	3.7

## SHAPES, WEIGHTS AND DESIGNATION OF MS ROLLED STEEL SECTION

Designation	Wt kg/m	Situation of Use of Section
T2	1.036	Vertical and horizontal glazing bars for doors and shashes : windows, ventilators glazing bars for door side lights sub dividing bars for fixed length, sash bars for doors, windows and ventilators wheel steel aluminium or wooden beading is used for fixing glasses.
T3	1.14	Vertical glazing bar for FZ 7 frame
T 6	0.839	Vertical and horizontal glazing bar for standard windows and ventilators.
F 2	1.46	Inner frames for open-in windows
F 3	2.28	Outer frames for open in windows
F 5	1.55	(a) Inner and middle frames in centre-hung ventilators (b) F5 is some times used as inner frames for open-out windows. Also used as inner frame for bottom hung ventilators (c) F8 is also used as outer frame for bottom hung ventilators.
F 4 B	2.28	Central mullion (meeting bar for shutters) for windows and ventilators using F7D as inner frames, outer frames for open- in windows in rainy areas, subdividing bars for openable windows and top- hung ventilators.
F 7 D	1.419	Inner and outer frames for windows and top hung ventilators, for inner frames for centre-hung ventilators and outer frames for door sidelights.
FX 6	2.52	Inner frame for doors
F Z 7	1.90	Used as outer frame for industrial shashes. Also used for outer frame for wooden doors
FX 8	2.31	Outer frames for doors
FZ5	2.52	Inner frames for doors
K 11B	1.80	(a) Vertical coupling mullion for standard windows (b) Can be used as horizontal coupling bar when openable windows are to be coupled above fixed ones or between two fixed windows. (c) Can also be used as horizontal coupling mullion where windows are not exposed to weather.
K 12 B	2.30	Horizontal coupling mullion, also known as weather bar, Especially used when the coupled unit is exposed to rain.

**Table-A**  
PARTICULARS OF MEDIUM GRADE G.I. PIPES

Nominal bore	Dimension of pipes			Weight of pipe	
	Outside diameter		Thickness	Plain end	Screwed end socket
	Max.	Min.			
mm	mm	mm	mm	Kg/m	Kg/m
6	10.6	9.8	2.0	0.404	0.407
8	14.0	13.2	2.3	0.641	0.645
10	17.5	16.7	2.3	0.839	0.845
15	21.8	21.0	2.6	1.21	1.22
20	27.3	26.5	2.6	1.56	1.57
25	34.2	33.3	3.2	2.41	2.43
32	42.9	42.0	3.2	3.10	3.13
40	48.8	47.9	3.2	3.56	3.60
50	60.8	59.7	3.6	5.03	5.10
65	76.6	75.3	3.6	6.42	6.54
80	89.5	88.0	4.0	8.36	8.53
100	115.0	113.1	4.5	12.2	12.50
125	140.8	138.5	4.8	15.90	16.40
150	166.5	163.9	4.8	18.90	19.50

**Tolerance in Thickness and Weight****A) Thickness**

- |                             |                 |
|-----------------------------|-----------------|
| 1. Butt welded medium tubes | + not limited   |
|                             | - 10 per cent   |
| 2. Seamless tubes           | + not limited   |
|                             | - 12.5 per cent |

**B) Weight**

- |  |                |
|--|----------------|
| 1. Single tube (light series)  | + 10 per cent  |
|  | - 8 per cent   |
| 2. Single tube (medium and heavy series)                               | ± 10 per cent  |
| 3. For quantities per load of 10 tonnes, min (light series)            | ± 5 per cent   |
|  | - 8 per cent   |
| 4. For quantities per load of 10 tonnes, min (medium and heavy series) | ± 7.5 per cent |

**Table-B**

## Stoneware Pipes

Internal Diameter (mm)	Mean Thickness of the Barrel and Socket (mm)
100	12
150	15
200	16
230	19
250	20
300	25
350	30
400	35
450	37



## STANDARD FORMAT FOR STRUCTURAL AUDIT REPORT

<b>1.</b>	<b>Name of Building</b>	
<b>2.</b>	<b>CTS No. / Ward</b>	
<b>3.</b>	<b>No. of Storey</b>	
<b>4.</b>	<b>Year of Construction</b>	
<b>5.</b>	<b>User Department</b>	
<b>6.</b>	<b>Mode of construction of existing bldg</b>	
	i.Foundation	
	ii.Floors	
	iii.Walls	
	iv.Beams	
	v.Columns	
	vi.Roof	
<b>7.</b>	<b>History of Repairs done year-wise-</b>	
	a) Slab recasting	
	b) Column Jacketing	
	i.Structural Repairs	
	ii.Tenantable Repairs	
	iii.Roof / Waterproofing	
	iv.Plumbing	
	v.Additions/Alterations if any	
<b>8.</b>	<b>Date of Inspection by Consultant -</b>	
<b>9.</b>	<b>Condition of -</b>	
	i.Internal plaster	
	ii.External plaster	
	iii.Plumbings	
	iv.Drains lines / chambers	
<b>10.</b>	<b>Observations -</b>	
	a)Doors & windows don't close	
	b)Columns & steel exposed	
	c)Settlement uneven flooring gaps between and skirting & floor	

	d)Foundation settlement	
	e)Deflections / sagging	
	f)Major cracks in column / beams	
	g)Seepages / Leakages	
	h)Staircase area / column condition	
	i)Lift walls	
	j)U.G.Tank	
	k)OHT / Column condition	
	l)Parapet at terraces	
	m)Chhajas	
	n) Common areas	
	o) Toilet blocks	
	p) Terrace / Water proofing	
<b>11.</b>	<b>Test carried on structural observations thereof – (Note: Please see detailed report for interpretation &amp; explanation).</b>	
	<b>NDT</b>	<b>Findings</b>
	<b>a) Ultrasonic pulse velocity test</b>	<b>Range as per is Code</b> 3 to 3.5 km/sec concrete quality grading – Medium
	<b>b) Rebound Hammer Test</b>	15 N/mm <sup>2</sup> (original design)
	<b>c) Half Cell Potential Test</b>	No IS code available for this test
	<b>d) Carbonation Depth Test</b>	No I. S. Code available for this test
	<b>e) Core Test (3 nos)</b>	11.25 (N/mm <sup>2</sup> )
		11.25 (N/mm <sup>2</sup> )
		11.25 (N/mm <sup>2</sup> )
	<b>Average value</b>	12.75 (N/mm <sup>2</sup> )
	<b>f)Chemical Analysis - Chloride</b>	Shall be less than 0.6 kg/cu.m.
	<b>- Sulphates</b>	Shall be less than 4%

	<b>- pH</b>		No I. S. Code available.
	<b>g)Cement aggregate ratio</b>		No I. S. Code available.
<b>12.</b>	<b>Distress Mapping Plan &amp; photographs with caption below about description of structural member and its location</b>		
<b>13.</b>	<b>Brief Description of repairs to be done</b>		
	a)Water proofing		
	b)External plaster		
	c)Structural repairs		
	i.Column jacketing		
	ii.Slab recasting		
	iii.RCC cover to be replaced		
	iv.Beam recasting		
	d)Partial Evacuation during repairs needed		
	e)propping		
<b>14.</b>	<b>Conclusions of Consultants -</b>	<b>Observations</b>	<b>Key reason</b>
	i. Whether structural is livable / or whether it is to be evacuated / pulled down		
	ii. Whether structural requires tenantable repairs / Major structural repairs & its time frame		
	iii.Whether structure can be allowed to occupy during course of repairs		
	iv.Nature / Methodology of repairs		
	v. Whether structure requires immediate propping. If so. Its propping plan / methodology given		
	vi.Whether other immediate safety measures required – What is specific recommendation?		
	vii.Enhancement in life of structure after repairs / frequency of repairs required in extended life period		
	viii.Projected repairs cost / Sq. ft of built up area		
	ix.Projected reconstruction cost / Sq. ft		
	x. Specific remarks. Whether building needs to be vacated / demolished / repairable		

	xi.Whether structural in extremely critical condition		
<b>15.</b>	<b>Critical Observation</b>		
<b>16.</b>	<b>Classification of Bldgs</b>	<b>Category</b>	<b>Auditors final conclusion</b>
		C1	To be evacuated / demolition immediately
		C2-A	To be evacuated and/or partial demolition requiring major structural repairs
		C2-B	No eviction only structural repairs
		C-3	No eviction needs minor repairs only.

**Signature**

( )

**Structural Auditor**  
**Licensed Structural Engg. Consultant**

(Lic. No. )

STANDARD FORMATS A,B,C,D .....

FOR

PREPARATION OF ESTIMATE FOR DPROF

A BUILDING PROJECT

## STANDARD FORMATS A,B,C,D ..... FOR PREPARATION OF ESTIMATE FOR DPR OF A BUILDING PROJECT

Preparation of accurate detail estimate is key for successful completion of a building project. It is, therefore, necessary that the cost estimate attached with a Detail Project Report (DPR) of a building work should be prepared accurately in standard formats which fulfil intended functional and structural requirement of the building. DPR for large number of building projects for various user departments are prepared by the Public Works Department for their administrative and financial sanctions. It is, therefore, very important that the project cost in a DPR should discretely display gross as well as individual cost of each major and minor work constituents of the building project to enable technical & financial project sanctioning authorities to take informed decisions.

For clarity and simplicity in understanding of a building project, standard formats for estimating has been devised in which "Project Cost" has been divided into "Project Cost Center" (PCC) and in turn each "Project Cost Center" have been further subdivided into "Cost Centers" (CC). Each "Project Cost Center" represents a major project activity namely individual building, campus services or campus development. Similarly "Cost Centers" of each "Project Cost Center" represents distinct components of "Project Cost Center" (PCC) such as RCC structure below plinth, RCC structure above plinth, internal electrification, sewage treatment, lifts, HVAC, internal roads, boundary wall etc. With this motive, templates such as Technical Report (Format 'A'), Project Abstract (Format 'B'), Building Work Abstract (Format 'C'), External Work Abstract (Format 'D'), Cost Abstract (Format 'E') and Quantity Sheet (Format 'F') have been standardized.

To enable project sanctioning authority to take informed decisions, standard formats for granting technical sanctions by competent authority of civil & electrical works and presenting all information of technical sanctions have been standardized as formats T2, T3, & T1 respectively.

For good understanding of a building by the authorities at the time of granting sanction and execution and taking over a constructed building by user department, it is recommended that finishing information of the building should be provided in a standard format and should be appended with the estimate and hand over documents as well. With this motive a standard format of schedule of finishes has been devised as Format 'SOF' for civil works, toilets and electrical works.

After preparation of estimate for a building project, a very well prepared Bill of Quantity (BOQ) is a very important document for successful execution of work through contract. With this motive, a format for BOQ Schedule "Q" has been standardized.

During construction stage monitoring of work progress (quantity & cost of work completed) with respect to stipulated quantities & time for completion is very essential for successful completion the project and with this motive a format Chart 'P' has been standardized.

In case of a DPR for a revised sanction, a revised cost estimate of the building project is required to be prepared in which component wise (cost centre wise) cost excess statement with reasons is always essential to enable project sanctioning authority to take informed decision on revised cost. With this motive & for clarity a standard template Format 'RA' has been devised which gives details of access cost with reasons for each cost centres. Further details of all above standard formats are as below:-

## **I. Format “A” Technical Report:-**

All important information and guidelines about estimate is included in Format “A” which contains following details-

### **1. Administrative & General Information:-**

Describes name, location, project cost and ownership of the project and project land .It also describes about project area ,adjoining land details with the help of Google index plan , drone photos, khasra,map ,survey plans,etc

### **2. Executive Summary:-**

Describes history of existing campus and necessity of the project.

### **3. Functional Spaces and Facilities Provided in Project :-**

Describes present and future project requirement to meet intended use of building. It also describes space (capacity) to be provided for intended building use, plinth area, built up area, number of stories of each building, type of buildings, number of buildings, future project needs and provision made for the same, etc.

### **4. Salient Features of Project :-**

Describes salient features such as total Built up Area, Plinth Area, Number of Floors, Future expansions (provision horizontal and vertical) and concept Design/DrawingNumber etc.

### **5. Design Basis Report (DBR):-**

Describes in technical terms, all physical elements of the project which are basis for inclusion of items in the estimates. Description of physical element in technical terms should be in group such that each group represents a Cost Centre belonging to a specific Project Cost Centre Each Cost Centre has been assigned a unique number for future reference. Prepare DBR for each building separately and also for campus services and campus development separately for clarity to quantity surveyor while preparing estimate cost centre wise for monitoring quantity by project and engineers while executing project.

### **6. Finishes :-**

Standard format for finishing of civil work ‘SOF – Civil’, finishing of toilets ‘SOF- Toilets’ and finishing of Electrical works ‘SOF- Electrical’ have been standardized for good understanding of finishes of building project.

### **7. Program Chart ‘ P1’ & ‘P2’ :-**

Standard format Chart ‘P1’(Project Program Chart) displaying projected time line for completion each “Project Cost Centre” is prepared only one for whole project, showing stipulated time line for all major construction activity “Project Cost Centers” such as a building or campus services or campus development works. However in a major construction project Chart “P2” is also prepared to display time lines for all components (‘Cost Centers’) of “Project Cost Centers”.

### **8. Revised Project Cost :-**

Standard Format ‘RA’ for representing revised cost of project, if required, is prepared to provide Project Cost Centre wise and Cost Centre wise cost comparison.

### **9. Rates:-**

Describes about SOR applicable and market rates (Non SOR terms) if any adopted.

### **10. Standards applicable:-**

Describes about standards (NBC, IPHS, MCI, BIS, Bhumi Vikas Adhinyam, AICTE, PCB, NEC, AAI etc.) that are followed in planning and designing the project.

### **11. Specification:-**

Describes specifications (CPWD, BIS, MPPWD, MORTH etc.) followed in designing all elements of the project.

**12. Green Building Rating, if targeted:-**

Describes GRIHA or IGB rating, if targeted.

**II. Format “B” (Project Abstract):-**

Is prepared only one for whole project and displays project cost inclusive of supervision charges and GST separately at the end of summation cost of "Building numbers -1", "Building number- 2" , "Building number -N" and so on and also " Campus services " and "Campus Development" which are designated as “Project Cost Centers”.

Format “B” also displays project cost center values which comprise of apportioned cost (% of Net Project Cost ie. project cost without supervision charges and GST), unit and quantity. Supervision charges and GST are added at last to arrive at Project Cost. Apportioned cost is very useful data to know cost impact of each “Project Cost Centers” on total project cost.

**III. Format “C” (Building Work Abstract):-**

Is prepared individually for each “Project Cost Centers” in building work category. These Building Work Abstracts in building work category are Format C1 for of Buildings no 1, C2 for Building no 2, C3 for Building no 3 and CN for Building no

N. Each “Project Cost Centers” are further subdivided into “Cost Centers” under various building sub head (I) Civil Works, (II)- Internal Services , (III) Internal Special Services and (IV) Equipment & Furniture.

Each “Cost Center” represents a constituent of the “Project Cost Center”, Examples of a “Cost Center” of “Project Cost Center” namely " building No.-1" are works such as civil works below plinth , civil works above plinth , internal electrification, Internal water supply ,HVAC, lift, firefighting, etc. Amount of “Project Cost Center” of each building is arrived at by summing estimated amount of all “Cost Centers” as per DBR from S.No. CC 1 to CC 30 The Supervision Charges and GST are not added at this stage.

Format “C” also displays apportioned cost which is % of “Project Cost Center” cost Format ‘C’ other cost center values such as units, quantity as per unit cost. Apportioned cost is a very useful data to know impact of cost center on project cost center.

**IV. Format “D” (External Work Abstract):-**

Is prepared only one for whole project. Total amount of External Work Abstract is arrived at by summing estimated amount of “Project Cost Center” namely campus services and campus development which are further sub divided into “Cost Centers” from s.no. CC 31 to CC 55 as per DBR.

Examples of “Cost Center” of “Project Cost Center” namely 'Campus services' are rain water harvesting, external electrification, external water supply, sewerage, sewage treatment plants etc. Similarly examples of “Cost Centers” of “Project Cost Center” namely “Campus Development" are works such as roads, culverts, boundary walls, gates, plantation, open drains, nalla training, landscaping, open parking, utility shifting, tree cutting, soil investigation, play fields, demolition, statutory approval fees etc.

Format “D” also displays apportioned cost (% of Project Cost Center cost) and other values such as units, quantity as per unit cost.

**V. Format “E” (Cost Abstract):-**

Is prepared individually in traditional way for each “Cost Center” (S.No. CC 1 to S.No. CC 30 of DBR) for each building of the project and these costs are filled up in Format 'C' to arrive at Format C1, Format C2 and Format CN etc. for Building No-1,



Building No-2 and Building No-N respectively.

Format 'E' is also prepared individually only once for each "Cost Center" of Campus services and external development work (S.No CC 31 to CC 55 of DBR) and these costs are filled up in Format 'D' for whole project. A "Cost Center", if not relevant to a building work or external work of the project, shall be bypassed (not prepared) but unique serial number and name of the "Cost Center" prescribed in DBR shall not be altered to maintain uniformity in the estimate. New "Cost Center" for a building and external work can always be added, as misc-1, misc-2, misc. -3 etc., on requirement basis against item no. 24 and 55 to capture any imagination in planning and design of a project. Description of SOR items in full are optional in format E for ease of reading the cost abstract. Therefore, full description of SOR items in Format E can be hidden and can display only BOQ serial number, SOR Item Number, SOR Sub Item Number and SOR Item Name.

**VI. Format "F" (Quantity Sheet):-**

Is prepared traditional in support of each sheet of Format "E". Full description of SOR items are always written in full text in quantity sheet Format-'F'

**VII. Standard Formats "T1", "T2", "T3" (Technical Sanction):-**

Format T2 (Technical Sanction Civil Works) and Format T3 (Technical Sanction Electrical & Mechanical Works) are prescribed for granting technical sanctions by the competent authorities. Amount of technical sanctions do not include supervision charges and GST. Format T1 (Technical Sanction Details) is a prescribed format to display summation of technically sanctioned cost (T2+T3) and supervision charges and GST added at the end. Standard format T2 & T3 also display "Cost Center" number belonging to civil and E/M component. This is as guide only however technical sanction granting competent authority may further bifurcate cost centers.

**VIII. Format "SOF"- (Schedule of Finishes):-**

For clarity in understanding of final built product during project sanction, execution and building handing over, standard formats 'SOF-Civil' for civil work , 'SOF -Toilets' for toilet finishes and 'SOF- Electrical' for Electrical work are prepared after writing DPR and framing the estimate.

**IX. Schedule 'Q' (BOQ):-**

BOQ is a final outcome of estimating and costing and is a most important document for execution of works at site through legally binding contract and is also a basic document for making payment to the contractors. Therefore BOQ has to be prepared with utmost accuracy and clarity. Standard Format Schedule 'Q' has been prescribed for preparing BOQ. Schedule 'Q' should be prepared individually for each "Project Cost Centers" known as Project Cost Centre BOQ and then added horizontally to form a Project 'BOQ'. In standard format "Q" each BOQ items is assigned a unique BOQ Serial Number. Each BOQ item is further identified by Unique SOR Item number, Unique SOR Sub Item number, Unique SOR name, and Unique SOR description. Each BOQ item has Quantity, Measuring Units, Rates and Amount. Order of placement of SOR items in Schedule 'Q' BOQ has been prescribed as Civil SOR items, Civil Non SOR items, Electrical SOR items, and Electrical Non SOR items in descending order. Standard Format Schedule 'Q' (BOQ) is same for both Project 'BOQ' & "Project Cost Center" BOQ. Project 'BOQ' is obtained by horizontal summation of "Project Cost Center" BOQ.

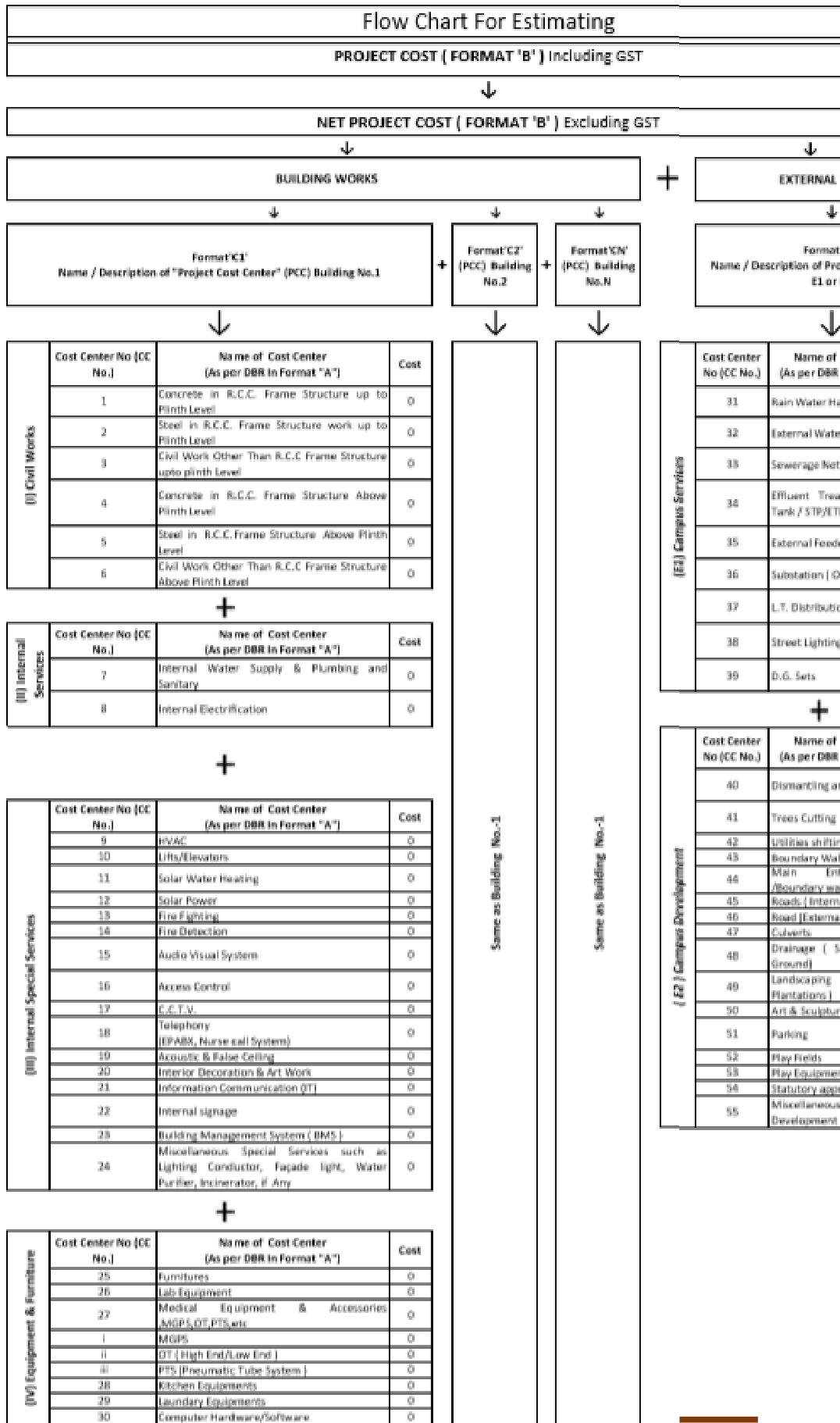
**X. Chart 'P' (Program Chart):-**

Project Program Chart 'P' is prepared one for whole project in which target of each "Project Cost Center" are set against milestones set in the project. This Chart 'P1'

(Project Program Chart) is prepared by the architect/engineer who prepares D.P.R. In cases where the contractor is required to submit construction program, Chart 'P1'(Project Program Chart) shall be modified by the contractor and submitted for approval of the Engineer-in-charge. In case of a complex project Chart 'P2' (P.C.C. Program Chart) may be prepared for each "Project Cost Center" individually in which targets shall be set for each "Cost Center" also. Progress for work during construction shall be monitored by observing achievement data filled by the field staff.

**XI. Format 'RA' (Revised Cost):-**

After preparation of Revised Cost estimate, if prepared for revised 'AA' of the project standard template RA-'B' is prepared to display variation at P.C.C level. Standard template RA-'C' is prepared to display variation in each building.Revised template RA-'D' is prepared to display variation in external works.



Same as building No.-1

Same as building No.-1

<b>TECHNICAL REPORT</b>			
Item No.	Particular		Description
<b>1</b>	<b>ADMINISTRATIVE &amp; GENERAL INFORMATION</b>		
<b>1.1</b>	<b>PROJECT NAME :-</b>		
<b>1.2</b>	<b>PROJECT LOCATION :-</b> (Place and District)		
<b>1.3</b>	<b>DEPARTMENT OWNING BUILDING:-</b>		
<b>1.4</b>	<b>PROJECT COST :-</b>		
<b>1.5</b>	<b>PROJECT BUILT UP AREA :-</b> ( In.Sq.m.)		
<b>1.6</b>	<b>AUTHORITY COMPETENT TO GRANT ADMINISTRATIVE APPROVAL OF PROJECT :-</b>		
<b>1.7</b>	<b>PROJECT LAND :-</b>		
	<b>1.7.1</b>	Project Plot/Land Area (in hectares) :-	<b>0</b>
	<b>1.7.2</b>	Topography :- (Plain /Undulated ) :-	
	<b>1.7.3</b>	Adjoining Landmark (Nalla, Road, Building, Pipe Lines , Electrical Line, private land , Basti , orchard , garden etc ) :-	
	<b>1.7.3.1</b>	North Side :-	
	<b>1.7.3.2</b>	South Side :-	
	<b>1.7.3.3</b>	East Side :-	
	<b>1.7.3.4</b>	West Side :-	
	<b>1.7.4</b>	Adjoining Land use and ownership :-	
	<b>1.7.4.1</b>	North Side :-	
	<b>1.7.4.2</b>	South Side :-	
	<b>1.7.4.3</b>	East Side :-	
	<b>1.7.4.4</b>	West Side :-	
	<b>1.7.5</b>	Old/ Existing buildings and other structures in the Project Land:-	
	<b>1.7.6</b>	Distance From Nearest Town/Village:-	
	<b>1.7.7</b>	/Index Plan /Photo / Map / Plan/ Drawing/Bore logs/T.P. :-	
	<b>1.7.7.1</b>	Google index Map ( Yes/No ):-	
	<b>1.7.7.2</b>	Drone Photo/Video( Yes / No ) :-	
	<b>1.7.7.3</b>	Khasra Map ( Yes/No):-	
	<b>1.7.7.4</b>	Engineer Survey plan ( Yes/No.):-	

		<b>1.7.7.5</b>	Master Plan of Compus ( Yes/No.):-	
		<b>1.7.7.6</b>	Concept / Working Drawing ( Yes /No.):-	
		<b>1.7.7.7</b>	Borelogs ( Yes /No.):-	
<b>2</b>		<b>EXECUTIVE SUMMARY :-</b>		
	<b>2.1</b>	<b>HISTORY OF EXISTING FACILITY AT PROJECT SITE :-</b> ( Add extra sheet , if required to respond in details)		
	<b>2.2</b>	<b>NECESSITY OF PROJECT :-</b> (Reason/Justification/Need for proposed construction) ( Add extra sheet , if required ,to respond in details)		
<b>3</b>		<b>( FUNCTIONAL SPACES AND FACILITIES TO BE PROVIDED IN PROJECT)</b>		
		<b>PARTICULERS</b>	<b>Functional Spaces &amp; Facilities Provided in Project</b> (Attach extra column or sheet, if required to respond in detail)	
	<b>3.1</b>	<b>Building Spaces :-</b> (e.g. Classrooms/ Office/ Reception/ Waiting/lab/ Meeting hall / Computer room/Library/Dormitory/Room/Dinning / Common Room/ Kitchen/ Store /Pantry/ Laundry/ Wards/ OT/OPD/ Labour room/ICCU / Court rooms/ Malkhana/Bed rooms/Balcony/ Suites/ Basement use, If anyetc.) ( Add extra sheet , if required ,to respond in details)		
	<b>3.2</b>	<b>Internal Special Services :-</b> (e.g.,HVAC/Lifts/Elevators/Solar Water Heating /Solar Power/Fire Fighting/Fire Detection/  Audio Visual System/Access Control & Low Voltage System/Acoustic & False Ceiling/Interior Decoration & Art Work/Information Communication (IT)/Internal signage/Building Management System ( BMS) ,etc)		
	<b>3.3</b>	<b>Equipment &amp; Furniture:-</b> (eg. Furnitures/Medical Equipment & Accessories such as (MGPS,OT,Nurse call , PTS Medical/Kitchen / Laundry , etc )		

	3.4	<b>Campus Services :-</b> ( eg. Rain Water Harvesting/External Water Supply/Sewerage Net Work/Effluent Treatment ( Septic Tank / STP/ETP /Bio Digester/External Feeder Line Extension /Substation:- ( Outdoor/Indoor )/L.T. Distributions /Street Lighting/D.G. Set, etc):- ( Add extra sheet , if required ,to respond in details)	
	3.5	<b>Campus Development :-</b> (e.g.,Dismantling and Site Clearing/Trees Cutting /Utilities shifting /Boundary Wall /Main Entrance Gate /Boundary wall Gate / Wicket Gate/security room/Roads ( internal Campus )/Road (External Approach )/Culverts /Drainage ( Surface / Under Ground)/Landscaping ( Horticulture, Plantations )/Art & Sculpture/Parking /Play Fields/Statutory approval fees.,etc):- ( Add extra sheet , if required ,to respond in details)	
4		<b>SALIENT FEATURES OF PROJECT :-</b> ( Add extra column or sheet , if required for each building )	
	4.1	Built Up Area (Sq.m.) :-	
	4.2	Plinth Area ( Sq.m.)	
	4.3	Type of Building Construction (Permanent / Temporary /LGSF / Pre.FabBuilding )	
	4.4	Number of Stories (Floors) in each building :-	
	4.5	Future Expansion Provision if any :-	
		4.5.1	Vertical Number of ( Floor )
		4.5.2	Horizontal ( Area )
	4.6	Concept Design/ Drawing Number :-	

1	<b>DESIGN BASIS REPORT ( DBR )</b> ( Describe all physical elements of the project which are basis for inclusion of items in the estimates. ) PerpareDBR for each building saperately and only one for external works of the campus.			
	<b>Particulars</b>			<b>Technical provisions made for each building</b> ( If required attach extra column or sheets, to respond in detail for Building No-1, Building No-2, Building No-3 and BuildingNo-n)
	<b>(I) Civil Works</b>			
1	<b>Concrete in R.C.C. Frame Structure up to Plinth Level</b>			
	1.1	<b>Unit Quantity of R.C.C. 0.50 Cum/Sq.m. of B.U.A :-</b> ( Cum/Sq.m. of Plinth Area )		
	1.2	<b>Foundation Details :-</b>		
		1.2.1	Average Depth of Foundation :- (Mts.)	
		1.2.2	Founding Strata ( Hard soil / Moorum / Soft rock / Hard rock /Largeboulders/ sand ) & SBC	
		1.2.3	Type :- (Open Column footing / Pile/ Raft/Strip etc.)	
		1.2.4	Grade of Concrete in Footings :- (e.g. M 15 /M 20/ M 25/M30 etc. )	
2	<b>Steel in R.C.C. Frame Structure work up to Plinth Level</b>			
	(Unit Quantity of steel ) 75 Kg/ Sq.m. of B.U.A. :- ( Kg./Sq.m. of Plinth Area )			
3	<b>Civil Work Other Than R.C.C Frame Structure upto plinth Level</b>			
	3.1	<b>Basement :-</b>		
		3.1.1	Area :- (Sqm.)	
		3.1.2	Ceiling Height :- (m)	
		3.1.3	Flooring :- (e.g. CC / Kota/ Tiles etc. )	
		3.1.4	Water proofing, if any :- (e.g. Kota,Membrane,Crystallization of concrete etc. )	
		3.1.5	Water Proofing of Horizontal Surfaces :- (+Ve or - Ve Water Proofing Area )	

			<b>3.1.6</b>	Water Proofing of Vertical Surfaces:- (+Ve or - Ve Water Proofing Area )	
			<b>3.1.7</b>	Construction joint water Proofing:-	
		<b>3.2</b>	<b>Plinth/Under Floor Filling :-</b>		
			<b>3.2.1</b>	Average Plinth Height :- (Mts.)	
			<b>3.2.2</b>	Non B.C. Soil filling from available excavated earth. (thickness in mm)	
			<b>3.2.3</b>	Imported hard muram/hard copra filling having MDD not Less than 2.0 t/m <sup>3</sup> (thickness in mm)	
			<b>3.2.4</b>	Imported non B.C. Soil having MDD not Less than 1.85 t/m <sup>3</sup> (thickness in mm)	
			<b>3.2.5</b>	Cru-sheer stone dust (thickness in mm)	
			<b>3.2.6</b>	P.C.C. ( M:10 Or M:15 ) thickness inmm	
			<b>3.2.7</b>	Plinth Protection ( Width & thickness in mm )	
		<b>3.3</b>	<b>Anti Termite Treatment</b>		
			<b>3.3.1</b>	<b>Treatment Process :-</b> ( Spreading /Grouting/Piping,etc ) Sq.m./Lit./Nos,etc	
			<b>3.3.2</b>	Chemical used ( Fipronil/ Lmidaclopride /Cloropyrifos/ Cypermethrin/Bifenthrin,etc):-	
	<b>4</b>	<b>Concrete in R.C.C. Frame Structure Above Plinth Level</b>			
		<b>4.1</b>	<b>Unit Quantity of R.C.C in /Cum./Sq.m. of Built Up Area</b>		
		<b>4.2</b>	<b>Super Structure :-</b>		
			<b>4.2.1</b>	Type :- (e.g. Load Bearing ,RCC Frame etc. )	
			<b>4.2.2</b>	Grade of Concrete :- (e.g. M: 20 , M: 25, M:30 , M:40 etc. )	



	<b>5</b>	<b>Steel in R.C.C.Frame Structure Above Plinth Level</b>	
		( Kg./Sq.m. of Built Up Area ) Assumed or actual Quantity )	
	<b>6</b>	<b>Civil Work Other Than R.C.C Frame Structure Above Plinth Level</b>	
	<b>6.1</b>	<b>Stilt Parking, if any :-</b>	
	<b>6.1.1</b>	Area :- (Sq.m.)	
	<b>6.1.2</b>	Parking Capacity : (No. of car and bike parking)	
	<b>6.1.3</b>	Ceiling Height :- (Mts.)	
	<b>6.1.4</b>	Flooring :- (e.g. CC/ CC tiles/ Endura tiles/ Kota/Stone Flooring/ Paver Block etc.)	
	<b>6.2</b>	<b>Walls :-</b>	
	<b>6.2.1</b>	Material :-  (e.g. Bricks/Fly Ash Bricks/ AAC Blocks/ ACC panels etc. )	
	<b>6.2.2</b>	Jointing Mortar :- (e.g. C.M. 1:4/1:6 or Adhesive etc. )	
	<b>6.3</b>	<b>Roof :-</b>  (e.g. Soft roof (AC/ GI/ Acrylic/ PUF/ Galvalumium) Clay tile/ RCC/Prestressed/ Precast	
	<b>6.4</b>	<b>Inner Plaster :-</b>	
	<b>6.4.1</b>	Type :- (e.g. Cement sand Mortar/Synthetic polymermodified Mortar /Textured/Calcium silicate etc.)	
	<b>6.4.2</b>	Thickness :- (e.g. 6 mm , 8 mm , 12 mm/ 15 mm ,18 mm etc.)	
	<b>6.4.3</b>	Mix-Ratio :- (e.g. 1:4 /1:6 etc.)	
	<b>6.5</b>	<b>Outer Plaster :-</b>	
	<b>6.5.1</b>	Type :- (e.g. Cement sand Mortar/Sand faced/Synthetic polymer modified Mortar Washed stone grit/ Synthetic/Texturedetc.)	

			<b>6.5.2</b>	Thickness :- (e.g. 2-6 mm, 8-10 mm , 12 mm/ 15 mm ,18 mm , 20 mm etc.)	
			<b>6.5.3</b>	Mix-Ratio :- (e.g. 1:4 / 1:6/ as per item etc.)	
			<b>6.5.4</b>	Fibre mesh on external face of outer wall only ( 5 mm x 5 mm x45 GSM ) if any	
			<b>6.5.5</b>	Application Method ( By Machine or Hand )	
		<b>6.6</b>	<b>Wall Finishing (Inner):-</b> (e.g. Putty/Distemper/Paint/Texture etc.)		
		<b>6.7</b>	<b>Finishing (Outer):-</b> (e.g. Putty/Distemper/ Paint/ Texture/Stone dry Cladding/Stone vet Cladding/ Plain Glazing/ Structural Glazing / Spider Glazing / ACP/Cement Board /sand faced / Solid Surface etc.)		
		<b>6.8</b>	<b>Windows and Ventilators :-</b>		
			<b>6.8.1</b>	Frames :- (e.g. (Powder Coated/Anodised) Aluminium / UPVC/ MS - Tubular/ Pressed steel frame/ Wooden/ Angle iron etc.)	
			<b>6.8.2</b>	Shutters :- (e.g. Wooden/ (Powder Coated/Anodised) Aluminium/ UPVC/ MS tubular/ Glazed/ Panelled/ steel etc.)	
			<b>6.8.3</b>	Shutter Panels :- (e.g. Glass/ MS sheet/ Cement board/APP board/ Wooden Ply/ACP etc.)	
			<b>6.8.4</b>	Grills :- (e.g. Pipe tubes/ Square Bars/ Flats/ Aluminium etc.)	
			<b>6.8.5</b>	Fly proof mesh :- ( Steel /HDPE Net Fabrics )	
			<b>6.8.6</b>	Windows Sill & Jam Finishes ( eg. Plaster , stone , etc )	
		<b>6.9</b>	<b>Doors :-</b>		
			<b>6.9.1</b>	Frames :- (e.g. MS Angle iron/Wood/Plastic wood /Granite/Concrete frame /M.S. Tublar/UPVC/ Pressed steel/ Aluminium etc.)	

			<b>6.9.2</b>	Shutters :- (e.g. Flush /PVC/ Aluminium/wooden/ MS sheet/ Grill/ Rolling/ Collapsible/ Rolling Grill etc.)	
			<b>6.9.3</b>	Shutter Thickness :- (mm)	
			<b>6.9.4</b>	Door Jam Finishes ( eg. Plaster , Stone , etc)	
		<b>6.10</b>	<b>Flooring Types :-</b> (e.g. IT/Kota/Ceramic/Vitrified tiles/Granite/ Marble/Wooden/PVC/ Vinyl/Anti-Static Flooring/Mosaic/ Terrazzo/ Sand stone/Cement Tilesetc.)		
			<b>6.10.1</b>	In Circulation Area :- (e.g. Corridor/Reception/ Waiting/ Lift Lobby /Dado etc.)	
			<b>6.10.2</b>	In Rooms and Usable Spaces :- (e.g. Principal /Warden/ classrooms/Dormitory / Laboratory/Multipurpose Hall/Kitchenetc.)	
			<b>6.10.3</b>	Stair Cases :-	
			<b>6.10.4</b>	Toilets :- (e.g. Floor etc.)	
		<b>6.11</b>	<b>Dado / Skirting :-</b> (e.g. Kota/Rectified Ceramic Tiles/Vitrified tiles/Ultrathin Vitrified Tiles /Granite/ mosaic Marble/ Sand stone/Cement Tiles etc.)		
			<b>6.11.1</b>	In Circulation Area :- (e.g. Corridor/Reception/ Waiting/ Lift Lobby /Dado etc.)	
			<b>6.11.2</b>	In Rooms and Usable Spaces :- (e.g. Ward/Dormitory / Laboratory/Dining Hall/ Kitchen/O.T. etc.)	
			<b>6.11.3</b>	Staircase :-	
			<b>6.11.4</b>	Toilets :- (e.g. Walls etc.)	
		<b>6.12</b>	<b>Roof Treatment( Water Proofing) :-</b>		
			<b>6.12.1</b>	<b>Treatment Type :-</b> Grading Concrete/ APP/ Chemical treatment etc.	
			<b>6.12.2</b>	<b>Water ingress protection :-</b> ( e.g. Gola,Khurra,Drip Course )	
		<b>6.13</b>	<b>Roof Treatment( Heat insulation) :-</b>		

			6.13.1	Top of the roof:- (e.g. PUF, Heat Treatment Chemical , Heat reflecting , Tiles Polyurethane foam , Extruded polystyrene board , etc )	
			6.13.2	Under Deck :- ( Fiberglass, Mineral wool ,Cellulose, Polystyrene Over False Ceiling ,etc )	
		<b>6.14</b>	<b>Expansion Joints Treatment (if any)</b>		
			6.14.1	Roof :- (Yes/No)	
			6.14.2	Outer wall side :-(Yes/No)	
			6.14.3	Inner wall Side :-(Yes/No)	
			6.14.4	Intermediate Slab:- ( Yes/No)	
			6.14.5	Joint Treatment Type :- ( Bitumen mix filler, silicon sealant, Fibre board ,Stainless steel grade 304 plate , Polysulphide filler, Aluminium Strip,Aluminium Extruded sections,etc	
		<b>6.15</b>	<b>Railing ( Stair Case / Porch / Balcony / Terrace :-</b>		
			6.15.1	Quantity :- ( Rm/Sq.m. )	
			6.15.2	Material :-  (M.S./Steel/Wooden/Glass/Acrylic	
		<b>6.16</b>	<b>False Ceiling</b> (e.g.Gypsum ceiling ,Plaster of Paris ceiling , Fiber Mesh ceiling,Wooden ceiling , Glass ceiling , ,Metal ceiling , Metalic sheet ceiling , Mineral ceiling , Synthetic leather or cloth ceiling , Antibacterial ceiling ,PVC ceiling , Aluminum ceiling , Thermocol ceiling, etc)		
		<b>6.17</b>	<b>False Ceiling Area</b>		
			6.17.1	Quantity in Sq.m. :-	
			6.17.2	Quantity in % of Built Up Area :-	
<b>(II) Internal Services</b>					
	<b>7</b>	<b>Internal Water Supply &amp; Plumbing and Sanitary</b>			
		<b>7.1</b>	<b>Sanitary Fittings :-</b> (e.g. .Premium/Normal/CP/PTMT etc.)		
		<b>7.2</b>	<b>Water Supply Pipes(Internal):-</b> (e.g. GI/CPVC/PE-AL-PE etc.)		

		<b>7.3</b>	<b>Drainage (Internal Soil &amp; Waste water ) :-</b> (e.g. UPVC/ CI/AC/PVC/DWC etc.)	
		<b>7.4</b>	<b>Drainage (Rain water ) :-</b> (e.g. UPVC/AC/CI/PVC etc.)	
	<b>8</b>	<b>Internal Electrification</b>		
		<b>8.1</b>	<b>POINT Wiring in pvc conduit surface or concealed with pvc insulated copper conductor wire:-</b> (e.g. Modular/Normal Flush Type)	
		<b>8.2</b>	<b>Distribution Boxes IP43 Powder Coated:-</b> (e.g. Single Door/ Double door)	
		<b>8.3</b>	<b>MS Switch Boxes :-</b> (e.g. Modular/ Non modular )	
		<b>8.4</b>	<b>Fans:-</b> (e.g. 5 Star rating Energy saver50 W 1200mm/ Ornamental etc.)	
		<b>8.5</b>	<b>Tube lights:-</b> (e.g. T5/ Led type/ CFL type etc.)	
		<b>8.6</b>	<b>Lumanaries :-</b> (e.g. CFL/ LED etc.)	
		<b>8.7</b>	<b>Down lighter( Size &amp; Type ) :-</b> (e.g. T5/Led type/CFL type etc.)	
		<b>8.8</b>	<b>Electrical Load (KVA) :-</b>	
		<b>8.9</b>	<b>UPS &amp; Inverter</b> ( Capacity / Member / KVA )	
		<b>(III) Internal Special Services</b>		
	<b>9</b>	<b>HVAC</b>		
		<b>9.1</b>	<b>Types :-</b> (e.g. Window/Split/wall mounted/ ceiling mounted cassette./duct able /VRV/Water Chiller, etc.)	
		<b>9.2</b>	<b>Name of spaces:-</b> (e.g. Officers/Judge/OT/ICU/ etc.)	
		<b>9.3</b>	<b>Area of Spaces Covered (sq.m)</b>	
		<b>9.4</b>	<b>Percentage of area covered w.r.t total (Builtup Area (%)</b>	
		<b>9.5</b>	<b>HVAC Load :-</b> (tonnes)	
		<b>9.6</b>	<b>Electrical Load (KVA) :-</b>	
	<b>10</b>	<b>Lifts/Elevators</b>		
		<b>10.1</b>	<b>Types :-</b> (e.g. passenger, Stretcher, Goods etc.)	
		<b>10.2</b>	<b>Capacity:-</b> (e.g. No.of Passenger/Stretcher/load)	
		<b>10.3</b>	<b>Number of Lifts :-</b>	

		<b>10.4</b>	<b>Nos. Of Floors :-</b>	
		<b>10.5</b>	<b>Speed (metre/Sec)</b>	
		<b>10.6</b>	<b>Machine room :-</b> (machine room less or with machine room)	
		<b>10.7</b>	<b>Vision Panels (provided or not)</b>	
	<b>11</b>	<b>Solar Water Heating</b>		
		<b>11.1</b>	<b>Location :-</b> (Yes/No)	
		<b>11.2</b>	<b>Capacity:-</b> (In Litres)	
	<b>12</b>	<b>Solar Power</b>		
		<b>12.1</b>	<b>Location:-</b>	
		<b>12.2</b>	<b>Capacity (KVA):-</b>	
	<b>13</b>	<b>Fire Fighting</b>		
		<b>13.1</b>	<b>Fire Fighting system :-</b> (Hydrant/wet riser/wet dowlomer,Hozereel , wall mounted/ trolley mounted/fire extinguisher/Gas based fire fighting system, sprinklers etc. )	
	<b>14</b>	<b>Fire Detection</b>		
		<b>14.1</b>	<b>Fire Detection System :-</b> ( Fire detection System(alarming)/Smoke Detectors)	
		<b>14.2</b>	<b>Spaces Covered by Sprinklers ,if any</b>	
	<b>15</b>	<b>Audio Visual System</b>		
		15.1	Light (Material Type & Make):-	
		15.2	Sound (Material Type & Make):-	
		15.3	Wall Acoustics ( Material & Type & Make ):-	
	<b>16</b>	<b>Access Control</b>		
		16.1	Technical Details (Biometric or Electronic):-	
		16.2	Location Served :-	
	<b>17</b>	<b>C.C.T.V.</b>		
		17.1	CC TV system and locations capacity	
		17.2	LAN	
		17.3	LAN System Type	
		17.4	Location Served :-	
	<b>18</b>	<b>Telephony (EPABX, Nurse call System)</b>		
		18.1	EPABX	
		18.2	System Type	

		18.3	Location Served :-	
		18.4	Nurse Call System :-	
	<b>19</b>	<b>Acoustic &amp; False Ceiling</b>		
		19.1	Acoustic Material Type :-	
		19.2	Area ( in Sq.m. )	
	<b>20</b>	<b>Interior Decoration &amp; Art Work</b>		
		20.1	Material Type:-	
		20.2	Location:-	
	<b>21</b>	<b>Information Communication (IT)</b>		
		21.1	Raceway in flooring ,if provided ( Yes/No):-	
		21.2	Other Details :-	
	<b>22</b>	<b>Internal signage</b>		
	<b>23</b>	<b>Building Management System ( BMS )</b>		
		23.1	Location :	
		23.2	Technical Details :	
	<b>24</b>	<b>Miscellaneous Special Services such as Lighting Conductor, Façade light, Water Purifier, Incinerator, if Any</b>		
		<b>(IV) Equipment &amp; Furniture</b>		
	<b>25</b>	<b>Furnitures</b>		
		25.1	Material Type & Make :- (e.g. Steel , wooden, M.S. , Plastic,etc )	
		25.2	Use Type :- ( Office, Class Room, Hospital , R.H.,C.H.,Laboratory, Kitchen, Dining, Library, Out door, etc.)	
	<b>26</b>	<b>Lab Equipment</b>		
		26.1	Material Type : (e.g. Steel , wooden, M.S. , Plastic,etc )	
		26.2	Type Laboratories/Lab :- ( Physics , Chemistry ,Analytical and Quality Laboratories,BiosafetyLaboratories,Clinical and Medical Laboratories,IncubatorLaboratories,Production Laboratories,Research& Development (R&D) Laboratories.etc)	
	<b>27</b>	<b>Medical Equipment &amp; Accessories ,MGPS,OT,PTS,etc</b>		
		i	<b>Medical Gas Pipe Line:-</b> (Material Type and system )	
		ii	<b>Operation Theater:-</b> (e.g. Modular or Non modular )	

		iii	Pneumatic Tube system:-	
		iv	Medical Equipment & Accessories :-	
	<b>28</b>	<b>Kitchen Equipments</b>		
	<b>29</b>	<b>Laundry Equipments</b>		
	<b>30</b>	<b>Computer Hardware/Software</b>		
		( e.g. Computer , T.V. Video wall etc)		
		<b>Particular</b>		<b>Technical Provisions for whole campus</b>
		<b>(E1) Campus Services</b>		
	<b>31</b>	<b>Rain Water Harvesting</b>		
		<b>31.1</b>	<b>Type of Recharge structures</b> ( e.g. Recharge through Abandoned Dug Well /Hand pump/Recharge Pit/Trench/Gravity Head Recharge Tube Well /Recharge Shaft )	
		<b>31.2</b>	<b>Dia of Pipe</b> ( e.g. 50mm@6.6sq.m/ 75mm @ 20.4 sq.m/ 100mm@42.70sq.m/125mm @80.5 sq.m):-	
		<b>31.3</b>	<b>Nos. of down Pipe and Location :-</b>	
		<b>31.4</b>	<b>Filter Kit for down pipe :-</b> ( for each down pipe or combined for two or more down pipe )	
	<b>32</b>	<b>External Water Supply</b>		
		<b>32.1</b>	<b>Under Ground Storage :-</b>	
			32.1.1 Size of tank :-	
			32.1.2 Capacity of tank :-	
			32.1.3 Location :- In Campus & Distance	
			32.1.4 Type of Water Proofing :- (e.g. Kota/ Ceramic Tile/ Vitrified Tile or Crystillazation of Concrete etc)	
			32.1.5 Water Proofing :- Phase (+ve or - ve)	
		<b>32.2</b>	<b>Over Head Storage :-</b>	
			32.2.1 Size :-	
			32.2.2 Capacity:-	
			32.2.3 Location :-	
			32.2.4 Type of Tank:- (e.g. Sintex/ RCCetc)	



		32.2.5	Type of Water Proofing :- (e.g. Kota/ Ceramic Tile/ Vitrified Tile or Crystillazation of Concrete etc)	
		32.2.6	Water Proofing :- Phase (+ve or - ve)	
		<b>32.3</b>	<b>Type of water Source :-</b> (e.g. Tube well /Well/Municipal Pipeline etc.)	
		<b>32.4</b>	<b>Water Supply Pipes made of :-</b> (e.g. GI/ Steel/ RCC etc.)	
		<b>32.5</b>	<b>Distance of water Source ( Tapping Point ) :-</b> (mts)	
		<b>32.6</b>	<b>Submersible Pump Details :-</b> (e.g. Deep Well , Open Well, Centrifugal etc.)	
	<b>33</b>	<b>Sewerage Net Work</b>		
		Drainage Pipe (e.g. SW /RCC / UPVC / CI etc.)		
	<b>34</b>	<b>Effluent Treatment ( Septic Tank / STP/ETP /Bio Digester )</b>		
		34.1	<b>Type :-</b> (Septic Tank/STP/ETP /Bio Digester etc.)	
		34.2	<b>Technology :-</b> (MBBR/MBR/SBR /ETU /REED BED / ETP/KIT etc.)	
		34.3	Design User Number and Capacity :- (No.) & Technology Used	
		34.4	Distance of plant from building :- (mts)	
		34.5	Recommended /Provided Size :- KLD	
	<b>35</b>	<b>External Feeder Line Extension</b>		
		35.1	<b>Source Lines:-</b> (11kv,33kv)	
		35.2	<b>Distance from source( Tapping Point):-</b> (km)	
		35.3	<b>Connecting Feeder Lines:-</b> (11kv,33kv)	
		35.4	<b>Poles For Connecting Feeder Line :-</b> ( e.g RS Joint/ H Beam/Rail, Concreatect.)	
	<b>36</b>	<b>Substation ( Outdoor/Indoor )</b>		
		36.1	<b>Electrical Load of Campus (KVA):-</b>	

		36.2	<b>Substation Type:-</b> (e.g. conventional type/ Compact type/11kv /33 kv etc. )	
		36.3	<b>Transformer:-</b> (Capacity in KVA and NO.)	
		36.4	<b>Panels:-</b> (e.g. LT/MV/ Indoor/ Outdoor)	
	<b>37</b>	<b>L.T. Distributions</b>		
		37.1	<b>H.T. / Cables Type &amp; Length :-</b> ( km)	
		37.2	<b>L.T.Panels Type :-</b>	
		37.3	<b>Location for panels :-</b>	
	<b>38</b>	<b>Street Lighting</b>		
		38.1	<b>Street Light Poles:-</b> (e.g, Tubular/Octogonal/Decorative)	
		38.2	<b>Steet Lights Lumanaries :-</b> (e.g. MH/LED etc.)	
	<b>39</b>	<b>D.G. Sets</b>		
		39.1	<b>Diesel Generator (DG) Set:-</b> (e.g. AMF/Without AMF)	
		39.2	<b>DG Capacity and Numbers :-</b> (Kva)	
		39.3	<b>DG Emergency Load :-</b>	
		<b>( E2 ) Campus Development</b>		<b>Technical Provisions For Whole Campus</b>
	<b>40</b>	<b>Dismantling and Site Clearing</b>		
	<b>41</b>	<b>Trees Cutting</b>		
	<b>42</b>	<b>Utilities shifting</b>		
	<b>43</b>	<b>Boundary Wall</b>		
		43.1	<b>Length :-</b> (mts)	
		43.2	<b>Height :-</b> (mts)	
		43.3	<b>Retaining Wall, If any :-</b>	
	<b>44</b>	<b>Main Entrance Gate /Boundary wall Gate / Wicket Gate/Security Room</b>		
		44.1	<b>Area :-</b>	
		44.2	<b>Height :-</b> (mts)	
		44.3	<b>Guard Room :-</b> (Yes/NO)	
	<b>45</b>	<b>Roads ( Internal Campus )</b>		

		<b>45.1</b>	<b>Internal Road :-</b> (e.g. WBM/CC/BT etc.)		
			45.1.1	Length :- (mts)	
			45.1.2	Width of Carriageway :- (mts)	
			45.1.3	Hard Shoulder Width and Type :- (Murrum/Paver block etc.)	
	<b>46</b>	<b>Road (External Approach )</b>			
		<b>46.1</b>	<b>Approach Road External :-</b> (e.g. WBM/CC/BT etc.)		
			46.1.1	Length :- (mts)	
			46.1.2	Width of Carriageway :- (mts)	
			46.1.3	Hard Shoulder Width and Type :- (Murrum/Paver block etc.)	
	<b>47</b>	<b>Culverts</b>			
			47.1	Length :- (mts)	
			47.2	Width of culvert :- (mts)	
			47.3	Type :( R.C.C/Pipe)	
	<b>48</b>	<b>Drainage ( Surface / Under Ground)</b>			
		<b>48.1</b>	<b>Surface Drain (Storm Water ) :-</b> (e.g.Open/Hume pipe/ RCC etc.)		
			48.1.1	Length :- (mts)	
			48.1.2	Size of opening :- (BXD/Dia.)	
		<b>48.2</b>	<b>Nalla Training :-</b>		
			48.2.1	Length :- (mts) & size	
			48.2.2	Size :- (BXD/Dia.)	
	<b>49</b>	<b>Landscaping ( Horticulture, Plantations )</b>			
			49.1	<b>Hardscaping :-</b> (e.g. paver block/ Stone Flooring/ Cement Concrete etc.)	
			49.2	<b>Softscaping :-</b> (e.g. Soil/Murrum/Grass etc.)	
			49.3	<b>Types and No.s of Plantation :-</b> (e.g. Neem/ Gulmmohar/jatropha/karanj etc.)	
			49.4	<b>Overground :-</b> (Electricity ,Cables)	
			49.5	<b>Underground :-</b> (Sewerage water supply, Fibre Optics)	
	<b>50</b>	<b>Art &amp; Sculpture</b>			
			50.1	<b>Material:-</b>	
			50.2	<b>Locations / Area :-</b>	

	<b>51</b>	<b>Parking</b>		
		51.1	<b>Open</b>	
		51.1.1	Four Wheeler ( Nos ) :-	
		51.1.2	Two Wheeler ( Nos ) :-	
		51.2	<b>Underground/Covered :-</b>	
		51.2.1	Four Wheeler ( Nos ) :-	
		51.2.2	Two Wheeler ( Nos ) :-	
	<b>52</b>	<b>Play Fields</b>		
		(names of sports and type of play fields)		
	<b>53</b>	<b>Play Equipment</b>		
		( Type of Equipment )		
	<b>54</b>	<b>Statutory approval fees.</b>		
		(For GRIHA Rating Building Permission, Environmental Clearance etc.)		
	<b>55</b>	<b>Miscellaneous Campus Development</b>		
<b>6</b>		<b>SCHEDULE OF FINISHES :-</b> ( Attached Yes/No ):-		
		6.1	Civil Work ( Format SOF- Civil Attached Yes/No ):-:-	
		6.2	Toilet Work ( Format SOF- Toilet Attached Yes/No ):-:-	
		6.3	Electrical Work ( Format SOF-Electrical Attached Yes/No ):- ):-	
<b>7</b>		<b>PROGRAM CHART:-</b>		
		7.1	CHART "P1" ( Project Programme Chart ) Attached Yes/No :-	
		7.2	CHART "P2" ( P.C.C. Programme Chart ) Attached Yes/No (Optional) :-	
<b>8</b>		<b>REVISED COST CHART , IF APPLICABLE</b>		
		8.1	Revised Cost Chart ( Format RA-B,RA-C,RA-D Attached Yes/No ):-	
<b>9</b>		<b>RATES ADOPTED:-</b> (MPPWD SOR, Non SOR etc.)		
<b>10</b>		<b>STANDARDS APPLICABLE :-</b> (e.g .NBC, IPHS, MCI, MP Bhumi Vikas Adhinyam,Kendriya Vidhyalaya certification, AICTE,GAD,AAI,ISHRAE,PCB,NEC, GRIHA, AERB etc.)		

<b>11</b>		<b>SPECIFICATIONS :-</b> (CPWD,BIS,MPPWD SOR etc.)	
<b>12</b>		<b>GREEN BUILDING RATING ,IF TARGETED ( Yes / No/ Rating Grade)</b>	
<b>Consultants</b>	Signature :-		
	Date :-		
	Name :-		
	Consultant:-		
	Company :-		
	Phone No. :-		
	Email Id:-		
	Consultant Empanelment No :-		
<b>Department</b>	Signature :-		
	Date :-		
	Name :-		
	Designation :-		
	Department :-		

<b>Name of Project :-</b>	CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.
<b>Project Builtup Area ( in sq.m.)</b>	Σ Total BU
<b>Total Campus Area ( in Hectare) :-</b>	0

**PROJECT ABSTRACT**  
( SUM OF ALL MAJOR COST CENTER )

All Amount in Rs.

Project Sub Head	Project Cost Center (PCC)		Cost			Project Cost Center Values				Reference Format
	Project Cost Center No. (PCC No.)	(Name of Building Work or External Work )	SOR	NON SOR	Total	Unit (Such as Number /Sq.M./ Hectares/ M)	Quantity (Such as Counted Number, Built Up Area or Campus Area or Length )	Per Unit Cost	Apportioned cost ( % of Net Project cost )	
1	2	3	4	5	6	7	8	9	10	11
Building Work	B1	Building No. 1 :- .....					0			Format C - 1
	B2	Building No. 2 :- .....								Format C - 2
	BN	Building No. N :- .....								Format C - N
Sub Total ( B1 +B2 + ..... BN (All BuildingWorks)			Σ above	Σ above	Σ above		Σ Total BU	Average (per sqm.)	Σ above %	
External Works	E1	Campus Services					0			Format D - 1
	E2	Campus Development					0			Format D - 1
Sub Total (E1+E2 (All External Works)			Σ above	Σ above	Σ above			Average (per Hectare)	Σ above %	
NET PROJECT COST ( B1 +B2 + ..... BN + E1+E2)			Σ above	Σ above	Σ above				100%	
Add Supervision Charges @.....										
GRAND TOTAL										
Add GST Charges @.....										
PROJECT COST										

<b>Consultants</b>	Signature :-	
	Date :-	
	Name :-	
	Designation :-	
	Consultant :-	
	Phone No. :-	
	Email Id:-	
<b>Department</b>	Signature :-	
	Date :-	
	Name :-	
	Department :-	

( Such as C1, C2.....Cn For Each "Building Works" Or "Project Cost Center" )

<b>Name of Project:-</b>	CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.									
<b>Project Cost Center ( As per Column 2, 3 &amp; 8 of Format - B)</b>	PCC No. (As per Column 2 of Format B)	B1								
	Name of Project Cost Center (PCC) ( As per Column 8 of Format B)	Building No. 1 :- .....								
	Built Up Area of Building (in Sqm.) :-	0								
<b>Building Work Abstract</b> (One For each "Building Works" or "Project Cost Center")										
Building Sub Heads	Name of Cost Center (As per DBR In Format "A")		Cost (INR)			Cost Center Values				ReferenceFormat
	Cost Center No (CC No.)	Building Work	SOR	NON SOR	Total	Unit (Sq.m./Cum/ M/Nos/KLD/ Hectares/Lump Sum )	Quantity	Per Unit Cost	Apportioned Cost (% of Total Cost of PCC)	
1	2	3	4	5	6	7	8	9	10	11
<b>(I) Civil Works</b>	1	Concrete in R.C.C. Frame Structure up to Plinth Level								Format -E
	2	Steel in R.C.C. Frame Structure work up to Plinth Level								Format -E
	3	Civil Work Other Than R.C.C Frame Structure upto plinth Level								Format -E
	4	Concrete in R.C.C. Frame Structure Above Plinth Level								Format -E
	5	Steel in R.C.C.Frame Structure Above Plinth Level								Format -E
	6	Civil Work Other Than R.C.C Frame Structure Above Plinth Level								Format -E
	<b>Sub Total</b>	<b>(I) Civil Works</b>	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>(II) Internal Services</b>	7	Internal Water Supply & Plumbing and Sanitary								Format -E
	8	Internal Electrification								Format -E
	<b>Sub Total</b>	<b>(II) Internal Services</b>	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>(III) Internal Special Services</b>	9	HVAC								Format -E
	10	Lifts/Elevators								Format -E
	11	Solar Water Heating								Format -E
	12	Solar Power								Format -E
	13	Fire Fighting								Format -E
	14	Fire Detection								Format -E
	15	Audio Visual System								Format -E
	16	Access Control								Format -E
	17	C.C.T.V.								Format -E
	18	Telephony (EPABX, Nurse call System)								Format -E
	19	Acoustic & False Ceiling								Format -E
	20	Interior Decoration & Art Work								Format -E
	21	Information Communication (IT)								Format -E
	22	Internal signage								Format -E
23	Building Management System ( BMS )								Format -E	
24	Miscellaneous Special Services such as Lighting Conductor, Façade light, Water Purifier, Incinerator, if Any									Format -E

FORMAT-										
( Such as C1, C2.....Cn For Each "Building Works" Or "Project Cost Center" )										
<b>Name of Project:-</b>	CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.									
<b>Project Cost Center ( As per Column 2, 3 &amp; 8 of Format - B)</b>	PCC No. (As per Column 2 of Format B)	B1								
	Name of Project Cost Center (PCC) ( As per Column 8 of Format B)	Building No. 1 :- .....								
	Built Up Area of Building (in Sqm.) :-	0								
<b>Building Work Abstract</b> (One For each "Building Works" or "Project Cost Center")										
Building Sub Heads	Name of Cost Center (As per DBR In Format "A")		Cost (INR)			Cost Center Values				Reference Format
	Cost Center No (CC No.)	Building Work	SOR	NON SOR	Total	Unit (Sq.m./Cum/ M/Nos/KLD/ Hectares/Lump Sum )	Quantity	Per Unit Cost	Apportioned Cost (% of Total Cost of PCC)	
1	2	3	4	5	6	7	8	9	10	11
	<b>Sub Total</b>	<b>(III) Internal Special Services</b>	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>(IV) Equipment &amp; Furniture</b>	25	Furnitures								Format -E
	26	Lab Equipment								Format -E
	27	Medical Equipment & Accessories ,MGPS,OT,PTS,etc								Format -E
	i	MGPS								
	ii	OT ( High End/Low End )								
	iii	PTS (Pneumatic Tube System )								
	iv	Medical Equipment & Accessories								
	28	Kitchen Equipments								Format -E
29	LaundryEquipments								Format -E	
30	Computer Hardware/Software								Format -E	
<b>Sub Total IV :- (Equipment &amp; Furniture )</b>			$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>Cost Center Cost (Sub Total I+II+III+IV) :-</b>			$\Sigma$ above	$\Sigma$ above	$\Sigma$ above					
<b>Consultants</b>	Signature :-									
	Date :-									
	Name :-									
	Designation :-									
	Consultant :-									
	Phone No. :-									
	Email Id:-									
Consultant Empanelment No :-										
<b>Department</b>	Signature :-									
	Date :-									
	Name :-									
	Designation :-									
	Department :-									



<b>FORMAT-</b> (One for All External Works)										
<b>Name of Project:-</b>		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.								
<b>Campus Area ( in Hect.) As per column 8 Format B :-</b>		0								
<b>External Work Abstract</b> ( One for All External Works )										
External Sub Head	Name of Cost Center (As per DBR In Format "A")		Cost (INR)			Cost Center Values				Reference Fo rmate
	Cost Center No (CC No.)	External Works	SOR	NON-SOR	Total	Unit (Sq.m./Cum/ M/Nos/KLD/ Hectares/Lump Sum )	Quantity	Per Unit Cost	Apportioned Cost (% of Total Cost of PCC)	
1	2	3	4	5	6	7	8	9	10	11
<b>(E1) Campus Services</b>	31	Rain Water Harvesting								Format -E
	32	External Water Supply								Format -E
	33	Sewerage Net Work								Format -E
	34	Effluent Treatment ( Septic Tank / STP/ETP /Bio Digester )								Format -E
	35	External Feeder Line Extension								Format -E
	36	Substation ( Outdoor/Indoor )								Format -E
	37	L.T. Distributions								Format -E
	38	Street Lighting								Format -E
	39	D.G. Sets								Format -E
	<b>Sub Total</b>	<b>( E1 ) Campus Services</b>	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>( E2 ) Campus Development</b>	40	Dismantling and Site Clearing								Format -E
	41	Trees Cutting								Format -E
	42	Utilities shifting								Format -E
	43	Boundary Wall								Format -E
	44	Main Entrance Gate /Boundary wall Gate / Wicket Gate/Security Room								Format -E
	45	Roads ( Internal Campus )								Format -E
	46	Road ( External Approach )								Format -E
	47	Culverts								Format -E
	48	Drainage ( Surface / Under Ground)								Format -E
	49	Landscaping ( Horticulture, Plantations )								Format -E
	50	Art & Sculpture								Format -E
	51	Parking								Format -E
	52	Play Fields								Format -E
	53	Play Equipment								Format -E
54	Statutory approval fees.								Format -E	
55	Miscellaneous Campus Development								Format -E	
	<b>Sub Total</b>	<b>( E2 ) Campus Development</b>	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>All External work Total E1+ E2 :- ( External Services + Campus Development )</b>			$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	$\Sigma$ above	Average (per sqm.)	$\Sigma$ above %	
<b>Consultants</b>	Signature :-									
	Date :-									
	Name :-									
	Designation :-									
	Consultant :-									
	Phone No. :-									
	Email Id:-									
Consultant Empanelment No :-										
<b>Department</b>	Signature :-									
	Date :-									
	Name :-									
	Designation :-									
	Department :-									

RMAT -E ( Abstract of cost)								
<b>Name of Project:-</b>		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.						
S.No. and Name of Project cost center as per column 2&3 of Format -B								
S.No.and Name of Cost Center As per Column 2 & 3 of Format C or Format D :-								
Note ( 1 ) :-		Prepare Format E for each Cost Center separately and fill up value in Format C & Format D						
Note ( 2 ) :-		Description of item in Format E (Abstract of Cost) is optional . The same can be hidden.						
<b>Cost Abstract</b> (Separate for each "Cost Center" )								
								All Amount in Rs.
S.No.	SOR Item NO.	SOR sub item No, if any	Item Name	Description of Item	Unit	Quantity	Rate	Amount
1	2	3	4	5	6	7	8	9
<b>SOR ITEMS</b>								
1								
2								
n								
<b>SUB TOTAL SOR ITEMS</b>								
<b>NON-SOR ITEMS</b>								
1								
2								
n								
<b>SUB TOTAL NON SOR ITEMS</b>								
<b>TOTAL SOR + NON SOR ITEMS</b>								
<b>Consultants</b>		Signature :-						
		Date :-						
		Name :-						
		Designation :-						
		Consultant :-						
		Phone No. :-						
		Email Id:-						
<b>Department</b>		Consultant Empanelment No :-						
		Signature :-						
		Date :-						
		Name :-						
		Designation :-						
Department :-								

<b>FORMAT - (Quantity Sheet</b>										
<b>Name of Project:-</b>		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.								
S.No. and Name of Project Cost Center as per column 2 and 3 of format -B										
S.No. and Name of Cost Center as per Column 2 & 3 of 'Format C' or 'Format D ':-										
<b>Quantity Sheet (Separate in Support of each Format 'F ' )</b>										
S.No.	SOR ITEM NO.	SOR sub item No, if any	Items Name	Description of Item	Unit	Nos	Length L	Breadth B	Depth D	Quantity
1	2	3	4	5	6	7	8	9	10	11
<b>SOR ITEMS</b>										
1										
2										
n										
<b>NON-SOR ITEMS</b>										
1										
2										
n										
<b>Consultants</b>		Signature :-								
		Date :-								
		Name :-								
		Designation :-								
		Consultant :-								
		Phone No. :-								
		Email Id:-								
<b>Department</b>		Consultant Empanelment No :-								
		Signature :-								
		Date :-								
		Name :-								
		Designation :-								
Department :-										

**FORMAT -T1**  
(One for Whole Project)

<b>Name of Project:-</b>	CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.
<b>Project Builtup Area ( in sq.m.)</b>	
<b>Total Campus Area ( in Hectare)</b>	

**( TECHNICAL SANCTION DETAILS )**

					All Amount in Rs.	
S.No.	Description	Amount SOR	Amount NON SOR	Amount TOTAL	T/S No. & date	Reference Format
1	2	3	4	5	6	7
1	Civil Work of Project :-					Format T2
2	Electrical Work of Project :-					Format T3
	<b>Project Cost ( Net) :-</b>	<b>∑ above</b>	<b>∑ above</b>	<b>∑ above</b>		
	AddSupervisioncharges .....% (DoesnotrequiredT.S.)					
	<b>Sub Total :-</b>	<b>∑ above</b>	<b>∑ above</b>	<b>∑ above</b>		
	AddG.S.T .....% (DoesnotrequiredT.S.)					
	<b>Project Cost Proposed for AA ( in Rs.)</b>	<b>∑ above</b>	<b>∑ above</b>	<b>∑ above</b>		
	<b>Project Cost Proposed for AA ( in Rs. Lakh)</b>					

FORMAT -T2 (One for Whole Project)						
Name of Project:-		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.				
Total Builtup Area (Sq.m) :-				Total Campus Area (Hect) :-		
TECHNICAL SANCTION OF CIVIL WORKS (TO BE ACCORDED BY THE COMPETENT AUTHORITY FOR TECHNICAL SANCTION OF CIVIL WORKS )						
S.No.	Sub item no.	Items	Amount SOR	Approved Amount NON SOR	Amount TOTAL	Format
1	2	3	4	5	6	8
<b>CIVIL WORKS OF BUILDINGS</b> ( Repeat information of sub item no. I, II , III & IV for each building or group of buildings )						
1	<b>Name of buildings No.1:-.....</b>					
	I	<b>Civil Works :-</b>				
		1(R.C.C. Frame Structure up to plinth level)+ 2 (Steel for R.C.C. Frame Structure work up to Plinth Level )+ 3(Civil Work Other Than R.C.C Frame Structure upto plinth Level)+ 4(Concrete in R.C.C. Frame Structure Above Plinth Level)+ 5(Steel for R.C.C. Frame Structure Above Plinth Level)+ 6(Civil Work Other Than R.C.C Frame Structure Above Plinth Level)				Format C - 1
	II	<b>Internal Services :-</b>				
		7 (Internal Water Supply & Plumbing and Sanitary )				Format C - 1
	III	<b>Special Services :-</b>				
		13(Fire Fighting)+ 19(Acoustic & False Ceiling)+ 20(Interior Decoration & Art Work)				Format C - 1
	IV	<b>Equipment &amp; Furniture</b>				
		25 (Furnitures)				Format C - 1
		<b>Sub Total Amount :- I+II+III+IV</b>	above	₹ above	₹ above	
2	<b>Name of buildings No.2:-.....</b>					
	I	Civil Works :-				Format C - 2
	II	Services :-				Format C - 2
	III	Special Services :-				Format C - 2
	IV	Equipment & Furniture				Format C - 2
		<b>Sub Total Amount :- I+II+III+IV</b>	above	₹ above	₹ above	
3	<b>Name of buildings No.N:-.....</b>					
	I	Civil Works :-				Format C - N

	II	Services :-				Format C - N
	III	Special Services :-				Format C - N
	IV	Equipment & Furniture				Format C - N
		<b>Sub Total Amount :- I+II+III+IV</b>	<b>Σ</b> above	above	above	
		<b>Sub Total Amount Building No. 1+2+.....N :-</b>				
<b>CIVIL WORKS OF EXTERNALWORKS ( ONLY ONE FOR WHOLE PROJECT)</b>						
	V	<b>External Services :-</b>				
		31(Rain Water Harvesting)+ 32(External Water Supply)+ 33(Sewerage Net Work)+ 34(Effluent Treatment ( Septic Tank / STP/ETP /Bio Digester )				Format D- 1
	VI	<b>Campus Development :-</b>				
		40(Dismantling and Site Clearing )+ 41(Trees Cutting )+ 42(Uilities shifting )+ 43(Boundary Wall )+ 44(Main Entrance Gate /Boundary wall Gate / Wicket Gate/Security Room)+ 45(Internal Campus Road )+ 46(External Approach Road)+ 47( Culverts )+ 48( Drainage ( Surface / Under Ground)+ 49(Landscaping ( Horticulture, Plantations )+ 50(Art & Sculpture )+ 51( Parking )+ 52( Play Fields)+ 53( Play Equipment )+ 54 (Statutory approval fees. Civil)+ 55(Miscellaneous Campus Development)	Σ	-	-	Format D - 1
		<b>Sub Total Amount:-</b>				
		<b>Sub Total</b>	above	Σabove	Σabove	
<b>TOTAL CIVIL WORK T2</b>						
<b>Amount of Technical Sanction of civil works</b>						
		<b>SOR (Rs).....</b>				
		<b>NON SOR (Rs).....</b>	Σ	-	-	
<b>( Signature &amp; Seal )</b>						
<b>Competent Authority For Technical Sanction of Civil Works</b>						

-      Σ      Σ

Name of Project:- CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.

Project Builtup Area ( In sq.m)	Project Campus Area (In Hect)
---------------------------------	-------------------------------

**TECHNICAL SANCTIONS OF ELECTRICAL WORKS  
(TO BE ACCORDED BY THE COMPETENT AUTHORITY TECHNICAL SANCTION OF E/M WORKS )**

S.No.	Sub item no	Items	Amount SOR	Approved Amount NONSOR	Amount TOTAL	Format	Page No.
1	2	3	4	5	6	8	9

**ELECTRICAL WORKS OF BUILDINGS  
( Repeat information of sub item no. I, II , III & IV for each buildings )**

<b>1</b>	<b>Name of building No.1:-.....</b>						
	II	<b>Internal Services :-</b>					
		8 (Internal Electrification )				Format C - 1	
	III	<b>Special Services :-</b>					
		9(HVAC) + 10( Lifts/Elevators)+ 11(Solar Water Heating )+ 12(Solar Power )+ 14(Fire Detection + 15(Audio Visual System )+ 17(C.C.T.V. )+ 18(Telephony (EPABX, Nurse call System)+ 21( Information Communication (IT)+ 22(Internal signage)+ 23(Building Management System ( BMS) + 24 (Miscellaneous Special Services such as Lighting Conductor, Water Purifier, Incinerator, if Any )				Format C - 1	
	IV	<b>Equipment &amp; Furniture</b>					
		26(Lab Equipment)+ 27( Medical Equipment & Accessories ,MGPS,OT,PTS,etci+ii+iii+iv)+ 28(Kitchen Equipments)+ 29 ( Laundry Equipments)+ 30 (Computer Hardware/Software)				Format C - 1	
		<b>Sub Total Amount :</b>	<b>₹ above</b>	<b>₹ above</b>	<b>₹ above</b>		
<b>2</b>	<b>Name of building No.1 .....</b>						
	II	Services :-				Format C - 2	
	III	Special Service :-				Format C - 2	
	IV	Equipment & Furniture				Format C - 2	
		<b>Sub Total Amount :</b>	<b>₹ above</b>	<b>₹ above</b>	<b>₹ above</b>		
<b>3</b>	<b>Name of building No.1.....N</b>						
	II	Services :-				Format C - N	
	III	Special Service :-				Format C - N	
	IV	Equipment & Furniture				Format C - N	
		<b>Sub Total Amount :</b>	<b>₹ above</b>	<b>above</b>	<b>₹ above</b>		
		<b>Sub Total Amount Building or group of building No. 1+2+.....N :-</b>					

<b>ELECTRICAL WORKS OF EXTERNAL WORKS ( ONLY ONE FOR WHOLE PROJECT )</b>							
	V	<b>External Service of Campus :-</b>					
		35(External Feeder Line Extension)+ 36(Substation ( Outdoor/Indoor )+ 37 (L.T. Distributions )+ 38(Street Lighting)+ 39(D.G. Sets) ( Add all E/M Works)				Format D- 1	
	VI	<b>Campus Development :-</b>					
		54 (Statutory approval fees. Electrical)				Format D- 1	
<b>Sub Total</b>			₹ above	above	₹ above		
<b>TOTAL ELECTRICAL WORK T3</b>							
<b>Amount of Technical Sanction of E/M works</b>							
<b>SOR (Rs).....</b>							
<b>NON SOR (Rs).....</b>							
<b>( Signature &amp; Seal )</b>							
<b>Competent Authority For Technical Sanction of E/M Works</b>							



<b>Name of Project:-</b>		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.						
<b>Project Cost Center ( As per Column 2, 3 &amp; 8 of Format -B)</b>	PCC No. As per Column 2 of Format B	BN						
	Name of "Project Cost Center" ( PCC ) ( As per Column 8 of Format B	Building No. N :-.....						
	Built Up Area of Building (in Sqm.) :-	0						
<b>BILL OF QUANTITIES (BOQ)</b>								
							All Amount in Rs.	
Unique BOQ No.	Item No.	Sub Item No.	Items Name	Description of Item	Quantity	Unit	Rate	Amount
1	2		3	4	5	6	7	8
<b>CIVIL WORKS <u>OR</u> ITEMS ( Q1 )</b>								
1								
2								
3								
n1								
<b>Q1=SUBTOTALCIVILWORKS(<u>OR</u>ITEMS)</b>								
<b>CIVIL WORKS <u>NON-SOR</u> ITEMS ( Q2 )</b>								
n1+1								
n1+2								
n1+3								
n1+n=n2								
<b>Q2=SUBTOTALCIVILWORKS(<u>NONSOR</u>ITEMS)</b>								
<b>Q1+Q2=TOTALCIVILWORKS(<u>SOR</u>+<u>NONSOR</u>)</b>								
<b>ELECTRICAL &amp; MECHANICAL WORKS <u>OR</u> ITEMS ( Q3 )</b>								
n2+1								
n2+2								
n2+3								
n2+n=n3								
<b>Q3=SUBTOTALELECTRICAL&amp;MECHANICALWORKS(<u>SOR</u>ITEMS)</b>								
<b>ELECTRICAL &amp; MECHANICAL WORKS <u>NON-SOR</u> ITEMS ( Q4 )</b>								
n3+1								
n3+2								
n3+3								
n3+n=n4								
<b>Q4=SUBTOTALELECTRICAL&amp;MECHANICALWORKS(<u>NONSOR</u>ITEM)</b>								
<b>Q3+Q4=TOTALELECTRICAL&amp;MECHANICALWORKS(<u>OR</u>+<u>NONSOR</u>)</b>								
<b>Q = ( Q1+Q2 )+(Q3+Q4) GRAND TOTAL (=PAC):-</b>								
<b>Consultants</b>		Signature :-						
		Date :-						
		Name :-						
		Consultant:-						
		Company :-						
		Phone No. :-						
		Email Id:-						
<b>Department</b>		Consultant Empanelment No :-						
		Signature :-						
		Date :-						
		Name :-						
		Designation :-						
		Department :-						

**CHART "P1"**  
**(Project Programme Chart)**

Name of Project/Department Name/Built up Area Sq.m. / Cost in Lakhs **CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.**

Stipulate Periodicity Month	...	Start Date (Zero date)	...../...../.....	Stipulated Target Date	...../...../.....	Revised Target Date	...../...../.....	Revised Periodicity Month	...../...../.....	Date of Achievement	...../...../.....
-----------------------------	-----	------------------------	-------------------	------------------------	-------------------	---------------------	-------------------	---------------------------	-------------------	---------------------	-------------------

Project Sub Head	S.No.	Project Cost Center	Target	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )			Milestone :- ( M-IV )				Remarks
			Period Elapsed from Start date Zerodate	1/16	2/16	3/16	4/16	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	13/16	14/16	15/16	

Building Works	1	Building No.-1																	
			////////////////////																
			////////////////////																
		2	Building No.-2																
				////////////////////															
				////////////////////															

External works	4	External Services																	
			////////////////////																
			////////////////////																
		5	Campus Development																
				////////////////////															
				////////////////////															

**CHART "P2" (Project Cost Center Programme Chart)**

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulate Perio inMont		Start Date (Zero date)	...../...../.....	Stipulated Traget Date	...../...../.....	Revised TargetDate	...../...../.....	Revised perio inMont	...../...../.....	Date of Achievem	...../...../.....									
Building Sub Heads	S. No.	Description	Target Achievement \\\\\\\\\\\\\\\\'	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remarks
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/16.	14/16.	15/16.	16/16.	

(I) Civil Works	1	Concrete in R.C.C. Frame Structure up to Plinth Level																		
		i	Excavation in Foundation	\\\\\\\\\\\\\\\\\\\\																
				\\\\\\\\\\\\\\\\\\\\																
		ii	Footing	\\\\\\\\\\\\\\\\\\\\																
				\\\\\\\\\\\\\\\\\\\\																
		iii	R.C.C. Work	\\\\\\\\\\\\\\\\\\\\																
				\\\\\\\\\\\\\\\\\\\\																
		2	Steel in R.C.C. Frame Structure work up to Plinth Level	\\\\\\\\\\\\\\\\\\\\																
				\\\\\\\\\\\\\\\\\\\\																
		3	Civil Work Other Than R.C.C Frame Structure upto plinth Level	\\\\\\\\\\\\\\\\\\\\																
				\\\\\\\\\\\\\\\\\\\\																
		4	Concrete in R.C.C. Frame StructureAbove Plinth Level																	
			i	R.C.C. Work	\\\\\\\\\\\\\\\\\\\\															
					\\\\\\\\\\\\\\\\\\\\															
			ii	Brick Work	\\\\\\\\\\\\\\\\\\\\															
					\\\\\\\\\\\\\\\\\\\\															
		iii	Door	\\\\\\\\\\\\\\\\\\\\																

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.															
---	--	---	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Stipulated Period in Month	Start Date (Zero date)	...../...../.....	Stipulated Target Date	...../...../.....	Revised Target Date	...../...../.....	Revised period in Month	...../...../.....	Date of Achievement	...../...../.....										
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remarks
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/16.	14/16.	15/16.	16/16.	
			//////////																	
	iv	Windows	//////////																	
			//////////																	
	v	Plastering Work	//////////																	
			//////////																	
	vi	Flooring Work	//////////																	
			//////////																	
	vii	False Ceiling Work	//////////																	
			//////////																	
	viii	Painting Work	//////////																	
			//////////																	
	5	Steel in R.C.C.Frame Structure Above Plinth Level	//////////																	
			//////////																	
	6	Civil Work Other Than R.C.C Frame Structure Above Plinth Level	//////////																	
			//////////																	
(II) Internal Services	7	Internal Water Supply & Plumbing and Sanitary																		
	i	Water Supply Line	//////////																	
			//////////																	
	ii	Plumbing Work	//////////																	

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth	Start Date (Zero date)	...../...../.....	Stipulated Target Date	...../...../.....	Revised TargetDate	...../...../.....	Revised period inMonth	...../...../.....	Date of Achievemen	...../...../.....										
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remarks
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/16.	14/16.	15/16.	16/16.	
			//////////																	
	iii	Sanitary Fittings	//////////																	
			//////////																	
	8	Internal Electrification																		
	i	Electrical Line ( Open & Concealed )	//////////																	
			//////////																	
	ii	Electrical Fixture	//////////																	
			//////////																	
(III) Special Services	9	HVAC	//////////																	
			//////////																	
	10.00	Lifts/Elevators	//////////																	
			//////////																	
	11	Solar Water Heating	//////////																	
			//////////																	
	12	Solar Power	//////////																	
			//////////																	
	13	Fire Fighting	//////////																	
			//////////																	
14	Fire Detection	//////////																		
		//////////																		
15	Audio Visual System	//////////																		
		//////////																		

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth	Start Date (Zero date)	...../...../.....	Stipulated Target Date	...../...../.....	Revised TargetDate	...../...../.....	Revised period inMonth	...../...../.....	Date of Achievement	...../...../.....								Remark		
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remark
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/16.	14/16.	15/16.	16/16.	
	16	Access Control	////////////////																	
			////////////////																	
	17	C.C.T.V.	////////////////																	
			////////////////																	
	18	Telephony (EPABX, Nurse call System)	////////////////																	
			////////////////																	
	19	Acoustic & False Ceiling	////////////////																	
			////////////////																	
	20	Interior Decoration & Art Work	////////////////																	
			////////////////																	
	21	Information Communication (IT)	////////////////																	
			////////////////																	
	22	Internal signage	////////////////																	
			////////////////																	
	23	Building Management System ( BMS )	////////////////																	
			////////////////																	

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth	Start Date (Zero date)	...../...../.....	Stipulated Traget Date	...../...../.....	Revised TargetDate	...../...../.....	Revised peric inMonth	...../...../.....	Date of Achieveme	...../...../.....								Remark		
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remark
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/.16	14/16	15/16	16/.16	
	24	Miscellaneous Special Services such as Lighting Conductor, Façade light, Water Purifier, Incinerator, ifAny	////////////////																	
			////////////////																	
(IV) Equipment & Furniture	25	Furnitures	////////////////																	
			////////////////																	
	26	Lab Equipment	////////////////																	
			////////////////																	
	27	Medical Equipment & Accessories ,MGPS,OT,PTS,etc	////////////////																	
			////////////////																	
	28	Kitchen Equipments	////////////////																	
			////////////////																	
(V) External Services	30	Computer Hardware/Software	////////////////																	
			////////////////																	
	31	Rain Water Harvesting	////////////////																	
			////////////////																	
	32	External Water Supply	////////////////																	
		////////////////																		
	33	Sewerage Net Work	////////////////																	



Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth	Start Date (Zero date)	...../...../.....	Stipulated Traget Date	...../...../.....	Revised TargetDate	...../...../.....	Revised peric inMonth	...../...../.....	Date of Achieveme	...../...../.....								Remark		
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remark
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/.16	14/16	15/16	16/.16	
			//////////																	
	34	Effluent Treatment ( Septic Tank / STP/ETP /Bio Digester )	//////////																	
			//////////																	
	35	External Feeder Line Extension	//////////																	
			//////////																	
	36	Substation ( Outdoor/Indoor )	//////////																	
			//////////																	
	37	L.T. Distributions	//////////																	
			//////////																	
	38	Street Lighting	//////////																	
			//////////																	
	39	D.G. Sets	//////////																	
			//////////																	
( V ) Campus Development	40	Dismantling and Site Clearing	//////////																	
			//////////																	
	41	Trees Cutting	//////////																	
			//////////																	
	42	Utilities shifting	//////////																	
			//////////																	



Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth	Start Date (Zero date)	...../...../.....	Stipulated Target Date	...../...../.....	Revised TargetDate	...../...../.....	Revised period inMonth	...../...../.....	Date of Achievement	...../...../.....										
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remark
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/.16	14/16.	15/16.	16/.16	
	43	Boundary Wall	////////////////																	
			////////////////																	
	44	Main Entrance Gate /Boundary wall Gate / Wicket Gate/Security Room	////////////////																	
			////////////////																	
	45	Roads ( Internal Campus )	////////////////																	
			////////////////																	
	46	Road (External Approach )	////////////////																	
			////////////////																	
	47	Culverts	////////////////																	
			////////////////																	
	48	Drainage ( Surface / Under Ground)	////////////////																	
			////////////////																	
	49	Landscaping ( Horticulture, Plantations)	////////////////																	
			////////////////																	
	50	Art & Sculpture	////////////////																	
			////////////////																	
	51	Parking	////////////////																	
			////////////////																	

Name of Project / Department Name / Built up Area Sq.m. / Cost inLakh		CONSTRUCTION OF BUILDING PROJECT OF "PROJECT X" AT " PLACE Y" IN "DISTRICT Z" OF M.P.																		
Stipulated Period inMonth		Start Date (Zero date)	...../...../.....	Stipulated Traget Date	...../...../.....	Revised TargetDate	...../...../.....	Revised period inMonth	...../...../.....	Date of Achieveme	...../...../.....									
Building Sub Heads	S. No.	Description	Target Achievement	Milestone :- ( M-I )				Milestone :- ( M-II )				Milestone :- ( M-III )				Milestone :- ( M-IV )				Remark
			Period Elapsed from Start date Zero date	1/16.	2/16.	3/16.	4/16.	5/16.	6/16.	7/16.	8/16.	9/16.	10/16.	11/16.	12/16.	13/.16	14/16.	15/16.	16/.16	
	53	Play Equipment	////////////////																	
			////////////////																	
	54	Statutory approval fees.	////////////////																	
			////////////////																	
	55	Miscellaneous Campus Development	////////////////																	
			////////////////																	

( FORMAT - 'RA' -B )

REVISED COST CHART							
Name of Project / Department Name / Built up Area Sq.m. / Cost in Lakh							
Sanction Project Cost ( in Lacs )							
Project cost (As Per Tender ( ± % ) Cost)							
Project Sub Hea	Project Cost Center No. (PCC No.)	(Name of Building Work or External Work )	As per sanction Estimate	As per Revised /Actual	Cost		Remark
			Amount	Amount	Excess	Saving	
Building Work	B1	Building No. 1 :- ..... .....					
	B2	Building No. 2 :- ..... .....					
	BN	Building No. N :- ..... .....					
Sub Total ( B1 +B2+ ..... BN (All BuildingWorks)			₹ above	₹ above	₹ above	₹ above	
External Works	E1	Campus Services					
	E2	Campus Development					
Sub Total (E1+E2 ) (All External Works)							
NET PROJECT COST ( B1 +B2+ ..... BN + E1+E2)							
Add Supervision Charges@.....							
GRAND TOTAL							
Add GST Charges@.....							
PROJECT COST							

(I) CivilWork+(II)InternalServices+(III)InternalSpecialServices+(IV)Equipment&amp;Furniture

REVISED COST CHART							
NameofProject/DepartmentName/BuiltupArea Sq.m./CostinLakh							
Sanction Project Cost ( in Lacs )							
Project cost (As Per Tender ( ± % ) Cost)							
Building Sub Heads	S. No.	Name of Cost center	As per sanction Estimate	As per Revised /Actual	Cost		Remark
			Amount	Amount	Excess	Saving	
(I) Civil Works	1	Concrete in R.C.C. Frame Structure up to Plinth Level					
		i	Excavation in Foundation				
		ii	Footing				
		iii	R.C.C. Work				
	2	Steel in R.C.C. Frame Structure work up to Plinth Level					
	3	Civil Work Other Than R.C.C Frame Structure upto plinth Level					
	4	Concrete in R.C.C. Frame Structure Above Plinth Level					
		i	R.C.C. Work				
		ii	Brick Work				
		iii	Door				
		iv	Windows				
		v	Plastering Work				
		vi	Flooring Work				
		vii	False Ceiling Work				
		viii	Painting Work				
		5	Steel in R.C.C.Frame Structure AbovePlinth Level				
	6	Civil Work Other Than R.C.C Frame Structure Above Plinth Level					
(II) Internal Services	7	Internal Water Supply & Plumbing and Sanitary					
		i	Water Supply Line				
		ii	Plumbing Work				
		iii	Sanitary Fittings				
	8	Internal Electrification					
		i	Electrical Line ( Open & Concealed )				
	ii	Electrical Fixture					

REVISED COST CHART							
Name of Project/Department Name/Built up Area Sq.m./Cost in Lakh							
Sanction Project Cost ( in Lacs )							
Project cost ( As Per Tender ( ± % ) Cost)							
Building Sub Heads	S. No.	Name of Cost center	As per sanction Estimate	As per Revised /Actual	Cost		Remark
			Amount	Amount	Excess	Saving	
(III) Internal Special Services	9	HVAC					
	10	Lifts/Elevators					
	11	Solar Water Heating					
	12	Solar Power					
	13	Fire Fighting					
	14	Fire Detection					
	15	Audio Visual System					
	16	Access Control					
	17	C.C.T.V.					
	18	Telephony (EPABX, Nurse call System)					
	19	Acoustic & False Ceiling					
	20	Interior Decoration & Art Work					
	21	Information Communication (IT)					
	22	Internal signage					
	23	Building Management System ( BMS )					
24	Miscellaneous Special Services such as Lighting Conductor, Façade light, Water Purifier, Incinerator, if Any						
(IV) Equipment &Furniture	25	Furnitures					
	26	Lab Equipment					
	27	Medical Equipment & Accessories ,MGPS,OT,PTS,etc					
	i	MGPS					
	ii	OT ( High End/Low End )					
	iii	PTS (Pneumatic Tube System )					
	iv	Medical Equipment & Accessories					
	28	Kitchen Equipments					
	30	Computer Hardware/Software					
<b>TOTAL</b>							

(E1)CampusServices+(E2)CampusDevelopment

REVISED COST CHART							
NameofProject/DepartmentName/BuiltupArea Sq.m./CostinLakh							
Sanction Project Cost ( in Lacs )							
Project cost (As Per Tender ( ± % ) Cost)							
Building Sub Heads	S. No.	Name of Cost center	As per sanction Estimate	As per Revised /Actual	Cost		Remark
			Amount	Amount	Excess	Saving	
(E1) Campus Services	31	Rain Water Harvesting					
	32	External Water Supply					
	33	Sewerage Net Work					
	34	Effluent Treatment ( Septic Tank / STP/ETP/Bio Digester )					
	35	External Feeder Line Extension					
	36	Substation ( Outdoor/Indoor )					
	37	L.T. Distributions					
	38	Street Lighting					
	39	D.G. Sets					
(E2) Campus Developme nt	40	Dismantling and Site Clearing					
	41	Trees Cutting					
	42	Utilities shifting					
	43	Boundary Wall					
	44	Main Entrance Gate /Boundary wall Gate / Wicket Gate/Security Room					
	45	Roads ( Internal Campus )					
	46	Road (External Approach )					
	47	Culverts					
	48	Drainage ( Surface /Under Ground)					
	49	Landscaping ( Horticulture, Plantations )					
	50	Art & Sculpture					
	51	Parking					
	53	Play Equipment					
	54	Statutory approval fees.					
	55	Miscellaneous Campus Development					
	<b>TOTA</b>						








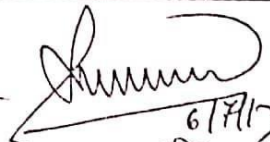


**M.P.P.W.D. SCHEDULE OF TESTING CHARGES (2013)**

S.No.	Material of Test	Specified Test Performed	Reference of Test Method	Quantity of Sample	Testing Charges Per Test (Rs.)
1	2	3	3	4	5
1	Cement	Standard Consistency	IS:4031(Part-4) -1988	Min. 1 Scaled Bag of 50 Kgs.	385.00
		Initial And Final Setting Time	IS:4031(Part-5) - 1988		385.00
		Compressive Strength of Cement ( For 2 Ages)	IS:4031(Part-6) - 1988		855.00
		Soundness Test By Le Chatelier Method	IS:4031(Part-3) -1988		620.00
		Fineness Test By Blains Air Permiability Method	IS:4031 (Part-2) - 1999		650.00
		Adultration by Bromoform Method	--		- 665.00
		2	Aggregate		Sieve Analysis / Fineness Modulus (Coarse Aggregate)
Sieve Analysis / Fineness Modulus (Fine Aggregate)	IS:2386 (Part-1) - 1963			Min. 5 Kgs.	520.00
Flakiness and Elongation Index	IS:2386 (Part-1) - 1963			Min. 50 Kgs.	420.00
Water Absorption (Coarse Aggregate)	IS:2386 (Part-3) - 1963			Min. 5 Kgs.	265.00
Water Absorption (Fine Aggregate)	IS:2386 (Part-3) - 1963			Min. 2 Kgs.	265.00
Specific Gravity (Coarse Aggregate)	IS:2386 (Part-3) -1963			Min. 5 Kgs.	265.00
Specific Gravity (Fine Aggregate)	IS:2386 (Part-3) -1963			Min. 2 Kgs.	265.00
Aggregate Impact Value	IS:2386 (Part-4) - 1963			Min. 10 Kgs.	455.00
Crushing Value	IS:2386 (Part-4) - 1963			Min. 20 Kgs.	455.00
Bulk Density (Coarse Aggregate)	IS:2386 (Part-3)-1963			Min. 30 Kgs.	200.00
Bulk Density (Fine Aggregate)	IS:2386 (Part-3)-1963			Min. 7 Kgs.	265.00
Soundness (Coarse Aggregate) (5 Cycle)	IS:2386 (Part-5) - 1963			Min. 10 Kgs.	2125.00
Soundness (Fine Aggregate) (5 Cycle)	IS:2386 (Part-5) - 1963			Min. 10 Kgs.	1875.00
Delitrious Material (Coarse Aggregate)	IS:2386 (Part-2) - 1963			Min. 10 Kgs.	705.00

  
**Research Officer\***  
 Central Research Laboratory  
 M.P.P.W.D., BHOPAL  
 Ph. No. 0755-2776494


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 31/12/18  
 संयुक्त परियोजना संचालक  
 कार्यालय परियोजना संचालक  
 लोक निर्माण विभाग (प्र.आर.स.)  
 निर्माण भवन, असेरा हिल्स, भोपाल

  
 6/1/17  
 मुख्य वास्तुविद  
 सह मुख्य अभियंता  
 (अनुसंधान विकास एवं रूपांकन)  
 लोक निर्माण विभाग, म.प्र., भोपाल

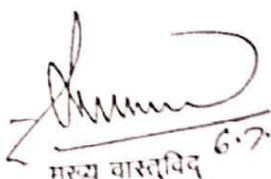





S.No.	Material of Test	Specified Test Performed	Reference of Test Method	Quantity of Sample	Testing Charges Per Test (Rs.)
1	2	3	3	4	5
		Specific Gravity	IS 2720 (Part-3) - 1980	Min. 1Kgs.	310.00
		Natural Moisture Content	IS 2720 (Part-2) - 1973	Min. 1 Kgs.	310.00
5(A)	Bitumen	Penetration	IS: 1203 - 1978	Min. 1 Kgs.	480.00
		Absolute Viscosity	IS:1206 (Part-2)	Min. 1 Kgs.	540.00
		Ductility	IS:1208 - 1978	Min. 1 Kgs.	800.00
		Specific Gravity	IS:1202 -1978	Min. 1 Kgs.	295.00
		Softening Point	IS:1205 - 1978	Min. 1 Kgs.	480.00
		Flash Point & Fire Point	IS:1209 - 1978	Min. 1 Kgs.	480.00
		Rate of Spray of Binder	SP- 11-1976		365.00
5(B)	Bitumen Mix	Bitumen Binder Content	SP: 11-1988, ASTM D 2172.	Min. 5 Kgs	1115.00
		Marshal Stability	ASTM D 1559	Min 20 Kgs.	1540.00
		Bituminous Mix Design (Job Mix Formula for Bituminous Mix) by Marshal Stability Method	IRC 29- 1988	Min Bit. 20 Kgs + Agg. 50 Kgs	10835.00
6	Steel	Determination of Yield Strength, Tensile Strength and Elongation of Steel Bar of All Diameter with the Help of UTM	IS 1608: 2005	3 Nos. of Min. 1000 mm Long	2170.00
		Weight Per Meter	IS:1786 - 2008	3 Nos. of Min 1000 mm Long	235.00
		Bend & Rebend Test	IS:1599 - 1985, IS:1786 - 2008	3 Nos. of Min 1500 mm Long	875.00
7	Concrete	Mix Design Upto M25 Grade	IS 10262-1982, IS: 456, SP 23	Min. Cement 50 Kgs. + Sand 80 Kgs + Agg. (10 mm) 80 Kgs. +Agg (20 mm). 120 Kgs.	6890.00


  
 Research Officer\*  
 Central Research Laboratory  
 M.P.P.V.D., BHOPAL  
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 निर्माण मन्त्र. अररा हिल्स, भोपाल

  
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 6.7.13

No.	Material of Test	Specified Test Performed	Reference of Test Method	Quantity of Sample	Testing Charges Per Test (Rs.)
1	2	3	3	4	5
		Mix Design Above M25 Grade	IS 10262 - 1982	Min. Cement 50 Kgs. + Sand 80 Kgs. + Agg (10 mm) : 80 Kgs. + Agg (20 mm) : 120 Kgs.	7860.00
		Compressive Strength of Cube (15x15x15 Cms)	IS 516 - 1959	3 Nos.	380.00
		Compressive Strength of Cylindrical Concrete Specimen	IS 516 - 1960	3 Nos.	380.00
		Determination of Ratio of Cement, Sand and Aggregate in Hardened Concrete.	IS: 1199 - 1959	Min. Concrete: 10 Kgs. + Cement Used: 1Kg. + Sand Used 1 kg.	3880.00
8	Cement Mortar	Determination of Ratio of Cement and Sand in Hardened Mortar	IS: 1199 - 1959	Min. Mortar: 5 Kgs. + Cement Used: 1Kg. + Sand Used 1 kg.	3500.00
9	Concrete Paver Block	Water Absorption	IS: 15658 2006	3 Nos.	290.00
		Abrasion Resistance Value	IS: 15658 2006	8 Nos.	1035.00
		Compressive Strength	IS: 15658 2006	8 Nos.	495.00
10	Concrete / Terrazo / Chequered Flooring Tiles	Water Absorption	IS 1237-1980 / IS 13801	6 Nos.	290.00
		Resistance to Wear	IS: 1237-1980 / IS 13801	6 Nos.	800.00
		Wet Transverse Strength	IS: 1237-1980 / IS 13801	6 Nos.	480.00
11	Glazed Ceramic Vitrified Tiles	Water Absorption	IS: 13630 (Part-2)-2006	5 Nos.	290.00
		Modulus Of Rupture	IS 13630 (Part-6)-2006	5 Nos.	480.00
		Scratch Hardness According To MOHS	IS: 13630 (Part-13)-2006	3 Nos.	760.00
		Dimension/ Surface Quality	IS: 1360 (Part-1)-2006	10 Nos.	265.00
		Abrasion	IS 13630 (Part 11): 2006	15 Nos.	800.00
		Chemical Resistance For Stains	IS: 13630 (Part-2)-2006	5 Nos.	690.00

  
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1	2	3	4	5
Material of Test	Specified Test Performed	Reference of Test Method	Quantity of Sample	Testing Charges Per Test (Rs.)
12	Marble/Granite / Kota Stone	Scratch Hardness According To MOHS	IS:13630 (Part-13)-2006	3 Nos. 760.00
13	Timber	Moisture Content	IS:1708 (Part-1) - 1986	1 No. of 5 x 5 x 2.5 Cms. 415.00
		Flush Door End Emersion Test	IS: 4020 (Part-13) -1986	1 Door Shutter 520.00
		Flush Door Knife Test	IS: 4020 (Part-14) -1986	1 Door Shutter 520.00
		Flush Door Adhesion Test	IS: 4020 (Part-15) - 1986	1 Door Shutter 520.00
14	Hollow Concrete Block	Compressive Strength	IS : 2185 (Part I) - 1979	8 Nos. 495.00
		Water Absorption	IS : 2185 (Part I) - 1979	3 Nos. 290.00
		Block Density	IS 2185 (Part I) - 1979	3 Nos. 345.00
15	Field Test	Plate Load Test (SBC) (Without Lab Conveyance)	IS: 1888 - 1982	-- 15225.00
		Standard Penetration Test (Without Lab Conveyance)	IS: 2131-1981	-- 8330.00
		Field density by Sand Replacement Method (Without Lab Conveyance)	IS: 2720 (Part-28) - 1974	-- 790.00
		Field density by Core Cutter Method (Without Lab Conveyance)	IS:2720 (Part 29) - 1975	-- 420.00
		Slump Test (3 Trials)	IS: 1199 - 1959	-- 380.00
		3 Nos. Core of 15 Cms Dia and Max 30 Cms in Length Obtained from Cutting of Bituminous Pavement (Without Lab Conveyance)	--	-- 3000.00
		3 Nos. Core of 15 Cms Dia and Max 30 Cms in Length Obtained from Cutting of Concrete Pavement (Without Lab Conveyance)	--	-- 3000.00
16	Collection of Sample	Upto 8 Kms (Without Lab Conveyance)	--	-- 800.00
		Beyond 8 Kms (Without Lab Conveyance)	--	-- 1600.00

  
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