



GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
(A GOVT. OF GUJARAT UNDERTAKING)

E-TENDER NOTICE NO.02 OF 2026-27 Sr No.1

Tender Papers of technical bid for the work of Up-Gradation of fire station for four fire tenders along with control room, conference room & dormitory for fire and disaster team at GIDC Umargam.

VOLUME -II

TECHNICAL

BID

EXECUTIVE ENGINEER

First Floor, Administrative Building,

Plot No. C/5-101,

Nr. Telephone Exchange, Cross road,

G.I.D.C.-Vapi, 396195

INDEX OF TECHNICAL BID

Name of work: Up-Gradation of fire station for four fire tenders along with control room, conference room & dormitory for fire and disaster team at GIDC Umargam.

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INSTRUCTIONS TO BIDDER FOR BID

If any price-bid contains any conditions, the same shall have to be rejected outright.

- A.** The bidder shall clearly indicate deviation(s) from specifications or the tender conditions very explicitly in the appropriate section and submit a copy of the same with the documents to be submitted by hand delivery. It should be very clearly understood by all tenderers that the technical bid should be restricted only to technical matters and stipulations of conditions. If any, by tenderer having financial implications, the prices of the main tender should not be disclosed in the technical bid.
- B.** The technical bid with pre-qualification application will be opened first in the presence of those bidders who remain present.
- C.** First, application for pre-qualification submitted by the tender along with the technical bid will be scrutinized & based on information given by the bidder. GIDC will pre-qualify the application of applicant. The price bid of dis-qualified tenderer by GIDC will not be opened and opened technical bid will not be considered. The GIDC will determine the time and date of opening of price bid, and the same will be intimated to the qualified bidders. If required after the technical bid proposal are opened and analyzed and all clarifications / price variations, if any are obtained.
- D.** The conditions specified in the Technical Bid should invariably be accompanied by proper financial evaluation with mode of calculation, specifying assumptions, quantities, and rates and ceiling amounts for each condition and shall also accompany the information in the form stating.
 - a. Sr. No.
 - b. Description of the condition.
 - c. Financial evaluation
 - d. Ceiling amount.
- E.** Ceiling amounts shall be binding on the contractors and are liable to be added to the tender amount.
- F.** It is necessary that the contractor or his authorized representative remain present at the time of opening of technical bid as specified in (F) above so that wanting details and clarifications in respect of conditions can be furnished by him or conditions withdrawn on the spot by him. If the technical bid is incomplete in respect of any of the details referred to in sub clauses (G) above and the contractor does not furnish the wanting details as required above on the spot in the presence of other bidders after opening the technical bid, the tender would be liable for rejection.
- G.** The evaluation as given by the contractor with the ceiling limit will then be intimated to all the bidders who remain present and then, if convenient, the price bid may be opened on the same day and the combined evaluation of the tender of price-bid and the technical bid would be worked out. No further opportunity shall be given to the contractor to modify/ withdraw conditions at that stage as the price bid would be known to all GIDC. However, reserves the right to negotiate about the tender (s) further with any or all the contractors. In case the price bids cannot be opened on the same day then another date will be intimated to the tenderers as in para (F) above.
- H.** The Competent Authority of GIDC shall open tenders in the presence of any intending contractors who have submitted tenders or their representatives who may choose to remain

present at the time and he will enter the amount of the several tenders in a comparative statement in a suitable form. In the event of a tender being accepted, the contractor shall thereupon for the purpose of identification, sign copies of the specifications and other documents mentioned in this tender.

- I. The GIDC shall have the right of rejecting all or any of the tenders, without assigning any reason thereof.
- J. The contractor shall exhibit a board as per requirement of GIDC with detailed specification and details of work and amount at site at his own cost as directed by the Engineer-in - charge.

K. CONDITION FOR EMPLOYEES PROVIDENT FUND AND MISC.PROVISION ACT-1952.

The contractor shall responsible for complying with the provision of the employee provident fund and miscellaneous provision Act-1952 scheme and modifications of the Act from time to time. The contractor shall get themselves enrolled with the Regional Provident Fund commissioner of any competent officer appointed under the Act and shall have to get a separate number in respect of their respective establishment as defined in Sec. 3 of the employees Provident Fund Act and shall discharge all the liabilities arising out of the aforesaid Act as provided in Para 36A of the scheme and other provisions of the Act.

“The Engineer – in – charge on receiving a report from the competent inspecting officer under the said Act shall have the power to deduct from the payment to the contractor any sum required or estimated to be required for making good the loss/suffered by the worker or workers by reason of non-fulfillment of the condition of the contractor for the benefit of the workers under the said Act. The contractor shall indemnify GIDC against any payment to be made for the observance of the regulations aforesaid.

The contractor shall produce the certificate and registration number with R.P.F.C. while entering into agreement, the same shall be produced within one month from the date of work order. If the contractor fails to produce proof of its registration R.P.F.C. and an amount of equal to 3% of the gross amount payable to the contractor shall be recovered from his running account bills from the 1st R. A. Bill at the rate of 3% of the gross amount of the R. A. Bill till the registration from R.P.F.C. is obtained and produced to the GIDC. In all 3% on the total gross payment made for the work shall stands to be recovered from the running account bills to contractor. If even till completion of works and deducting the amount 3% contractor has not registered its establishment with R.P.F.C., Security Deposit when payment shall also not be refunded till the clearance certificate of the compliance of the provisions of the Act is obtained by the contractor and Produced to the Executive Engineer, contractor shall sign indemnity bond in favor of GIDC but amount shall be withheld till R.P.F.C. registration certificate is received by GIDC.

L. LABOUR CONTRACT ACT:

The contractor tendering for the work shall have to obtain licensee under the labour contractor (Registration and Abolition) Act-1970 within a week of award of work and comply with all the amenities for the amenity if not provided by the contractor such amenity shall be provided by the Executive Engineer, as principal employees as his representative within the prescribed time and the expenses incurred by the principal employer Providing the amenity shall be recovered by the amount payable the contractor. The contractor shall Act in accordance with the provision of the Act in all respect and shall above the principal employer from any consequence whatsoever. Every Principal employer shall nominate a representative duly authorized by him to be present at the time of disbursement of wages and it shall be the duty of such representative to certify the amount paid as wages in such manner as may be prescribed.

In case, the contractor fails to make payment of wages within the prescribed period of payment of wages in full or the unpaid balance due as the case may be, the correct Labour employed by the contractor and recover the amount so paid from the contractor by deducting from any amount payable to the contractor under any contract.

The contractor shall provide every facility to the principal employer to maintain registers and records giving particulars of contract Labour employed. The nature of work performed by the contract Labour the rates of wages paid to the contract Labour and such other particulars that are prescribed or may be prescribed under the provisions of the said Act.

- M.** The Unit rates specified for various items to be executed as per Schedule – B attached with the Price Bid are excluding GST but inclusive of all labors, materials, testing charges, Labour Cess & Other taxes, equipment's, all incidental charges involving in the work and as specified in the Mode of measurement & payment of detailed specifications of items incl. all taxes, royalty, octroi, transportation cost etc. all as applicable presently as to be enforced for future by any / all including Central/State Government & Statutory bodies from time to time.
- N.** Income tax with surcharge shall be recovered from bill of contractor as per govt. Notification. Agency may produce certificate from competent officer of sale tax department if deduction at source is not to be operated.
- O.** All works shall be carried out as per PWD HB Vol. I & II and the specifications attached with the technical bid or as directed by Engineer- in-charge.
- P.** Material delivered either in broken condition of non-confirming to the quality ordered shall not be accepted and claim for whatever reason shall not be entertained.
- Q.** The tenderer shall have to give testing in presence of concern Engineer and test report shall be produce along with materials.
- R.** Earnest money as mentioned in the memorandum of work in brief attached herewith shall be paid in the form of DD/FDR for the minimum period of 180 days and documents for the same should be attached with the technical bid only.
- S.** If the tender is taken in favor of the company a power of attorney/necessary authorization in favor of the person who may have signed the tender for the company must accompany the tender.
- T.** The rate quoted include clearance of site (Prior to commencement of work & at its close) in all respects and hold good for work under all conditions including site moisture, weather etc.
- U.** Any sort of correction or erasure in the tender shall not be done by the tenderer by applying white fluid or any other chemical. The tenders with corrections made in aforesaid manner shall be out rightly rejected by the Corporation if not initiated at corrected figures & words.
- V.** If any corrections, erasures or overwriting are required by the tenderer before submitting the tender, all the corrections, shall be initiated by the tenderer only before submission of the tender, otherwise the tender shall be rejected by the corporation.
- W.** The contractor shall have to furnish the Permanent Account No. Assessment No. & Ward under which he is assessed.
- X.** The contractor shall have to furnish the True copy of the GST Registration and R.P.F.C. registration certificate.
- Y.** The contractor shall have to obtain the Insurance of all the labour, staff working at site and hand over the receipt of Insurance Policy etc.
- Z.** The contractor will be required to pay cess of 1% of construction cost to the industrial safety and health department Valsad/competent authority or by challan at respective treasury office or it will be deducted from RA bill.

AA.

- All testing of material /output of processed material shall have to be got tested in a GERI/GIDC approved laboratory, as defined in general/technical Specification/Item wise specification. The payment for the testing charges to the laboratory shall be made by GIDC as per bill received. The testing charges of an amount limited to 1% of estimated cost put to tender shall be deducted from the bills.
- There are chances to occur some excess / extra items in the tender qty. based on actual work as finalised by GIDC department. But the bidder shall not claim anything beyond tender terms and conditions.
- As per clause of Form B-1, if the quantity of any item exceeds the quantity as in the tender by more than 10% the contractor will be paid for the quantity in excess of 10% at the rate entered in the SOR of the year during which the excess in quantity is first executed or tender whichever is less. The same shall have to be got approved from GIDC before execution by the bidder.
- There are also chances that some items may not be required to execute / to execute in very less qty than tendered quantity, as per finally approved decisions from GIDC. In this situation, the bidder shall not have any right to claim anything extra for such items.
- All Kinds of Material Test and Core Tests, NDT Tests for RCC works and Other Tests laboratory charges for Asphalt Road works & all other components shall be paid by Bidders.

BB. Joint Venture (J.V.) is not allowed.

CC. MAINTENANCE GUARANTEE PERIOD:

- a. Maintenance works for all works done under this contract.

The contractor shall also undertake Five years Maintenance contract starting from the date of completion of the work.

The contractor shall undertake five years comprehensive free maintenance contract with effect from the certified date of completion of the work, as per Modified Clause No.17B of B-1 Form.

The contractor shall have to give Five years free maintenance guarantee period from the certified date of completion of work as per Modified clause No. 17B of B1 agreement attached herewith. During this period contractor shall have to maintain & repair the damaged portion of all the items of Building including its components, Plumbing Network &, electric work incl. Street Light done under this contract by him at his risk and cost as per direction of the Engineer-in-charge of GIDC.

The requirement and nature of repair work will be decided by Engineer-in-charge and will be binding to contractor.

During the free maintenance guarantee period as described under Para above, Contractor shall be responsible for maintaining the building including its components, Plumbing Network &, electric work incl. Street Light, approaches to plots /sheds including its components & other works done under this contract including its components in best of condition by carrying out the routine maintenance works as decided by the Engineer-in- charge. The routine maintenance work shall be carried out as per direction of Engineer-in-charge.

Special repairs shall be carried out for keeping the building including its components, Plumbing Network &, electric work incl. Street Light in perfect condition from time to time. Action shall be taken for repairing of all the damages the pot holes, depressions, cuts in surface, approaches to plots/sheds, including its components & other works so that the crust as well as other components of the work does not get damaged due to any reasons whatsoever.

During the free maintenance guarantee period, contractor shall have to repair the building including its components, Plumbing Network &, electric work incl. Street Light at his risk and cost as per direction of the Engineer-in-charge or GIDC. The entire cost of testing shall be borne by the contractor. Contractor will perform such test periodically (minimum once in a year) during the guarantee period or as directed by the Engineer-in-charge or GIDC.

GIDC reserve the right to withdraw the maintenance work at any stage. The decision of GIDC will be final and binding to the contractor.

MAINTENANCE GUARANTEE BOND FOR SAFEGUARDING THE INTEREST OF THE GIDC & ASSURING THE MAINTENANCE OF THE ROAD TO BE UNDERTAKEN BY THE CONTRACTOR AS DESCRIBED ABOVE IN PARA (a)

The contractor shall have to execute the maintenance guarantee bond / Bank Guarantee of Nationalized schedule bank amounting to 5 % of estimated cost put to tender or amount equal to maintenance cost of 05 years shown in bid, whichever is more in the given format attached herewith or in the format as approved by the GIDC and shall be for validity period of **Five years** before the date of completion of the work. The banker shall confirm this every year.

The maintenance guarantee bonds can be release after maintenance guarantee period is over.

DD. SUPERVISION OF WORK:

GIDC reserves rights to get check the quality of works through **THIRD PARTY INSPECTION** also in addition to the Engineer-in-charge & Quality Control Units of the GIDC.

EE. SECURED ADVANCE & MOBILIZATION ADVANCE:

Secured advance and mobilization advance shall not be paid by GIDC.

FF. PRICE ESCALATION:

Price escalation shall be payable as per Clause no 60A of B1 agreement. Clause No.60 is deleted.

GG. SURVEYING & MEASURING EQUIPMENTS:

Equipment for surveying & measurement on the work shall be procured by the contractor for his use. The same also is made available to the Engineer at site or any work connected with the contract without any additional charges.

HH. UNITS RATES UNDER SCHEDULE "B":

The Unit rates specified for various items to be executed as per Schedule – B attached with the Price Bid are excluding GST but inclusive of all labors, materials, testing charges, Labour Cess & Other taxes, equipment's, all incidental charges involving in the work and as specified in the Mode of measurement & payment of detailed specifications of items incl. all taxes, royalty, octroi, transportation cost etc. all as applicable presently as to be enforced for future by any / all including Central/State Government & Statutory bodies from time to time.

II. PERFORMANCE BOND / BANK GUARANTEE OF NATIONALIZED BANK:

The contractor shall have to execute the Performance Bond / Bank Guarantee of Nationalized schedule bank amounting to (5 % of estimated cost put to tender) in the given format attached herewith or in the format as approved by the GIDC and shall be for validity period of 2 Years with effect from the date of work order. The banker shall confirm this every year.

N.S.C. / F.D. / S.S.N.N.L. shall also be acceptable in favor of the EE, GIDC, Vapi

The performance Bond / B.G. or N.S.C. / F.D. / S.S.N.N.L. shall become refundable as per clause No. 1.

JJ. Others:

The tenderer shall have to make arrangement for providing accommodation for housing office for the departmental staff and laboratory for quality control etc. at two locations of work site, details of which are as under:

(i) Office:6.00 MX 6.00 M(Minimum-Facility should be as mentioned Memorandum of work)

(ii) Laboratory:6.00 M X 6.00 M (Minimum)

The above structure shall be semi- permanent type.

KK. NO PAYMENT TOWARDS MAINTENANCE WORK: -

- a. If the contractor does not maintain the building including its components & other works done under this contract to the entire satisfaction of GIDC / Engineer-in-charge, GIDC will undertake repairs of the building & its components by themselves and the expenditure so incurred shall be recovered from Maintenance Guarantee Bond. GIDC reserves right to en-cash Maintenance Guarantee Bond.
- b. The maintenance guarantee amount shall be given for 5% of the estimated cost and in the form of Bank Guarantee of Nationalized Bank / Schedule Bank for the period of minimum 05 (Five) years and shall only be released after satisfactory completion of maintenance guarantee period of 5 (Five) years. The maintenance guarantee bond shall have to be executed on non-judicial stamp paper in standard Performa.

Bidders signature

**Executive Engineer
GIDC, VAPI**

PERFORMANCE BOND

(See clause No. 1)

(The date of the bond must not be prior to the date of instrument in connection with which it is given)

Principal (Contractor)
Surety (Bank)
Sum of bond (express in words and figures)
Contract No. & date of contract

KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE PRINCIPALS AND SURETY above named are held and firmly bound into the _____

Hereinafter, called the Employer in the amount stated for payment of which sum, well and truly to be made, we bind, ourselves, our heirs, executors, administrators and successors jointly and severally, firmly by these presents subject to the provisions of which the aforesaid Contractor on demand and without demand on a claim being made by the Employer.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principals have entered into a contract with the Employer numbered and dates as shown above and hereto attached for the execution of work:

NOW THEREFORE, if the Principal shall well and truly perform and fulfill at the undertaking, covenants, terms, conditions and agreements of said contract during the original terms of the said contract and any extensions thereof that may be granted by Employer with or without notice to the surety and during the life or any guarantee required under the contract and shall also well and truly perform and fulfill all the Undertakings, covenants, terms, conditions and agreements of any all duty and unduly authorized modifications of said contract that may hereafter he made, notice of which modifications to the surety being hereby waived or shall pay over, make good and reimburse to the Employer all loss and damages which the employer may sustain by reason of failure of default on the part of said Principal so to do.

We _____, further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for a validity of the said Contract and that it shall continue to be enforceable till all the dues of the Employer under or by virtue of the contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the contract have been fully and properly carried out by the said Contractor and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the _____ we shall be discharged from all liabilities under this guarantee thereafter.

IN WITNESS WHERE OF, the above bounded parties have executed this instrument under their several seals on the date indicated above the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

IN THE PRESENT OF WITNESS

INDIVIDUAL

PRINCIPAL

(1)	as to	(Seal)
(2)	as to	(Seal)
(3)	as to	(Seal)
(4)	as to	(Seal)

by _____ affix corporate seal

Attested

Corporate Surety _____

Business address:

Affix by _____ Corporate

seal _____

Title

BIDDER'S SIGNATURE

FREE MAINTENANCE BOND

Whereas _____ (Name of Agency) have been awarded a contract dated _____ for the work of infrastructure for **Up-Gradaation of fire station for four fire tenders along with control room, conference room & dormitory for fire and disaster team at GIDC Umargam.**

Whereas the said _____ (Name of Agency) has approached (Name of Bank) _____ to provide Free Maintenance Guarantee Bond to the GIDC, Vapi Division for the work of _____ under takes by _____ (Agency & _____ Address) _____ and Whereas the said _____ (Name of Bank) have agreed provide such a Free Maintenance Guarantee Bond.

Now, therefore, we the _____ (Name of Bank) provide the following Free Maintenance, Bank Guarantee by way of this bond to the GIDC, Vapi Division.

- 1) The contract value of the contract provide to _____ Agency _____ by the GIDC _____ in _____ Rs. _____ (Rupees _____).

This Guarantee in the nature of Free Maintenance Guarantee is provided so as to ensure and indemnify the GIDC for full & proper performance of the contract by _____ (Name of Agency) & _____ (Name of Bank).

Here by indemnify the GIDC for all losses and / or damages to the infrastructure which would be laid or surface _____ (Name of Agency) and such Free Maintenance Guarantee would include any damage to any of the work executed under this contract which may be suffered by GIDC, by way of this bond. We _____ (Name of Bank) agree and promise that in the eventuality of the contractors _____ (Name of Agency) not repairing or remedying the problem, loss or damage to the road surface and other work of all the components, we shall indemnify and pay the GIDC such expenses, losses and damages, that may be incurred by the GIDC as a result of the GIDC getting the work done itself or from other source.

- 2) We _____ (Name of Bank) agree and understand that the decision as to whether any losses or damages to the road surface and other work of all the components have taken place or not and / or whether the work will be taken the Executive Engineer, GIDC, Vapi Division and in the Executive Engineers decision regarding such losses or damages or defects what so eve being so notified by the GIDC to us. We shall immediately take steps and ensure that (Name of Agency) faithfully and diligently carry out the necessary remedial steps to the full satisfaction of the Executive Engineer, GIDC, Vapi. The opinion of the Executive Engineer as to whether full and complete remedial steps, to the satisfaction of the Executive Engineer, GIDC, Vapi has been taken or not, will be that of GIDC. For the purpose of arriving at such decision as aforesaid it will be open to the Executive Engineer GIDC-Vapi, in case he so desires to delegate this power to any nominated officer of GIDC, however, to supplement Executive Engineer to take appropriate decision and the decision referred to above will be deemed to be properly take and as if taken by the Executive Engineer, GIDC, Vapi. In the eventuality of (Name of Agency) not taking remedial action to the utmost satisfaction of Executive Engineer, GIDC, Vapi will be entitled to get the work done by themselves or from other sources. On the Executive Engineer, GIDC, Vapi notifying to us the total expenses incurred for their purpose. We hereby expressly undertake to pay to GIDC, the said amount forthwith and in any case not later than thirty days from

such intimation. We shall accept as final binding the amount indicated by the Executive Engineer, GIDC, Vapi and our obligation to pay such amount will be continuing obligation irrespective of any dispute or difference that may arise between us and (Name of Agency) or between GIDC and (Name of Agency).

- 3) The contract value is Rs. _____ (Rupees _____). This Free Maintenance Guarantee is limited to 5% of the contract value and accordingly it comes to Rs. _____ (Rupees _____). Our liability will be in all cases be limited to Rs. _____ (Rupees _____).
- 4) We (Name of Bank) agree that the Free Maintenance Guarantee will be valid for a Period of **FIVE YEARS** from the date when the contract work is completed by (Name of agency). The Executive Engineer, GIDC, Vapi will notify such completion date to us.
- 5) We (Name of Bank) agree that the Free Maintenance Guarantee which is a documenting guarantee, will be binding and enforceable against us irrespective of any difference or dispute between GIDC and (Name of Agency) or between us and (Name of Agency).
- 6) In case any dispute arises as to the interpretation of this Free Maintenance Guarantee the matter shall be referred to the Civil Court Vapi whose decision in the matter will be final. In case any recourse to any court of law is necessitated, the Civil Court at Vapi alone will have jurisdiction.

Notwithstanding anything-contained hereinabove our liability under this guarantee is restricted to Rs. _____ (Rupees _____) and it shall remain in force for **FIVE YEARS from** the date of issue. The last date for claim will be date No claim period demanded unless a demand or claim under this Free Guarantee Bound is field against us on or before (date) all the rights under this Free Guarantee Bond shall be forfeited w.e.f. (Date) and we shall be relieved and discharged from all liability there under whether or not the original guarantee is returned to us.

Date this _____ day of _____ 2026 at Vapi.

For (Name of Bank)

Manager

GENERAL TECHNICAL SPECIFICATION

1) GENERAL:

These specifications apply to all such roads and other its related works as is required to be executed under the contract or otherwise directed by the Engineer-in-charge. In every case, the work shall be carried out to the satisfaction to the Engineer and confirm to the location, lines, dimensions, grades, & cross section shown on the drawing or as indicated by the Engineer. The quantity of materials, processing of materials as may be needed at the site, silent feature of the construction work and quality of finished work shall comply with the requirements set forth in succeeding section, where the drawing and specification describe a portion of the work in only general terms and not in complete detail it shall be understood that only the best general practice to prevail, materials and workmanship of the best quality are to be employed and instruction of the Engineer are to be fully complied with.

A list of Indian Road Congress Specifications, Recommended code of practice and specification of Road and Bridge works (Ministry of Road Transport & Highways) published by I.R.C. CPHEEO manual etc., which have been made use of in the preparation of these specifications.

The latest edition of all specifications / standards till 30 (thirty) days before the final date of submission of tender, shall be adopted.

2) DEFENITIONS:

The words like contract, contractor, / binder, Engineer (Synonymous) with Engineer-in-charge, drawings, employer, Government, G.I.D.C., Works, & work site used in this specification shall be considered to have the meaning as understood from the definitions of these terms given in the General condition of contract.

The following abbreviations shall have the meaning as set forth below:

ASTM : American Society for Testing and Materials.

BS : British Standard published by the British Standards Institutions.

CBR : California Bearing Ratio

IRC : Indian Road Congress.

IS : Indian Standard published by the Bureau of Indian Standards.

MoRTH: Ministry of Road Transport & Highways – Specifications for road and bridge works published by the I.R.C.

PWD : Public Works Department.

CPHEEO

3) MATERIAL & TEST STANDARDS:

The relevant standard of material as well as the testing procedures, have been indicated at appropriate place in the specification or standard books of I.R.C./I. S code/MORT & H.

4) SIEVE DESIGNATION:

The sieve designation referred to the specification correspondence to those specified by Bureau of Indian Standard in I.S. 460.

5) SCOPE OF WORK:

The work to be carried out under the contract shall consist of the various items as generally described in the tender documents as well as in the bill of quantities furnished in the tender documents.

The work to be performed shall include all general works, preparatory to the construction of road and all other related works. The work shall include work of any kind necessary for the due and satisfactory

construction, completion and maintenance of the works to the intent and meanings of the drawings and these specification and further drawings and orders that may be issued by the engineer from time to time.

The scope of work shall include compliance by the contractor with all general condition of contract, whether specifically mentioned or not in the various clauses of these specifications, all materials, apparatus, plant, equipment, tools, fuel, watering, strutting, timbering, transport, offices, stores, workshop, staff, labour and provision of proper and sufficient protective work, diversions, temporarily fencing & lighting. It shall also include: Safety of workers, first-aid equipment, suitable accommodation staff and workman with adequate sanitary arrangement, the effecting and maintenance of all insurance, the payment of all wages, salaries, fees, royalties, duties, or other charges arising out of the erection of the work and the regular clearance of rubbish, reinstatement and cleaning up of the site as may be required on completion of works, safety of the public and protection of the works and adjoining land.

The contractor shall ensure that all actions are taken too built in quality insurance in the planning and execution of the work. The quality insurance shall cover all stages of work, such as setting out, selection of materials, selection of construction method, selection of equipment and plant, deployment of personnel and supervisory staff, quality, control, testing etc. The work of building in quality insurance shall be deemed to be covered in this scope of the work.

6) REFERENCE STANDARD BOOKS:

The work included in this contract, shall be carried out in accordance with the specifications, rules and regulations as laid down in the books mentioned below:

- i) Specifications for Road & Bridge Works, Ministry of Road Transport & Highway published by Indian Road Congress - latest revision or revised from time to time.
- ii) For Batch mix plants and accessories to be used for the work shall be in conformity with the specifications prescribed vide Govt. of India M.O.S.T. circular No. RW/24011/2/89-RMP, dtd. 29/09/1989. The plant shall be equipped with all units and accessories as per latest I.S. :3056-1995 & as amended from time to time.
- iii) For paver finisher: Requirement for essential features for paver finisher: (As per M.O.S.T. specification-2nd Revision February-1998 or as revised from time to time) and as specified in the tender documents.
- iv) Relevant I.S. and I.R.C. specified in specification of item.
- v) P.W.D. Hand Book Vol. I and II.
- vi) CPHEEO manual

If the reference books quoted above fall short for the items quoted in the schedule of this contract, reference shall be made to Indian Standard Specification of the latest addition. If any of the items of this contract are not covered by reference books quoted above, details and specifications directed by the Engineer -in-charge / Consultant & TPI authority being appointed by CIA, GIDC, shall be final.

This shall depend on the standard specifications followed in difference countries of the World for the item concerned.

7) GENERAL CONDITION REGARDING USE OF EQUIPMENT ON WORKS:

In addition to the general conditions already indicated, the following conditions regarding use of equipment in works shall be satisfied.

- i) The contractor shall be required to give a trial run of the equipment(S) or establishing their capability to achieve the laid down specifications and tolerance to the satisfaction of the Engineer before commencement of the work.
- ii) All equipment provided shall be have proved efficient and shall be operated and maintained at all times in a manner acceptable to the Engineer.
- iii) All the plant / equipment to be deployed on the work shall be got approved from the Engineer for ensuring their fitness and efficiency before commencement of the work.

- iv) Any material or equipment not meeting the approval of the Engineer shall be removed from the site forthwith.
- v) No equipment or personnel will be removed from site without permission of Engineer.
- vi) The contractor shall also make available the equipment for site quality control work as directed by the Engineer.

8) CONTRACT DRAWINGS:

The contract drawings provided for tendering purpose shall be as content in the tender documents and shall be used as a reference only.

The two copies of the drawings, on the basis of which actual execution of the work is to proceed, shall be furnished free of cost to the contractor by the Engineer, progressively according to the work programme submitted by the contractor and accepted by the Engineer.

Examination and / or approval by the Engineer of any drawings or other documents submitted by the contractor shall not relieve the contractor of his responsibilities and liability under the contract.

9) PROGRAMMING:

The Executive Engineer may at any time give directions as to the order & manner in which the several parts of the work shall be carried out. The contractor shall strictly observe such directions. The contractor shall at all-time be responsible for any damage and trespass committed by his agent and working people in carrying out the work unless trespass is authorized by the Executive Engineer is working.

10) PERMIT & LICENSE:

The contractor shall procure at his sole expenses all permit & license & pay all charges and fee for lawful execution of the work.

11) INSPECTION OF WORKS & MATERIALS:

For Site engineer, Agent & employees of the contractor shall provide safe and proper facilities.

- i) The inspection of 'work shall not be relieved the contractor of his obligations to fulfill the terms of the contract as herein prescribed by the plans and specifications.

- ii) The Executive dates of work.

The contractor shall furnish written information to the Executive Engineer, carting the original sources of supply and dates of manufacturing of all materials brought to site of the work.

- iii) In order to ensure a proper time sequence for required inspection and approval, this information shall be furnished at least two weeks or as directed by the Engineer-in-charge in advance of use or incorporation in the work of any such materials and this shall be given in written by the contractor.

- iv) Failure to reject any defective work or materials at any time will not in any way prevent later rejection when such defects is discovered or observed by the department to the final acceptance.

Bidders signature

**Executive Engineer
GIDC, VAPI**

GENERAL SPECIFICATION FOR QUALITY CONTROL

ON WORKS & MATERIALS

(1) G E N E R A L

- 1.1) The contractor shall be responsible for the quality of the work in the entire construction work within the contract. He shall, therefore, have his own independent and adequate set up for ensuring the same.
- 1.2) The contractor shall provide necessary co-operation and assistance in obtaining the samples for test and carrying out the field tests as required by the Engineer-in-charge from time to time. This may include provision of labour, attendance, assistance in packing and dispatch and any other assistance considered necessary in connection with the test.
- 1.3) All materials to be used, all method adopted and all works performed shall be strictly in accordance with the requirements of this specification. The contractor shall set up field laboratory at the location approved by the Engineer & equip the same with adequate equipment and personnel in order to carry out all required test & quality of control work as per specification or as directed by the Engineer-in-charge. The list of equipment & the facilities to be provided shall be got approved from the Engineer-in-charge in advance.
- 1.4) The contractor's laboratory should be manned by a qualified materials Engineers, Civil Engineers, assisted by experienced technicians & the set up should be got approved by the Engineer.
- 1.5) The contractor shall carry out quality control tests on the materials & work to the frequency stipulated in subsequent paragraphs. In the absence of clear indications about method and or frequency of tests for any item, the instructions of the Engineer shall be followed.
- 1.6) For satisfying himself about the quality of the materials & work, quality control test will also be conducted by the Site Engineer in charge, and TPQA for quality control units or consultant as approved by GIDC, generally to the frequency set forth herein under. Additional tests may be also conducted where, in the opinion of the Engineer, need for such test exists.
- 1.7) For the work of embankment, sub-grade, and pavement, construction of subsequent layer of same or other materials the finished layer shall be done after obtaining permission the Engineer. Similar permission from the Engineer shall be obtained in the respect of all other items of work prior to proceeding with the next stage of construction.
- 1.8) The contractor shall carry out modifications in the procedure of work if found necessary, as directed by the Engineer during inspection. Works failing short of quality shall be rectified / redone by the contractor at his own cost and defective work shall also be removed from the site of work by the contractor at his own cost.
- 1.9) For testing of samples of soil/soil mixes, granular materials, and mixes, bituminous materials & mixes, aggregates, course etc. samples in the required quality & form shall be supplied to the Engineer by the contractor at his own cost.
- 1.10) For cement, quarry spalls, aggregate, bitumen, mild steel similar other materials where essential tests are to be carried out at the manufacture's plant or at laboratory other than the site laboratory, the cost of samples, sampling, testing, and furnishing of test certificate shall be borne by the contractor. He shall also furnish the test certificate to the Engineer. The contractor should not that materials other than site laboratory shall be tested in Govt. recognized laboratory at his own cost.
- 1.11) For testing of cement concrete at site during construction, arrangement for supply of samples, sampling, testing & supply of test results shall be made by the contractor as per the frequency and number of test specified in the Hand book of Quality control for construction of roads and runways (IRC Special publication No.11), and the Ministry of Shipping & Transport Specifications and where

the same are silent, as per the relevant IRC Standards, specifications, guidelines, Special publications and IS Standards. In the absence of relevant Indian standards, the sampling and testing procedure to be used shall be approved by the Engineer. Where the Engineer considers that in the interest of the Control of Quality on materials or workmanship, modifications, if any, are necessary, such modifications shall be carried out by the Contractor at no extra cost. The sampling and testing procedure to be used shall be approved by the Engineer and his decision shall be final and binding on the contractor.

1.12) The materials shall be tested in approved Laboratory other than site laboratory.

1.13) All testing charges involved in the entire work shall be borne by the Contractor.

1.14) The materials for embankment construction shall be got approved from the Engineer. The responsibility for arising & obtaining the land for borrowing or explore in any other way shall rest with the contractor who shall ensure smooth & uninterrupted supply of materials in the required quality during the construction period.

Similarly, supply of aggregates for construction of road pavement shall be from quarries approved by the Engineer. Responsibility for arising uninterrupted supply of material from the source shall be that of the contractor.

(2) DEFECTIVE MATERIALS:

All materials, which the Engineer/ Q.C. unit of GIDC/ Third Party Inspector appointed by the GIDC has determined as not conforming to the requirements of the contract shall be rejected whether in place or not, they shall be removed immediately from the site as directed. Materials, which have been subsequently collected, shall not be used in the work unless approval is accorded in writing by the Engineer. Upon failure of the contractor to comply with any order of the Engineer/ Q.C. unit of the GIDC / Third Party Inspector appointed by the GIDC, given under this clause. Engineer/ Q.C. unit of the GIDC / Third Party Inspector appointed by the GIDC, shall have authority to cause the removal of rejected material and to deduct the removal & allied cost thereof from any payments due to the Contractor.

(3) CONTROL OF ALIGNMENT, LEVELS & SURFACE REGULARITY.

3.1) GENERAL:

All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-charge subject to the permitted tolerances described hereinafter.

3.2) HORIZONTAL ALIGNMENT:

Horizontal alignment shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriageway as constructed shall be corrected within a tolerance of +/- 10mm there from. The corresponding tolerance for edges of the roadway and lower layers of pavement shall be +/- 25mm.

3.3) LONGITUDINAL PROFILE:

The levels of the sub grade and difference pavement courses as constructed shall not vary from those calculated with reference to the longitudinal and cross profile of the road shown on the drawings or as directed by the Engineer-in charge, beyond the tolerance mentioned below:

	Sub grade	+	20mm
		-	25mm
	Sub-base	+	10mm
	(a) Flexible pavement	-	20mm
	(b) Concrete pavement	+	6mm
	Sub-base for flexible pavement		

	(a) Bituminous course	+/- 6mm
	(b) Other than bituminous	
	(i) Machine laid	+/- 10mm
	(ii) Manually laid	+/- 15mm
	Wearing course of flexible pavement.	
	(i) Machine laid	+/- 6mm
	(ii) Manually laid	+/- 10mm
	Cement concrete pavement	+/- 5mm - 6mm

Provided, however, that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6mm for flexible pavement and 5mm for concrete pavement.

For checking compliance with the above requirement for sub-grade, sub-base & base courses, measurement of the surface levels shall be taken on a grid of points placed at 6.25m longitudinally and 3.5 mtr, transversely. For any 10 consecutive measurements taken longitudinally and transversely, not more than one measurement shall be permitted to exceed the tolerance as above, this one measurement being not in excess of 5mm above the permitted tolerance.

For checking the compliance with the above requirement for bituminous wearing courses and concrete pavements, measurement of the surface levels shall be taken on a grid of points placed at 6.25m along the length and at 0.5mtr. From the edges & at the centre of the pavement. In any length of the pavement, compliance shall be deemed to be met for the final road surface, only if the tolerance given above is satisfied for any point on the surface.

3.4) SURFACE REGULARITY OF SUB GRADE & PAVEMENT COURSES:

The surface regularity of completed sub-base, base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerance indicated in Table-1.

The longitudinal profile shall be checked within a 3-meter-long straight edge/ moving straight edge as desired by the Engineer, at the middle of each traffic lane along a line parallel to the centre line of the road. The maximum permitted number of surface irregularities shall be as per Table -1 below.

TABLE-1: MAXIMUM PERMITTED NUMBER OF SURFACE IRREGULARITIES

Irregularity	Surfaces of carriageways & paved shoulder				Surfaces of laybys Service area and all bituminous base courses			
	4mm		6mm		4mm		7mm	
Length (M)	300	75	300	75	300	75	300	75
Double lane/single lane	20	9	2	1	40	18	4	2

The maximum allowable difference between the road surface & underside of a 3-meter, straight edge when placed parallel with or at right angles to the centre line of the road at points decided by the Engineer shall be:

For pavement surface (bituminous & cement concrete)	3 mm
For bituminous base courses	6 mm
For Granular sub-base/base courses	8 mm
For sub-bases under concrete pavements	10 mm

3.5) RECTIFICATION:

Where the surface irregularity of sub grade and the various pavement courses fall outside the specified tolerance, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge.

(i) **Sub grade:**

Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low, the deficiency shall be corrected by adding fresh material. The degree of compaction and the type of material to be used shall conform to the relevant specifications.

(ii) **Granular/ Sub base:**

Same as at (i) above except that the degree of compaction and the type of material to be used shall conform to the relevant specifications.

(iii) **Water Bound Macadam Base/Wet Mix Macadam Base:**

Where the surfaced is high or low, the top 75mm shall be scarified, re-shaped with added material as necessary and re-compacted to MoRTH clause-404/406. The area treated as a place shall not be less than 5 meter long and 2 meters wide.

(iv) **Bituminous Constructions:**

For bituminous construction, other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh material and re-compacting to specifications. Where the surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications.

For wearing course, where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. In all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less' than 5 meter in length & not less than 3.5 meter in width.

3.6) QUALITY CONTROL TESTS DURING CONSTRUCTION:

3.6.1 GENERAL:

The materials supplied and the works carried out by the contractor shall conform to the specifications prescribed in the preceding clauses.

For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control tests, as described hereinafter by the Engineer-in-charge shall have the full authority to carry out tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specification. Test procedure for the various quality control tests are indicated in the respective sections of the specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer in-charge.

3.6.2 TESTS ON EARTH WORK FOR EMBANKMENT CONSTRUCTION:

3.6.2.1 Borrow materials:

- a) Sand content (I.S.:2720 -Part-4): Two tests per 3000 cu.mts. Of soil.
- b) Plasticity test (I.S.:2720-PART-5): Each type to be tested, 2 tests/ 3000 M3 of soil.
- c) Density Test (I.S.:2720 -PART-8): Each type to be tested, 2 tests/ 3000 M3 of soil.
- d) Each soil type to be tested, 2 tests per 3000 cu.mts. of soil.
- e) Deleterious content Test (I.S.:2720 -Part-27) as & when required by Engineer
- f) Moisture content Test (I.S.:2720 -Part-2) One test for every 250 M2 of soil.
- g) C.B.R. test on materials to be incorporated in the sub grade on soaked/ un-soaked samples (IS: 2720-Part-16) one CBR test for every 3000 cu.mtr. At least or closer as and when required by the Engineer-in-charge.

3.6.2.2 COMPACTION CONTROL:

Control shall be exercised by taking at least one measurement of density for each 1000 square meters of compacted area or closer as required to yield the minimum number of test results for evaluating day's work on statistical basis. The determination of density shall be in accordance with I.S.:2720 -Part-28). Test locations shall be chosen only through random sampling techniques.

Control shall not be based on the result of anyone test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 6 (if nondestructive test are carried out, the number of test shall be doubled) as long as it is felt that sufficient control over borrow material and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance criteria shall be subject to the condition that the mean density is not less than specified density plus:

$$1.65 - 1.65 \quad : \text{ times the standard deviation.} \\ \quad \quad \quad (\text{No. of samples})^{0.5}$$

However, for earthwork in shoulders (earthen) and in the sub grade, at least, one density measurement shall be taken for every 500 square meters of the compacted area provided further that the number of tests in each set of measurements should be at least 10. In other respects, the control shall be similar to that described earlier.

3.6.3 TESTS ON SUB BASE AND BASES & BITUMINIOUS WORKS:

The tests and their frequencies for the different types of bases and sub-bases shall be as given in TABLE - 2. The evaluation of density results for compaction control shall be on lines similar to those set on in Clause - 4.2.2.

TABLE – 2: CONTROL TEST & THEIR MINIMUM FREQUENCY FOR WORKS

Sr.no.	Type of material /Construction	Types of tests to be conducted/carried out	Frequency @ which minimum test shall be carried out
1	Earth work for embankment with excavated stuff / selected soil	1) M.D.D. Test 2) Moisture content prior to compaction. 3) Density of compacted layer. 4) Deleterious constituents.	As Required. One Test per 200 m3 One test per 500 m3 As required.
2	Granular sub-base (Quarry spall)	1) Gradation 2) Atterberg limits 3) Moisture content prior to compaction. 4) Density of compacted layer. 5) Deleterious constituents. 6) C.B.R. value	One test per 200 m3 -do- One test per 250 m3 One test per 500 m3 As required As required.
3	Wet Mix Macadam	1) Aggregates Impact value 2) Grading 3) Flakiness index & elongation index (Total) 4) Atterberg limits of portion of aggregate passing 425-micron sieve. 5) Density of compacted layer.	100 m3 – one test 101 to 500 – 3 tests 501 to 1500 – 5 tests 1501 to 5000 – 7 tests One test per 100 m3 of aggregates. One test per 500 m3
4	Paving Bitumen / Bitumen emulsion	Nos. of tanker 1 2 to 15 16 to 50 51 to 150 151 to 500 Above 501	No. of test. 1 2 3 5 8 13
5	Prime coat / Tack coat	1) Quality of binder 2) Binder temperature for application. 3) Rate of spread of binder.	As per Sr.No.4 above. At regular close intervals. One test per 500 m2 and not less than Two tests per day.
6	B.M. /Mix Seal Surfacing	1) Quality of binder 2) Aggregate Impact value / Los angles abrasion value. 3) Flakiness index & elongation index 4) Stripping value of aggregate. 5) Water sensitive of mix. 6) Grading of aggregates.	As per Sr.No.4 above 100 m3 – 1 test. 101 to 500 - 3 tests. 501 to 1500 - 5 tests. 1501 to 5000 –7 tests. -do- -do-

		7) Water absorption of aggregates 8) Soundness (Magnesium & sodium sulphate) 9) Percentage of Fractured phases. 10) Binder content & aggregate grading. 11) Control of temperature of binder & aggregate for mixing & of the mix at the time of laying & rolling 12) Rate of spread of mixed material 13) Density of compacted layer.	Two tests per day per plant both on the individual constituents and mixed aggregates from dryer. -do- -do- As required Periodic subject to minimum two tests per day per plant. At regular close intervals. Regular control through checks on layer thickness. 1 test per 250-m2 area.
7	Water	1) Chemical test IS: 456	Once for approval of source of supply subsequently only in case of doubt or as directed by the Engineer-in-charge.
8	Cement	a) Setting time – Initial & Final b) Fineness c) Compressive strength d) Consistency e) Fineness test by specific surface f) Chemical test	1 Test : up to 50 MT 2 Test : 50 to 100 MT 3 Test : 100 to 200 MT 4 Test : 200 to 300 MT 5 Test : 300 to 500 MT 6 Test : 500 to 800 MT 7 Test : 800 to 1300 MT
9	Sand	a) Silt content b) Fineness modulus c) Gradation	1 Test /150M3
10	Coarse & fine aggregates (Except Road work)	a) Gradation b) Flakiness c) Impact value d) Abrasion value. e) Water absorption	1 Test : up to 100 M3 3 Test : 101 to 500 M3 5 Test : 501 to 1500 M3 7 Test : 1501 to 5000 M3
11	M.S./H.Y.S.D./TMT bars	a) Ultimate tensile strength b) Yield stress (Proof stress) c) Percentage elongation	1 sample / 40 MT for each diameter.
12	Structural steel	a) Ultimate tensile strength b) Yield stress (Proof stress) c) Percentage elongation	1 sample / 20 MT for each dimension of steel component
13	Bricks	a) Compressive strength b) Water absorption	1 Test / 50000 No. (5 bricks)

14	Plain tiles / mosaic tiles/flooring tiles/vitrified tiles/wall tiles	a) Transverses strength b) Abrasion c) Water absorption	1 Test / 2000 No. (12 tiles)
15	Cement concrete cubes	a) Compressive strength for 7 days b) Compressive strength for 28 days	1 samples / 1-5 M ³ 2 samples / 6-15 M ³ 3 samples / 16-30 M ³ 4 samples / 31-50 M ³ 4+1 samples for each additional 50 M ³ or part thereof.
16	Cement mortar	Compressive strength	As per the requirement of Engineer
17	Concrete	Strength of concrete IS: 516 Core strength on hardened concrete IS: 516 Workability of fresh concrete – Slump test IS: 1199. Thickness determination Thickness measurement for trial length. Verification of level of string line (Building work, foundation, cement concrete works)	As per Sr. No. 10 above or as per the requirement of Engineer As per the requirement of Engineer. -do- -do- 2 cores per trial length and as above. String line or steel forms shall be checked for level at an interval of 5 mtr. or 6.25 mtr. The level tolerance allows shall be +/- 2mm.

24.0 OTHER SPECIFICATIONS:

Unless specified otherwise in this Schedule, Specifications as given in other volumes of the Tender Documents and List of Approved Makes, Notes on Bills of Quantities and Theoretical Unit Consumptions shall be applicable.

Special conditions (M&E):

The work of the streetlight section shall be carried out by Electrical Contractor having “B” class and above registration holder from R & B, Electrical Wing, Govt. of Gujarat / CPWD Electrical Wing, Govt. of India

1. The agency should quote the rates inclusive of all taxes & duties i.e. Excise duty, Works Contract Tax, Service Tax, Service Charges, labor cess, etc. as applicable from time to time and packing, forwarding, insurance, handling charges etc. up to site EXCLUDING GST. Any taxes & duties as applicable from time to time are to be borne by the contractor and are deemed to be included in the price. The Contractor should mention the present rate of Excise Duty, Service Charges, etc., considered in the rates quoted by him separately for each item invariably. Any modification/ variation in the present tax structure / law will be borne by the contractor during the entire contract period including extended period if any.
2. The work / items contained in the scope of the work shall be in working condition at the time of handing over to GIDC and completion of work as well as after completion of five years guarantee period. During the free maintenance guarantee period, all the materials supplied like Streetlight poles, cables, cable glands, terminal lugs, fixtures, junction box, tubes, wires, MCB, earthing material etc., shall be maintained for five years. **Any replacement required shall be made by the contractor. No any extra payment for replacement shall be given to the contractor/ agency by GIDC.**
3. The numbering on installed streetlight pole shall be given on each pole. The identification of erected poles is required to be done with good quality of enameled paint of Asian/ Nerolac make as directed by Engineer In charge at the own cost of the contractor. Extra cost shall not be given for this work.
4. Any damage caused in the streetlight poles, with allied accessories & its accessories will be replaced by the contractor at his own cost during the five years comprehensive maintenance period.
5. Insurance:

Insurance against Injury to person and Damage to property:

The Contractor shall insure against each liability for any loss, damage, death or bodily injury which may occur to any physical property (Mechanical, electrical, automation work) or to any person which may arise out of the Contractor's performance of his obligations under this condition during the contract period.

This insurance shall be for a limit of per occurrence of not less than the amount, with no limit on the number of occurrences, insurance for contractor's personnel. The contractor shall affect and maintain insurance against liability for arising from injury, sickness, disease or death of any person employed by the contractor or any other of the Contractor's personnel i.e. "All RISK TYPE POLICY"

The employer shall also be indemnified under the policy of insurance, except that this insurance may exclude losses and claim to the extent that they arise from any act or neglect of the Employer or of the Employer's Personnel.

Contractor shall have to take insurance for Electrical, Mechanical items, as well as semi-skilled and unskilled labor is compulsory. The same should be taken by the agency as per labor act laws in force. "ALL RISK POLICY" of manpower employed by the contractor as approved by Engineer in Charge should be taken on Account of GIDC.

General scope of work

General:

The scope of the works covers Design, manufacturing, factory testing, supply, delivery to site, unloading, handling and storage at site, complete installation including cement concrete foundation and supporting steel structure wherever necessary, final checkup, painting, performance testing and commissioning including comprehensive maintenance contract with required manpower for 5 years for the streetlight and related electrical equipment and other required accessories to be supplied under these specifications on turnkey basis. The scopes also include first filling of consumables and satisfactory performance of all equipment provided in the price schedule.

The contractor shall be fully responsible for the electrical, mechanical equipment and others installations for storage, theft, fire, natural calamity etc. till the entire work covered by this contract is satisfactorily completed by him and handed over to the owner.

All the installations shall be of high quality, safe, durable, complete and fully operational including all necessary items, spares and accessories **whether or not specified in details**. All the works shall be completed in accordance with the regulations and standards to the satisfactions of the owner, after completion of five years from the date of 100% successfully commissioning of the scheme.

All the equipment and accessories shall be manufactured as per the regulations, relevant standards and specifications. The equipment / materials shall be selected and procure from the approved vendor only.

The contractor shall have to arrange factory inspection and testing of the equipment / materials as per the Indian Standard specification or equivalent standard at his own cost. During the inspection tendered shall provide traceable certificates (of authorized bodies) of test and calibration instruments / equipment's that are used for testing of instruments.

The following test certificate shall be provided.

- Certificate of calibration with its accuracy and uncertainty
- Certificate of standard and classification
- MOC certificate of instruments and its parts.

The equipment shall be installed as per the instruction of respective manufacturer of equipment and approved by the owner.

The contractor shall have to submit a completion certificate of electrical license holder for installation of electrical equipment for inspection of installation for release of power-by-power supply authority.

On completion of work, the contractor shall have to submit inbuilt drawing indicating the complete road wise and phase wise installation of the streetlight & line diagram of pumping machinery with allied accessories including stand-by.

Documentation required

Within 30 days after issue of an acceptance letter the Contractor is required to submit bar chart for progress of work

The design and lighting layout showing lighting poles, section pillar location as per lux level, shall be submitted by the contractor to Engineer In charge within 30 days of acceptance of tender. All queries / remarks raised Engineer In charge with respect to the contractor's design shall be complied by the contractor within 15 days.

General arrangement of drawings for all the poles**Record Drawing**

"In built drawing for various roads shall have to be submitted by the contractor in three sets with reproducible soft copy on CD to GIDC within two months after completion of work.

Inspection of materials before dispatch

No materials shall be dispatched without inspection at manufacturer's works, accepted and approved by the authorize representative of the owner.

Quality Assurance / Quality Control Program

The contractor shall include in his offer the quality assurance program containing the overall quality management and procedure which is required. The contractor shall establish document and maintained an effective quality assurance system.

The owner / consultant or their representative reserve the right to inspect / witness, review any or all stages of work at shop / site as deemed necessary for quality assurance.

Safety of materials

The contractor shall provide proper and adequate storage facilities to protect all the materials and equipment including those issued by brought out items in contract / GIDC against damage, theft from any clause what so ever.

Scope of work:

Any item of work, either supply or erection of materials which have not been specifically mentioned in this specification and drawing but are necessary to complete the work for trouble free, efficient operation and guarantee performance of the entire System offered shall be deemed as included within the scope of this specification and shall be provided by the contractor without any extra cost to the owner.

Care of the works

From the commencement to virtual completion of the work, the contractor shall take full responsibility for the care for all works including all temporary works and any damages, loss or injury shall happen to the works or to any part thereof to any temporary works from any cause whatsoever, shall at his own cost repair and make good the same, so that at completion of the work shall be in good order and in conformity in every respects with the requirements of the contract and the Engineer In Charge's instruction.

COMPREHENSIVE OPERATION AND MAINTENANCE OF THE STREETLIGHT

1. The Comprehensive operation and maintenance of streetlight with allied accessories including stand-by shall be carried out by the contractor for five (5) years after completion of works including testing and commissioning.
2. The work / items contained in the scope of the work shall be in working condition at the time of handing over to GIDC and completion of work as well as after completion of five years guarantee period. During the free maintenance guarantee period, all the materials supplied like Solar Panels, Streetlight poles, cables, cable glands, LED lights, terminal lugs, fixtures, junction box, tubes, wires, MCB, earthing material etc., shall be maintained for five years. **Any replacement required shall be made by the contractor. No any extra payment for replacement shall be given to the contractor/ agency by GIDC.**
3. No any types of materials & labor, man - power shall be provided by GIDC during the 5 years comprehensive maintenance of streetlight.
4. The contractor has to maintain daily, weekly report & shall be submitted on monthly basis to GIDC.
5. Payment of monthly energy bill will be paid by GIDC. If the penalty imposed due to non-maintained the streetlight in proper condition, the same shall be recovered from the contractor/ agency's bill.
6. The contractor shall have to provide wheel-mounted Aluminum ladder for maintenance of streetlight at his cost.
7. The contractor shall have to cover insurance of all items / equipment kept in installed condition within the estate against theft, accident, earth quake, cyclone, any natural calamity etc. up to system handed over to Owner.
8. Contractor should recruit efficient and well qualified and experienced management team competent for O & M of streetlight.
9. As this is a streetlight work and required to run at night hours, average 95% working efficiency (number basis) throughout the month shall be maintained by the agency The weekly checking will be carried out jointly. At that time, the agency has to depute his representative. The average working efficiency will be calculated on that basis. If agency fails to depute his representative for weekly inspection, then the department will carry out the inspection and the performance/ efficiency considered shall be binding to the contractor. For daily routine maintenance, the contractor should arrange required sufficient skilled / technically qualified man power at his cost. The corporation should not pay any extra cost / charge for daily routine maintenance. Any charges levied / imposed (P.F.) by the power supply authority, the same shall be deducted from the pending bill payment/ deposit/ performance bond of the Contractor.
10. The streetlight poles shall be repainted by enameled silver paint at every year by the contractor.
11. The contractor has to attend the fault/ non-working streetlights within 48 hours. If the agency failed to attend the fault/ non-working streetlight, the compensation at the rate Rs.100 per day per pole shall be recovered.
12. The contractor, at his own cost during the five years comprehensive maintenance period, will replace any damage caused to the streetlight installation & its accessories.

Special Note:

This is a turnkey work. If any items / work required be executed, but not mentioning in the scope of work shall be carried out by the agency for which no extra payment shall be made by the Department.

1. The material shall be supplied as per the make/brand given in the Annexure, but wherever the make is not mentioned, the material shall be supplied only ISI mark.
2. The sample of each item as per tender specifications shall be got approved from GIDC, before placing the order by the contractor to the OEM.
3. The whole work is covered under the five years free maintenance and replacement guarantee period. The manpower and tools required for maintenance/ replacement during the routine maintenance shall be provided by the contractor. The contractor should attend the fault/ non-working Streetlights within 48 hours failing which; the Corporation shall carry out at the risk & cost of the contractor. The expenditure so incurred shall be recovered from the balance amount of contractor or performance bond/ security deposit paid by the contractor.
4. The material shall be dispatched only after due inspection carried out by the inspecting authority deputed by GIDC. The agency has to provide all the facilities for testing, and inspection of the material to the Inspector. The inspection shall be given at the original manufacturer works only.
5. As soon as the material is ready, before dispatch, the contractor has to inform concern DEE (M&E)/ XEN (M&E)/ the inspecting authority deputed by GIDC for the inspection.

COMPREHENSIVE OPERATION AND MAINTENANCE CONDITIONS FOR STREET LIGHT WORKS AS PER TENDER:**Scope of Work: -**

The contractor shall also undertake 5 (Five) years comprehensive free operation and maintenance contract starting from the date of completion of the work. During the maintenance guarantee period contractor shall ensure to keep at least 95% of the street lights in working condition at any point of time. The contractor has to attend the fault / non-working street light network including its component & other works done within 48 hours and rectify it to the satisfaction of Engineer-in-charge. If the agency failed to attend, the fault / non-working streetlight the compensation at the rate Rs.100 per day per pole shall be recovered.

Routine maintenance work shall be carried out as per direction of Engineer-in-charge. If the contractor does not maintain the street light network including its component & other works during the contract to the entire satisfaction of GIDC/Engineer-in-charge, GIDC will undertake repairs of the same by themselves and the expenditure so incurred shall be recovered from Maintenance Guarantee Bond (5% of the estimated cost of the tender-executed on non-judicial stamp paper in standard Performa) / Security deposit or if any as per respective clause of Agreement. All material required for maintaining the street light shall be provided by the agency. The contractor shall provide the wheel/vehicle mounted ladder and necessary tools & tackles etc. at site for day-to-day maintenance of streetlights during free maintenance period of 5 (Five) Years. No any types of materials & labor, man - power shall be provided by GIDC during the 5 (Five) years comprehensive operation & maintenance of streetlights. The contractor has to submit daily, weekly report & shall be submitted on monthly basis to GIDC. Contractor should recruit efficient and well qualified and experienced management/man-power team

for the Operation, Maintenance & Repairing of streetlight. The streetlight poles shall be repainted by enameled / Aluminum silver paint at by the contractor every year (immediate after the monsoon) or as per the instruction of Engineer-In-Charge.

The work/items contained in the scope of the work shall be in working condition at the time of handing over to GIDC and completion of work as well as after completion of five years guarantee period. During the free maintenance guarantee period, all the materials supplied like streetlight poles, LED lights, cables, cable glands, terminal lugs, fixtures, junction box, tubes, wires, MCB, earthing material etc. shall be maintained for five years. Any replacement required shall be made by the contractor. No any extra payment for replacement shall be given to the contractor/agency by GIDC.

Any damage caused due to any of the reason in the streetlight network and as well as its allied accessories, will be replaced by the contractor at his own during the five years comprehensive maintenance period.

PAYMENT TERMS & CONDITION FOR SITC of Street Light & High Mast:-

Sr.No	Description	% of Full Tender Rates to be released.
1	On Supply of Items at site duly inspected/tested at Factory/Works/OEM & verified by DEE(M&E), GIDC, VAPI.	70%
2	After completion of Erection work in all respect & duly inspected by DEE(M&E), GIDC, VAPI.	10%
3	On Testing work completed & duly inspected by DEE(M&E), GIDC, VAPI	10%
4	On Commissioning of entire system at the satisfaction of DEE[M&E], GIDC, VAPI	10%

Bidders signature

**Executive Engineer
GIDC, VAPI**

Annexure-A

UNDERTAKING ON LETTERPAD OF MANUFACTURER OF LED FITTING.

**To,
Executive engineer,
G.I.D.C., Vapi.**

Subject: Confirmation from Manufacturer for Technical and Service Support

Name of Project:

“Up-Gradation of fire station for four fire tenders along with control room, conference room & dormitory for fire and disaster team at GIDC Umargam”.

Tender Notice No. **02 OF 2025-2026 SR.NO.01.**

Dear Sir / Madam,

Hereby confirm that I/we Manufacture M/S_____ agree to Provide /Supply all technical support, timely delivery & service support for LED Fitting System having same technical specification as per tender to Executive Engineer(M&E), GIDC, Vapi, up to the completion of 5 YEARS O&M&R period from the date of work order issued by Executive Engineer(M&E), GIDC, Vapi.

This confirmation has been issued by us based on above referred Tender terms & conditions.

However, we disclaim any responsibility of commercial terms that may be agreed between M/s_____ and M/s _____.

This memorandum of understanding shall enter into force upon signature by the duly authorized representatives of Two Parties & Undertaking shall be effective from the date of signing and shall remain in force up to completion of O&M&R period for subject work. It shall automatically be renewed for until & unless discontinued by either party.

SPECIFICATION OF MATERIALS

GENERAL

- All materials to be used shall conform to the relevant specifications as per the latest edition of Indian Standard, unless otherwise stated in the detailed specifications of items of work.
- All materials to be used shall be of approved quality & make as per list of approved makes attached with the tender documents
- Wherever a reference to any Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.
- The following specifications, standards, and codes are made a part of this specification\Tender document.

Indian Standards: specification for building materials, specification for equipment, method of test, method of measurement of building works, code of practice for construction, safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards

- The contractor shall invariably carry out Materials & work Tests as specified in the tender document (**B1-Form**) and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
- Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
- Materials, if rejected by the Engineer-in-charge, shall be immediately removed from the site of work. If they are not removed within twenty-four hours of receiving such intimation, Engineer-in-charge shall get the same removed at contractor's cost.

The Engineer-in-charge shall dispose of such materials in a manner as he chooses and the contractor shall not entitle to any compensation for the cost of such materials.

- Approval to the samples of various materials given by the Engineer-in-charge will not absolve the contractor from the responsibility of replacing the defective material brought on site of materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
- The contractor shall be responsible for observing the law, rules and regulations imposed under the "Minor Minerals Act" and such officer laws and rules prescribed by Government from time to time.

M-1 Water:

Water shall not be salty or brackish and shall be clean, reasonably clean and free from objectionable quantities of silt and traces of oil and injurious alkalis, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in RCC container for transport storage and handling of water shall be clean. Water shall conform to the standards specification in I.S. 456-1978.

If required by Engineer-in-charge it shall be tested by comparison with detailed water. Comparison shall be made by means of standard cement, tests, soundness, time of setting and mortar strength as specified in IS- 269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 percent in strength of mortar, prepared with water sample when compared with the resulted obtained with mortar prepared with distilled water shall be sufficient cause for rejection of

water under test.

Water for curing to mortar concrete or masonry should not be too acidic or too alkaline, it shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of mortar or concrete during those produce objectionable stain or other unsightly deposits on concrete or mortar surface.

Hard and bitter shall not be used for curing.

Potable water will generally be found suitable for curing of mortar or concrete.

M-2 Lime:

Lime shall be hydraulic lime as per I.S. 712-1973. Necessary tests shall be carried out as per IS- 69332 (Part I to X) 1973.

The following field tests for limes are to be carried out.

A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty while colour indicates quick lime and solid lumps are the unburnt lime stone.

Acid tests for determining the carbonate in lime. Excessive number of impurities and rough determination of class of lime

Storage shall comply with I.S. 712-1973. The slacked limes if stored shall be kept in a weather proof and damp- proof shed with impervious floor and sides be protected it against rain, moisture, weather and extraneous materials mixing with it. All limits that have been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

Field testing shall be done according to I.S. 1624-1974 to show the acceptability of materials.

M-3 Cement:

Cement shall be ordinary Portland cement as per I.S. 269-1975.

The contractor shall take every precaution to store the cement properly. So that it is not spoiled by dampness etc. Cement required for use shall be fresh as possible and stored on plank raised 15 to 20 cms above the floor and stacked 30 cms. Away from the wall in suitable closed whether proof godown at the site of work. Cement shall be stored in such a way to allow the removal and use of cement in chronological order on receipt i.e. first received being first used. Not more than 15 bags shall be stacked vertically in one pile and maximum width of the piles should not be more than 3 meters. Any cement which has deteriorated caked or which has been set or partially set shall not be used. When temporarily stored in open for use it shall be kept on a suitable platform and suitably protected as necessary.

Different brands of cement or cement of the same brand from different factories shall be stored in separate groups and shall not be mixed during use. Cement shall be kept in a store under double locking arrangement. A board indicating stock and daily transaction or cement shall be kept in each room of the cement store. Daily account of receipt and use of cement bag shall be maintained by the contractor in the Performa prescribed by the Engineer-in-charge.

The cement shall be measured by one bag for all use in concrete (except otherwise stated) etc. In no case cement shall be measured by boxes or other means for the volumetric proportion of concrete and mortar. For calculation for the proportion, the volume of the cement bag shall be taken as 0.0342 cu.m. (1.20 cf) and measuring of size 30 cms x 30x38 cms for concrete works. If weight batch concrete is to be used, the cement shall have to be used as per actual weight and the contractor shall not be entitled for any compensation for loss in weight due to shifting of bags or on account of any other reasons.

M-4 White cement:

The whole cement shall conform to IS- 8042-E-1076.

M-5 Coloured cement:

Coloured cement shall be with white or grey Portland cement as specified in the item of the work.

The pigments used for coloured cement shall be of approved quality and shall not exceed 10% of cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigment shall have such properties to provide for durability under exposure to sunlight and weather. The pigments shall have the property such that it is neither affected by the cement nor detrimental to it.

M-6 Sand:

Sand shall be natural and clean, well graded, hard strong durable and gritty partition free from injuries amount of dust, clay, kankar nodules, or of flaky partition shale alkali, salts, organic matter loam mica or other deleterious substance shall be got approved from the Engineer-in-charge if sand is covered with dust it shall be washed with water to make it clean.

(A) The sand to be used in cement mortar for masonry work and first coat of plaster should generally satisfy the following grading.

I.S. sieve	Percentage by weight passing through.
480	100
230	80-95
120	70-90
60	40-85
30	5-50
15	0-10

(B) The fineness modules shall not exceed 3.0. Sand to be used in cement mortar for stone slab lining work, pointing and second coat of plaster may have the grading.

I.S. sieve	Percentage by weight passing through.
480	100
240	100
120	75-100
60	40-85
30	5-50
15	0-10

The fineness modules shall not exceed 1.6.

(C) Sand to be used for concrete work shall of grades as specified in I.S. 383-1970 with fineness modules varying from 2.6 to 3.6 as per requirement.

The sand shall be stacked carefully on a clean hard surface. Sand of approved quality shall be obtained from approved sources and will be allowed to be used for work.

M-7 Stone Dust:

This shall be obtained from crushing hard black trap stone. It shall not contain more than 8% of silt determined by field test with measuring cylinder. The method of determining silt content by field is given

as under.

A sample of stone dust to be tested shall be placed without drying in 200 mm measuring cylinder. The quantity of the sample shall be such that it fills the cylinder up to 100mm mark. The clean water shall be added up to 150mm mark. The mixture shall be stirred vigorously and the content allowed settling for 3 hours.

The height of silt visible as settled layer above the stone dust shall be expressed as percentage of height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the silt content within the allowable limit.

The fineness modules of stone dust shall not be less than 1.80.

M-8 Stone Grit:

Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean of proper gradation and free from skin or coating likely to prevent adhesion of mortar. Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

The grit shall conform to the following gradation as per sieve analysis.

The crushing strength of grit will be such as to allow the concrete in which it is used to built up the specified strength of concrete.

The necessary tests for grit shall carried out as per the requirements of I.S. 2386 (Parts I to VII) 1963, as per instruction of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

M-9 Cinder

Cinder is well burnt furnace residue which has been fused or sintered into lumps of varying sizes.

Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean free from clay, dirt, ash or other deleterious matter.

The average grading for cinder aggregates shall be as mentioned below:

M-9(A) FLY ASH

Fly ash for use in cement fly-ash concrete shall conform to IS:3812-1966 "Specification for Fly-Ash (Part-I) for use as soil stabilization layer, admixer in concrete and possess.

Specific Physical and Chemical requirements are as below.

A: Physical Requirements.

Sr. No	Characteristic.	Grade – 1.	Grade – 2.
1.	Fine ness specific surface area in cm/ mm ² , by Blane air permeability method— Minimum.	3200	2500
2.	Lime reactivity Ave. compressive strength in Kg./ cm ² – Minimum.	40	30
3.	3. Compressive strength of pozolana cement mortar at 28 days in Kg / cm ² .	Not less than 80 % of corresponding for cement mortar value	
4.	Drying shrinkage. Maximum.	0.15	0.10
5.	Soundness by Autoclave test, Expansion of specimen	0.80	0.80

B : Chemical Requirements.

Sr.No	Characteristic.	Requirements % by Wt.	
		Minimum.	Maximum.
a.	SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ .	70	--
b.	SiO ₂	35	--
c.	MgO	--	5
d.	Sulphur as SO ₃ .	--	2.75
e.	Available alkalis as Na ₂ O.	--	1.50
F	Loss on ignition.	--	12.00

MDD at OMC -- 1.12 gms / cc , Sp.Gr = 2.27 , CBR = 4.3%

Fly ash shall be non-plastic in nature.

M-10 Black Trap Grit:

Grit shall consist of crushed or broken stone and be hard, strong dense, durable clean of proper gradation and free from skin or coating likely to prevent proper adhesion of Mortar Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provision of IS - 383-1970. Unless special stone of particular quarries are mentioned, aggregate shall be broken from the best black trap stone as approved by the Engineer-in-charge. Stones shall have no deleterious reaction with cement.

The grit shall conform to the following gradation as per sieve analysis.

I.S. sieve designation	Percentage passing for sieve.
12.50 mm	100%
10.00 mm	45-100%
4.75 mm	0-20%
2.36 mm	0-5%

The crushing strength of grit shall be such as to allow the concrete in which to be used to built up the specified strength of concrete.

The necessary test for grit shall be carried out as per the requirement of I.S.- 2386-Part-I to VIII of 1993 or as revised from time to time as per instruction of the Engineer-in-charge.

M-11 Cement Mortar:

Cement: Cement shall conform to specification M-3

Water : Water shall conform to specification M-1

Sand : Sand shall conform to specification M-6.

Proportion of mix:

Cement and sand shall be mixed to specified proportion. Sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 kg/bag of cement being equal to 35 liters or 0.0342 M³. The mortar may be hand mixed or machine mixed as directed by the Engineer-in-charge.

Preparation of mortar:

In hand mixed mortar, cement and sand in the specified proportion shall be thoroughly mixed dry on a clean impervious platform by turning over at least 3 times of more till a homogeneous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious, extraneous material shall be get mixed with mortar or mortar shall flow out, while mixing the water shall be gradually added and thoroughly mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio may be adopted as directed by the

Engineer-in-charge.

The mortar so prepared shall be used within 30 minutes of adding water; only such quality of mortar shall be prepared as can be used within 30 minutes. The mortar remaining unused after that period or mortar which has partially hardened or damaged shall not be re-tempered or remixed. It shall be destroyed or thrown away.

M-12 Black trap stone coarse aggregate for plain and ordinary reinforced concrete.

Coarse aggregate shall be of machine crushed stone of black trap and be hard strong, dense, durable, clean and free in skin and coating likely to prevent proper adhesion of mortar. The aggregate shall generally be cubical in shape. Unless special stones or particular quarries are mentioned, aggregates shall be machine crushed from the best black trap stone as approved by the Engineer-in-charge. Aggregate shall leave no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. However, in case of reinforced cement concrete the maximum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6mm less than the cover which is smaller.

TABLE -1

L.S. sieve designation.	Percentage aggregates 40 mm	Passing for single of nominal size 20 mm	Size 16mm
40mm	85-100	100	100
20mm	0-20	85-100	100
16mm	--	--	--
12.5 mm	--	--	--
10 mm	0-5	0-20	0-30
4.75mm	--	0-5	0-5
2.36 mm	--	--	--

Note:

This percentage may be varied somewhat by the Engineer-in-charge when considered necessary for obtaining better density and strength of concrete.

Single size coarse aggregates conforming to the requirements in Table No. 1 above or following nominal size shall be used at site with the other ingredients of concrete as indicated below. The mixing shall be in a mixture or on the platform as directed in case of CC 1:5:10 only. For CC 1:4:8, CC 1:3:6, CC 1:2:4 and CC 1:1^{1/2}:3 mixing with the other ingredient of concrete shall be done in the mixture only except for small works.

- (1) CC 1:5:10 - Nominal size of aggregate 40 mm
- (2) CC 1:3:6 - Nominal size of aggregate 20 / 40 mm
- (3) CC 1:4:8 - Nominal size of aggregate 40 mm
- (4) CC 1:2:4 - Nominal size of aggregate 20 mm
- (5) CC 1:1^{1/2}:3- Nominal size of aggregate 20 mm

The grading test shall be taken in the beginning and at the change at the source of materials. The necessary test indicated in IS 383-1970 and 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner to prevent the inter mixing of different aggregates. If the aggregates are covered with the dust, it shall be washed with water to make it clean. The

coarse aggregates for plain and reinforced concrete shall be measured by volume in the steel or wooden boxes prepared as per the direction of the Engineer-in-charge.

M-13 Black trap stone coarse aggregates for controlled reinforced concrete:

Coarse aggregate shall be of machine crushed stone of black trap and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion mortar.

The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregate shall be machine crushed from the best, black trap stone as approved by the Engineer-in-charge. Aggregate shall have no deleterious reaction with cement.

In proportion concrete, the quantity of coarse aggregate shall be determined by weight only. The grading of coarse aggregate shall be controlled by obtaining the aggregate in different size and blending them in the right proportions as per concrete mix design approved by the Engineer-in-charge. The different sizes shall be stocked in separate stock piles. The grading of aggregates shall be checked as frequently as possible. The frequency for verification of the grading shall be as directed by the Engineer-in-charge to ensure that the grading as maintained uniform with that of the samples used in the preliminary tests.

The necessary test indicated in I.S. 383-1976 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

If aggregate is covered with dust, it shall be washed with water to make it clean.

M-14 Brick Bats Aggregate:

Brick aggregates shall be broken from well burnt to slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40mm to 50mm unless otherwise specified in the item. The under burnt to over burnt brick bats shall not be allowed.

M-15 Bricks / fly ash building brick:

(A) First class Bricks:

The bricks shall be hand or machine molded and made from suitable soils and kiln burnt. They shall be free from cracks and flaws modules of free time. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour. The bricks shall be molded with a frog of 100mm x 40 mm and 10mm to 20 mm deep on one of the flat sides. The bricks shall not break when thrown on the ground from a height of 600 mm.

The size of modular bricks shall be 190mmx90mm x 90mm and shall conform to IS 1077-1976 in respect of tolerance for sub-class "A" bricks.

The crushing strength of the bricks shall not be less than 35 kg / sq.cm. The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption shall be carried out as directed by the Engineer-in-charge.

(B) Second class bricks:

The second-class bricks shall be similar to first class bricks except that they may be permitted to have slight distorted and rounded edges provided no difficulty shall arise on this account in laying of uniform courses.

M-16 Mild Steel Bars:

Mild steel bars reinforcement for RCC work shall conform to I.S. 432 1966 and of tested quality. It shall also comply with relevant part of IS 456-1978.

All reinforcement shall be cleaned and free from dirt, oil, paint, grease, mill's make or loose or thick rust at the time of placing.

Reinforcement steel shall be stored such as to avoid distortion and sogs of long length and shall be protected as far as possible from surface deterioration. All bars of the same designation shall be stacked separately as far as possible and distinctly marked. For the purpose of payment, the bar shall be measured correct up to 10mm length and weight payable worked out at the rate specified below.

1	6 mm	0.22 kg / Rmt
2	8 mm	0.39 kg / Rmt
3	10 mm	0.62 kg / Rmt
4	12 mm	0.89 kg / Rmt
5	14 mm	1.21 kg / Rmt
6	16 mm	1.58 kg / Rmt
7	18 mm	2.00 kg / Rmt
8	20 mm	2.47 kg / Rmt
9	22 mm	2.98 kg / Rmt
10	25 mm	3.85 kg / Rmt
11	28 mm	4.83 kg / Rmt
12	32 mm	6.31 kg / Rmt
13	36 mm	7.99 kg / Rmt
14	40 mm	9.86 kg / Rmt

M-17 High Yield Strength Steel Deformed Bars/TMT/CRS:

High yield strength steel deformed bars shall be either cold twisted or hot rolled and shall conform to IS 1786-1979 & I.S. 1139-1966 respectively or as revised from time to time.

T.M.T. shall conform to IS 1789- or as revised from time to time. Approved make for TMT bar shall be epoxy coated of Tata, Shah Alloys, essar, Malhotra, Thermax

Corrosion Resistance Steel shall conform to relevant IS code or as revised from time to time.

Other provisions and requirements shall conform to specification No. M -14 for Mild steel bars.

M-18 Mild Steel Binding Wire:

The mild steel wire shall be of 1.63mm or 1.22mm (16 or 18 gauge) diameter and shall conform to IS 280-1978 or as revised from time to time.

The use of black wire will be permitted for binding reinforcement bars. It shall be free from dust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

Storage: The wire coils shall be stored such as to avoid deterioration.

Measurement: No measurement will be taken of the wire used for tying reinforcement bars. The rate for reinforcement steel and its fabrication shall include the cost of binding wire.

M-19 Structural Steel:

All structural steel shall conform to I.S.226-1975 & I.S. 800-1962 or as revised from time to time. The steel shall be free from defects mentioned in I.S. 226-1975 and shall have smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability Rivet bars shall conform to I.S. 1148-1973.

Structural steel shall be stored such as to avoid distortion of section of long length and shall be protected as far as practicable from surface deterioration. It should be so stored and handled that material will not be subject to excessive stress and damages. All deformed structural material will be properly straightened by methods which are not injurious prior or being aid off, punched or otherwise worked in the shop. Sharp

kinks and bends shall be caused for rejection.

When the steel is supplied by the contractor test certificate of the manufacturers shall be produced, if so required by the Engineer-in-charge. If further test be necessary, they will be done according to I.S. 226-1975 & I.S. 223-1950 or as revised from time to time.

M-20 Shuttering:

The shuttering shall be either of wooden planking of 30mm minimum thickness with or without steel sheet lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical bellies properly cross braced together so as to make the form work rigid.

The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

If at any stage of work during or after placing concrete in the structure, the forms work sags or budes out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequate rigid form work. The complete form shall be got inspected by and approved from the Engineer-in-charge before the reinforcement bars are placed in position.

If wooden props are used, the props shall consist of bellies having 100mm minimum diameter measured at mid length and 80mm at thin end and shall be placed at 1 to 1.20 m. spacing. These shall rest squarely on wooden sole plates 10 mm thick and minimum bearing area of 0.10 sq.m. laid on sufficiently hard base. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and casing of shuttering without jarring the concrete.

The timber used in shuttering shall not be so dry as to absorb water from concrete and swell budge nor so green or wet as to shrink after erection. The limber shall be properly swan and planned on the sides and the surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel shall be permitted.

As far as practicable clamp shall be used to hold the forms together and use of nails and spikes avoided.

The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of soap solution or raw linseed oil of approved manufacturer may be applied in place of soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface.

The shuttering for beams and slabs shall have camber of 4 mm per meter (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilever the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-charge.

The period that shall elapse after concrete has been laid before easing and removal of centering and shuttering as under taken shall be as follows:

Sr.No.	Part of structure	d
1	Sides of foundation, columns beams & walls.	34 to 48 hours
2	Undersides of slabs up to 4.5 m span	7 days.
3	-Do- above 4.5 m add under side of beams and arches up to 6 m span.	14 days.
4	-Do- above 6 m. span and up to 9 m span.	21 days
5	Undersides of beams and arches over 9 m span	28 days
6	Domes: Shall & other structure of special nature.	As per instruction.

Work damaged through premature or careless removal of forms shall be reconstructed. The period for

striking the form work shall be 1.5 times more in case of Pozzolona cement if used then that of the ordinary Port land cement and the contractor shall not entitle for any extra claim for the same.

M-21 Expansion Joints, Pre-molded Filler:

The item provides for expansion joints in R.C.C. frame structure for internal joints, as well as for exposed joints with the use of pre-molded bituminous joint filler.

Pre-molded bituminous joint filler i.e. pre-formed strip of expansion joints filler shall not be deformed or broken by twisting bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

Thickness of the pre-molded joint filler shall be 25mm unless otherwise specified pre-molded bituminous joints filler shall conform to I.S. 1938-1961 or as revised from time to time.

M-22 Expansion Joints – Copper Strip & Holdfast:

The item provides for expansion joints in R.C.C. frame structure for internal joints as well as for exposed joints with the use of necessary copper strip and hold fasts. Copper sheet shall be of 125 mm thick and 125mm or required width with the “U” shape in the middle. Copper strip shall hold fast of 3mm diameter copper rod fixed to the plaster shoulders on strip at intervals of about 30 or as shown in the drawing or as directed by the Engineer-in-charge. The width of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25mm depth of “U” to be provided in the expansion joint in the copper plate shall be of 25mm.

M-23 Teak Wood:

The teak wood shall be of good quality as required for the item to be executed when the kind of wood is not specially mentioned good Indian Teak Wood as approved by the Engineer-in-charge shall be use.

Teak wood shall generally free from large, loose, dead or cluster knots, flows, shakes, wraps twists bends or any other defects it shall generally be uniform in sub-stance and of straight fibers as far as possible. It shall be free from root, decay, harmful fungi and other damages of harmful nature which will affect the strength durability or its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting using and adhesive or resinous materials, made to hide the defects shall render the pieces liable to rejection by the Engineer-in-charge.

All scantlings, planks etc. shall be swept in straight lines and planes in the direction of grains and of uniform thickness.

The tolerance in the dimensions shall be allowed at the rate of 1.5mm per face to be planned.

First Class Teak Wood

First class teak wood shall have no individual hard and sound knots, more than 6 sq.cm. size and the aggregate area of such knots shall not be more than 1% of area of piece. The timber shall be closed grained.

Second class Teak Wood:

No individual hard and sound knots shall be more than 15 sq. cms in size and aggregate area of such knots shall not exceed 2% of the area of piece.

Non-Teak wood:

The non teak wood shall be chemically treated, seasoned as per IS specifications and of good quality. The type of wood shall be got approved before collecting the same on site. Fabrication of wooden member shall be started only after approval.

For this purpose, wood of Bio, Kalali, Siras, Behda, Jamun, Sisoo will be used for door frames whereas only Kalali, Siras, Halda, Kalam etc. will be permitted for shutters after proper seasoning and chemical

treatment.

The non-teak wood shall be free from large, loose, dead of cluster knots, flow, shakes, wraps, bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free from rots, decay harmful fungi and other defects of nature which effect the strength, durability or its usefulness for purpose for which it is required. The colour of wood shall be uniform as far as possible. The scantlings plank etc. shall be sawn in straight lines and planes in the direction of grain and uniform thickness.

The department will use the Agency to produce certificate from Forest Department in event of Dispute and the decision of the Department shall be final and binding to the contractor.

The tolerance in the dimension shall be allowed as 1.5 mm per face to be planed.

M-24 Glass:

All glass shall be of the best quality, free from specks, bubbles, smokes, veins, air holes, blisters and other defects. The kind of glass to be used shall be as mentioned in the item of specification or in the special provisions or as shown in detailed drawings. Thickness of glass panels shall be uniform. The specification of different kind of glass shall be as under:

Sheet Glass:

In absence of any specified thickness or weight in the item of detailed specifications of the item of work sheet glass shall be weighing 7.5 kg/ sq.m. up to 600mm x 600mm.

For panes larger than 600mmx600mm up to 800mmx800mm the glass weighting not less than 8.75 kg /sq.m. Shall be used. For bigger panes up to 900mmx900mm glass weighting less than 11.25 kg/ sq.m. Shall be used.

Sheet glass shall be patent Battened glass of best quality and for glazing and framing purposes shall conform to IS – 2835-1977. Sheet glass of the specified colour shall be used, if shown on detailed drawings or so specified. For important buildings and for panes with any dimensions 900 plate glass of specified thickness shall be used.

Plate Glass:

When plate glass is specified, it shall be “Polished Patent Plate Glass” of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undisturbed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the details drawing or as specified. In absence of any specified thickness, the thickness of plate glass to be supplied shall be 6mm and to tolerance of 0.55 to 0.88 mm shall be admissible.

Obscured Glass:

This type of glass transmits lights so that vision is partially or almost completely, obscured. Glass shall be plain rolled or double rolled, figured, ribbed or fluted, or frosted glass as may be specified or required, the thickness and types of glass shall be as detailed on drawings or as specified or as directed by the Engineer-in-charge.

Wired Glass:

Glass shall be with wire netting embedded in a sheet or plate glass electrically, welded 13mm. Georgian square mesh shall be used. Thickness of glass shall not be less than 6 mm wired glass shall be of type and thickness specified.

M-25 Fixtures & Fastenings:

General:

The fixtures and fastenings that is but things, tee and strap hinges, sliding door bolts, tower bolts, door

latch, bathroom latch, handles, door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specifications.

They shall be of iron, brass, aluminum chromium plated iron, and chromium plated brass, copper, oxidized iron, copper brass or anodized mat aluminum, stainless steel matt as specified.

The fixtures shall be approved make as per list of approved makes attached with the tender document. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operations.

The sample of fixtures and fastenings shall be got approved as regards quality and shape before providing them in position.

Their size shall conform to those prescribed in C-12. In respect of other dimensions not specified they shall conform to relevant I.S.

Hold Fast:

Hold fast shall be made from mild steel flat 50mm length at one end of the hold fast shall be bent at right angle and two Nos. of 6mm diameter holds shall be made in it for fixing it to the frame with screws. At the other end, the hold fast shall be forked and bent at right angles in opposite direction.

Butt Hinges:

Medium type iron butt hinges shall be specified.

Tee and strap hinges shall be manufactured from M.S. sheet as specified in the item.

Sliding Door Bolts (Aldrops)

In case of single leaf door, where iron socket plate or brass or aluminum fixing bolts (for sliding door bolt) cannot be fixed, a hole of suitable size shall be drilled in the door frame and a counter sunk plate not less than 1.5mm thick cut to shape shall be fixed at the face of the holes.

Tower Bolts (Barrel Type)

Mild steel door bolts shall be made in one piece. Knobs of tower bolts shall be cast and knob fixed in the bolt.

Door Latch:

The size of the door latch shall be taken as the length of latch.

Bathroom Latch:

Bathroom latch shall be similar to tower bolt. The size of the handles shall be determined by the inside grip length of the handles.

Door Stoppers:

Door stopper shall be either floor door stopper type or door catch type. Floor door stopper shall be of overall size as specified and shall have a rubber cushion.

Door Catch:

Door catch shall be fixed at a height of about 900 mm from the floor level such that one part of catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixity. The catch shall be fixed 20mm inside the face of the door for easy operation of catch.

Casement window fastener:

Casement window fastener for single leaf window shutter shall be left or right hand as directed.

Casement stays (straight peg stay):

The stays shall be made from a channel section having three holes at appropriate position so that the

window can be opened either fully or partially as directed.

Pivot:

The base socket plate shall be made from minimum 3 mm thick plate, and protected pivot shall not be less than 12 mm diameter and 12mm length and shall be firmly riveted to the base plate in case of iron pivot. Size of the stay shall be 250mm, 800mm as directed.

M-26 Paints:

(A) Oil Paints:

Oil paints shall be of the specified colour and shade, and approved by the Engineer-in-charge. The ready mixed paints shall be used. However, if its ready mixed paint of specified shade or tint is not available white ready mixed paint with approved strainer shall be allowed in such a case, the contractor shall ensure that the shade of the paints so allowed be uniform.

All the paints shall meet with the following general requirement:

- i) Paints shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, levering, cracking or colour separation and shall be free from lumps and skins.
- ii) The paint as received shall brush easily possesses good leveling properties and show no running or sagging tendencies.
- iii) The paint shall not skin within 48 hours in three quarters filled closed container.
- iv) The paint shall dry to smooth uniform finish free from roughness, grit, unevenness and other imperfections.

Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

(B) Enamel Paints:

The enamel paint shall satisfy in general requirements as mentioned in specification of oil paints.

Enamel paint shall conform to IS 2933-1975 or as revised from time to time.

M-27 French Polish:

The French polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials.

- i) Denatured spirit
- ii) Chandra's.
- iii) Shellac
- iv) Pigment

The French polish so prepared shall conform to I.S. 348-1968 or as revised from time to time.

M-28 Marble Chips for Marble Mosaic Terrazzo:

The marble chips shall be Makrana white or Chittor pink, yellow, green and black, Jaisalmer yellow, Baroda green, Deheradun white, grey (surat) and Alwar black or as specified. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains cracks, decay and weathering.

The size of various colours of marble chips ranging from the smallest up to 20mm shall be used where the thickness of top wearing layer is 6mm size. The marble chips of approved quality and colours only as per grading as decided by the Engineer-in-charge shall be used for Marble Mosaic Tiles or works.

The marble chips shall be machine crushed. They shall be free from foreign matters, dust, etc. Except as above the chips shall conform to I.S. 2114-1962 or as revised from time to time.

M-29 Flooring Tiles:

(a) Plain Cement Tiles:

The plain cement tiles shall be of general-purpose type. These are the tiles in the manufacture of which no pigments are used.

The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During manufacture tiles shall be subjected to a proportion of not less than 140 kg / sq.mt. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1:3 by weight. The wearing face through the tiles are of plain cement shall be provided with stone aggregates on 1 to 2 mm size. The proportion of cement to be aggregate in wearing layer of the tiles shall be three parts of cement to one part of chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist condition continuously at least for seven days and subsequently, if necessary, for such period that would ensure their conformity to requirements of I.S. 1237-1980 regarding resistance to wear and water absorption.

The wearing face of the tiles shall be plane, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles and all edges shall be sharp and true.

The size of tiles shall generally be squared shape size 24.85 cm x 24.85 cm or 25 cm x 25 cm. The thickness of tiles shall be 20 mm.

Tolerance on length and breadth shall be plus or minus one millimeter. Tolerance on thickness shall be plus 5 mm.

The tiles shall satisfy the test as regards transverse strength, resistance to wear and water absorption as per I.S. 1237-1980. Necessary tests shall be got carried out by the contractor.

(B) Plain Coloured Tiles:

These tiles shall have same specification as per plain cement tiles as per (A) above except that they shall have a plain wearing surface wherein pigments are used. They shall conform to IS 1237-1980.

The pigment used for colouring cement shall not exceed 10 percent by weight of cement used in the mix. The pigments, synthetics or otherwise used for colouring tiles shall have permanent colour and shall not contain materials detrimental to concrete.

The colour of the tiles shall be as specified in the item or directed by the Engineer-in-charge.

(C) Marble Mosaic Tiles / Terrazzo tiles:

These tiles shall have the same specifications as per plain cement tiles except that requirement as stated below:

The pigment incorporated in terrazzo shall be of permanent colour and shall conform to requirement mentioned in Appendix-A in I.S. 2114-1962. The marble powder shall pass through I.S. sieve Terrazzo-30. Marble chips shall conform to M-26.

The marble mosaic tiles shall conform to I.S. 1237-1980. The wearing face of the tiles shall be mechanically ground and filled. The wearing fact of tiles shall be free from projection, depressions, and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angel and all edges shall be sharp and true.

Chip used in the tiles shall be up to 6mm sizes. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be had on the wearing face, few samples (with or without their full-size photographs as directed by the Engineer-in-charge) shall be presented to the Engineer-in-charge for approval.

Any particular samples, if found suitable shall be approved by the Engineer-in-charge or he may ask for few more samples to be prepared indicating roughly the particular sized chips to be more or less in the sample presented. The sample shall have to be made by the contractor till a suitable sample is finally approved for use in the work. The contractor shall ensure that the supplied for the work shall be in conformity with the approved sample only tiles in item of its dimensions thickness of backing layer and wearing surface material ingredients, colour, shade chips distribution etc. required.

The tiles shall be prepared from cement conforming to I.S. or coloured Portland cement generally depending upon the colour of tiles to be used or as directed.

M-30 Rough Kotah Stone:

(A) Kotah Stones:

The kotah stones shall be hard, even, sound and regular in shape and generally uniform in colour. The colour of the stone shall generally be Green. Brown or yellow coloured, stones shall not be allowed for use. They shall be without any soft veins, cracks or flaws.

The sizes of the stones to be used for flooring shall be of size not less than 600mm x 450mm as directed. However, smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.

(B) Polished Kotah Stones:

Polished kotah stone shall have the same specification as per rough kotah stone as per (A) above except as mentioned below.

The stone shall have machine polished smooth surface. When brought on side, the stone shall be single or double polished depend upon the its use or as described in the item of Schedule "B". The stone for flooring shall generally be single polish. The stone to be used for dedo, skirting, platform, stair case steps etc. shall be double polished & all exposed edges rounded.

M-31 Dholpur Stone Slab:

Dholpur stone slab shall be for best quality as approved by the Engineer-in-charge. The stone slab shall be without any veins, cracks and flaws. The stone slab shall be even, sound and durable, regular in shape and of uniform colour.

The size of the stone shall be as specified in the item or detailed drawing or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2mm. The provisions in respect of polishing as per M-29 (B) of polished kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be file chiseled or polished as specified in the item of work and all the four edges shall be machine cut. All angles and edges of the stone slab shall be true square cut and free from chippings and surface shall be true and plane.

The sample of stone shall be got approved from the Engineer-in- charge for shade and tint for a particular work. It shall be ensured that the stones to be used in a particular work and shall not differ much in shade or tint from the approved sample.

M-32 Marble slab:

Marble slabs shall be white or of another colour and of best quality as approved by the Engineer-in-charge. Slab shall be hard, close, uniform and homogeneous in texture. They shall have even crystalline grain and

free from defects and cracks. The surface shall be machine polished to an even and perfectly plane surface and edges machine cut true and square. The rear face shall be rough enough to provide key for the mortar. Marble slabs with natural veins. If selected have to be laid as per the pattern given by the Engineer-in-charge. Size of slab shall be minimum 450mm x 450mm preferably 600mm x 600 mm. However, smaller size will be allowed to be used to the extent of maintaining required pattern.

The slab shall not be thinner than the specified thickness at its thinnest part. A few specimens of finished slab to be used shall be deposited by the contractor in the office for reference.

Except as above, the marble slab shall conform to IS 1130-1969 or as revised from time to time.

M-33 Granite Stone slab:

Granite shall be of approved colour and quality. The stone shall be hard sound, durable, resistant to wear, rectangular or square in shape and as directed by the Engineer-in-charge. Uniformity of size shall generally be maintained for the stones used in any one room. The stone shall be without any soft. Veins, cracks or flaws and shall have uniform colour. They shall have natural surface free from broken flakes on top, and the exposed surface shall be machine polished to a smooth, even and true plane and the edges hand cut and dressed true and square. The evenness of the surface of slabs and edges of the slab shall not be marred by careless dressing or handling and no patching up shall be allowed for the slab. The edges shall be quite straight. The under face may be left as required or rough dressed. Before taking up the work samples of stone slabs, to be used and their dressing and polishing shall be got approved by the Engineers in-charge and will keep them in his office' for reference and the stone slabs to be used shall conform to the approved sample.

The maximum water absorption percentage and minimum compressive strength shall be as given in Table – 1 below:

Table -1

Type of Stone	Maximum Water Absorption percentage by weight	Minimum Compressive strength Kg/Sq. cm
Granite	0.50	1000

Note -1: Test for compressive strength shall be carried out as laid down in IS: 1121(Part1).

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

The thickness of the stone shall be as specified in the item.

The Granite stone of approved colour shall be double polished on single or both side as per requirement of items to be executed.

All exposed faces shall be double polished to render truly smooth and even reflecting surface. The exposed edges and corners shall have rounded off as directed. The exposed edges shall be machine cut & rounded and shall have uniform thickness.

M-34 White Washing:

Following materials shall be used for preparing white wash.

1. Fresh burnt white stone or lime.
2. Gum Arabic 2.0 kg / cmt. Of lime.
3. Indigo as required.

It shall conform to relevant I.S. specifications.

M-35 Distemper:

Oil bound washable distemper of approved brand and manufacture and colour and shade shall be used. It shall conform to IS 427-1965. Distemper shall be used according to the manufacturer's instructions only.

M-36 White Glazed Tiles:

The tiles shall be of second-class quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing spots, chipped, edges and corners. The glazing shall be of uniform shade.

The tiles shall be of nominal size of 150mm x 150mm unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tiles, shall be plus or minus 1.5mm. The thickness of tiles shall be 6 mm. except as above the tiles shall conform to IS 777-1970.

M-37 Galvanized Iron Pipes & Fitting:

Galvanized Iron pipe shall be of the medium type and of required diameter and shall comply with IS 1239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screws, all galvanized iron fittings shall be of the standard "R" or equivalent make. All the pipes and fittings shall have ISI certification mark.

The pipe and fittings shall be smooth, sound, free from any imperfections and neatly dressed. The pipe and fittings shall be above to withstand a safe pressure of 6kg per square centimeter.

M-38 Bib Cock & Stop Cock:

A bib cock is a drawn off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for inserting in a pipe line for controlling stopping the flow.

They shall be of sPVC crew down type and of brass chromium plated and of diameter as specified in the description of the item. It shall conform to IS 781-1977 or as revised from time to time and they shall be of best Indian make. They shall be polished bright.

The minimum finished weight of bib cock and stop cock shall be as given below:

Diameter	Bib cock	Stop cock
8 mm	0.25 kg	0.25 kg
10 mm	0.30 kg	0.35 kg
15mm	0.40 kg	0.40 kg
20mm	0.75 kg	0.75 kg

M-39 Gun Metal Wheel valve:

The gun metal wheel valve shall be of approved quality, these shall be of the gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. They shall conform to I.S. 778-1980.

M-40 White Glazed Porcelain Wash Basin:

Wash basin shall be of white porcelain of approved quality best Indian make and it shall conform to IS 771-1979 or as revised from time to time. The size of the wash basin shall be as specified in the item. Wash basin shall be of one-piece construction with continued over flow arrangements. All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have simple tap hole as specified. Each basin shall have a circular waste hole which is either rebated or leveled internally with 65mm diameter at top 10 mm depth to suit the waste fitting. The necessary stud slot to receive the bracket on the underside of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl. Necessary CP brass waste, CP chain, brass CP 15mm dia socket, bottle trap, PVC waste pipe, waste plug and waste couplings shall be provided. The pillar cock for wash basin shall be in conformation with the I.S. 1275-1976 or as revised from time to time. The height from the floor to top of the rim of basin shall be 750 to 800 mm as directed.

M-41 European type water closet:

The European type water closet shall be white glazed porcelain second quality and shall be of wash down type conforming to I.S. 2556-1981 and 771-1979 or as revised from time to time.

“S” trap shall be provided as required with water seal not less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980 or as revised from time to time. They shall be made of moulded synthetic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects as shall have chromium plated brass hinges and rubber butter four number of suitable sizes.

M-42 Indian type Water closet:

The Indian type white glazed water closet of second quality shall be of size as specified in the item conforming to IS 771-1979 and I.S. 2556 (Part-II) 16981. Each pan shall have materials flushing ring of suitable type with adequate number of holes around as directed to have satisfactory flushing. It shall also have an inlet or back or front for connecting flush pipe as directed by the Engineer-in-charge. The inside of bottom of pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth.

Pan shall be provided with 100mm diameter “P” or “S” trap with approximately 50mm water seal and 50mm diameter Vent horn.

A pair of white glazed earthen ware rectangular foot rests of minimum size 250mm x 130mm x 20mm shall be provided with the water closet.

M-43 Flush Cock:

Half turn flush cock (Medium weight) shall be of brass chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant IS or as revised from time to time.

The flush cock shall be of a make as approved by the Engineer-in-charge.

M-44 Cast Iron Pipes & Fittings:

All soil, waste, vent and anti-symphonize pipes and fittings shall conform to IS 1729-1979 or as revised from time to time. The pipes shall have spigot and socket ends with head on spigot end. The pipes and fitting shall be true to shape, smooth, cylindrical their inner and outer surfaces being a nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pin holes or other imperfection and shall be neatly dressed and carefully fettled.

The ends of pipes and fittings shall be reasonable square to their axis.

The sand cast iron pipes shall be of the diameter as specified in the description and shall be in length of 1.5, 1.8m and 2m. Including socket ends of pipes unless shorter length either are specified or require at junctions etc. Tee pipes and fittings shall be supplied without ears unless specified or directed otherwise.

Tolerances:

The standard weights and thickness of pipes shall be as shown in the following table:

A tolerance up to minus 10 percent may however be allowed against these standard weights.

Sr.No.	Nominal dia of bore.	Thickness	Overall weight of pipes excluding ears.		
			1.5 m long	1.8 m long	2 m long
1	75mm	50	13.83 kg	16.52 kg	18.37 kg.
2	100 mm	50 mm	18.14 kg	21.67 kg	24.15 kg.

A tolerance up to minus 15 percent in thickness and 20mm in length will be allowed. For fittings tolerance in lengths shall be plus 25mm and minus 10 mm.

The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding size of straight pipes. The tolerance in weights and thickness shall be the same as for straight pipes.

M-45 Nahni Trap:

Nahni trap shall be sound and free from porosity or other defect which affects serviceability, the thickness of the base metal shall not be less than 6.5 mm. The surface shall be coated with vitreous enamel thoroughly fused to the cast iron base. The coating shall be adequate even and shall cover the entire surface. The surface shall be glossy, smooth and free from craze, chips and other flows or any other kind of defect which affect serviceability. The size of Nahni trap shall be as specified and shall be self-cleansing design.

The Nahni trap shall be of best quality approved by the Engineer-in-charge and shall generally conform to the relevant I.S.

The Nahni trap provided shall be with deep seal, minimum 50mm except at places where trap with deep seal cannot be accommodated. C.I. Jali shall be of appropriate size and quality.

M-46 Gully Trap:

Gully trap shall conform to I.S. 651-1980. These shall be sound, free from visible defects such as fire cracks or hair cracks. The glaze of the traps shall be free from crazing. There shall give a sharp clear tone when struck with light, hammed. There shall be no broken blisters.

The size of the gully trap shall be specified in the item.

Each gully trap shall have on CI grating of square size corresponding to the dimensions of inlet of gully trap. It shall also have water tight. C.I. cover with frame inside dimensions 300 mm x 300 mm. The cover weighting not less than 4.53 kg., and the frame not less than 2.72 kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined scatted facts.

M-47 Glazed Stoneware Pipe & Fittings:

The pipes and fittings shall be of best quality as approved by the Engineer-in-charge. The pipe shall be of best quality manufactured from stoneware of fire clay, self-glazed thoroughly burnt throughout the whole thickness of a close event texture, free from air blows, fire blisters, cracks and other imperfections, which affect the serviceability. The inner and outer surface shall be smooth and perfectly glazed. The thickness of the wall shall not be less than $1/12$ th of the internal dia. The depth of socket should not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 6mm around the pipe.

The pipes shall generally conform to relevant I.S. 651-1980.

M-48 GI Water Spout:

The G.I. pipes of 40 mm dia shall be medium quality and specials shall be of "R" brand or equivalent brand of best approved quality.

The pipes shall have length as required for thickness and wall in which it is fixed and at the outside end one tee and bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. the water spout shall be provided as per detailed drawing or as directed by the Engineer-in-charge.

M-49 Selected earth / Murrum:

The selected earth / Murrum shall be that obtained from excavated material or shall have to be brought from outside as indicated in the item. If item does not indicate anything the selected soil shall have to be brought from outside.

The selected earth / Murrum shall be good yellow soil and shall be got approved from the Engineer-in-

charge in case black cotton soil or similar greatly expensive and shrinkable soil shall be used. It shall be cleaned and free from all rubbish and perishable materials, stones or bats. The cold shall be broken to a size of 50mm or less. Contractor shall make his own arrangement at his own cost for land for borrowing selected earth / Murrum. The stacking of material shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any construction activities in decent stacks.

When excavated material is to be used only selected stuff got approved from the Engineer-in-charge shall be used. It shall be stacked separately and shall comply with all requirements of selected mentioned in Para 2 above.

M-50 Rolling shutters:

The rolling shutters shall be of approved makes and design and shall be suitable for fixing in position as directed by the Engineer-in-charge.

The shutter shall be built up of inter locking lath section formed from cold rolled strips. The size of different component shall be as per IS 6248-1979.

The cold rolled steel grip shall be rolling shutter lath section conforming to I.S. 4030-1973.

The self-coiling type rolling shutter shall be raised lowered manually by means of a pulling applied to the pulling handle fixed on the bottom lock place to the top most position with each.

The thickness of steel sheets from which the lath sections have been rolled shall be not less than 0.9 mm for shutter up to 3.5 m width and not less than 1.2mm. Shutter above 3.5 m width.

The lath section shall be rolled so as to have interlocking curls at bottom edges and a deep corrugation at the centre with a bridge depth of not less than 12 mm for each lath section shall be continuous signal place without any welded points.

The depth and width of guide channel shall be as under:

Clear width of shutter	Min. depth of guide channel.
Up to 3.5 m	65 mm
3.5 to 8 M	75 mm
8 M and above	100 mm

Width of guide channel shall be 25mm for lath section with bridge depth of about 12 mm and 32mm for lath section with bridge depth of about 16 mm. Size of bracket plate for different height of different rolling shutter shall be as follows:

Clear height Mt.	Size of bracket plate minimum mm x mm x mm
Up to 2.3	300 x 300 x 3.15
Above 2.3 & up to 2.6 Mt.	325 x 325 x 3.15
Above 2.6 & up to 3.00	350 x 350 x 3.15
Above 3.0 & up to 3.5	375 x 375 x 3.15
Above 3.5 & up to 4.5	400 x 400 x 6.00
Above 4.5 & up to 5.5	450 x 450 x 6.00

Above 5.5 & up to 6.50	500 x 500 x 10.00
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Size of shaft pipe shall be as given below:

Width	Size of pipe
Up to 2.0	32mm nominal bore
Up to 3.0 m	40mm nominal bore
Up to 6.00 m	50mm nominal bore

Hood cover shall be made of mild steel not less than 0.9 mm thick.

M-51 Urinal:

Urinal shall be of 2nd class quality white porcelain of approved quality; best Indian make and it shall conform to IS 1556-Part-II 1974 with suitable size of side collar for fixing in position. The size of urinal shall be as specified in the item. Urinal shall be of one-piece construction. All internal angles shall be designed so as to facilitate cleaning. Urinal shall have single tap hole as specified. Urinal shall have a circular waste hole which is 65mm dia and 100 mm deep to suit the waste fitting.

Necessary C.P. brass stop cock with PVC connection of specified size shall conform to I.S. 781-1977. Necessary PVC reducer with PVC waste pipe of 25mm dia shall be designed to make height from the floor to the top of the rim of the urinal 550 to 600 mm as directed.

M-52 Wooden flush door shutters (solid Core):

The solid core type flush door shutters shall be decorative or non-decorative in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per IS- 2202 – (Part-1) 1980. The timber shall be free from decay and insect attack. Knots and know holes less than half the width of cross section of the members in which they occur may be permitted. Pitch pockets, pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross – bands shall conform to I.S 303-1275.

The face panel of the shutters shall be formed by gluing by the hot press on both faces of the core with either plywood or cross-bands and face veneers. The hopping rebating opening of glazing, venation etc. shall be provided if specified in the drawing.

All edges of the door shutters shall be square. The shutters shall be free from twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

The shutter shall be tested for:

1. **End immersion test:** The test shall be carried out as per IS 2202 (Part-I) 1980. There shall be no delaminating at the end of the test.
2. **Knife Test:** The face panel when tested in accordance with IS 1659-1979 shall be pass the test.
3. **Glue adhesion test:** The flush door shall be tested for glue adhesive test in accordance with I.S. 2202 (Part-I) 1980. The shutters shall be considered to have passed the test if no delaminating occurs in the glue lines in the plywood and if no single delaminating more than 80mm in length and more than 3 mm in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delaminating at the corner shall be measured continuously around the corner. Delaminating at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

The tolerance in size of solid core type flush door shall be as under:

In normal thickness +/- 1.2mm

In normal height +/- 3mm.

The thick of the shutters shall be uniform throughout with a permissible variation of not more than 0.8 mm when measured at any two points.

M-53 Aluminum doors, windows, ventilators:

Aluminum alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S. 733-1975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The section shall be as specified in the drawing and design. The fabrication shall be done as directed.

The hinges shall be cast or extruded aluminum hinge of same type as in window but of large size.

The hinges shall normally be of 50mm projecting type. Non-projecting type of hinges may also be used if directed. The handles of door shall be of specified design. A suitable lock for the door operatable either from outside or inside shall be provided. In double shutter door, the first closing shutter shall have concealed aluminum alloy bolt at top and bottom.

M-54 Collapsible Steel Gate:

The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flats etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gates shall be as under:

- a) Pickets: These shall be of 20mm M.S. channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms. with an opening of 10 cms.
- b) Pivoted M.S. flats shall be 20mm x 6mm.
- c) Top and bottom guides shall be from tee or flat iron of approved size.
- d) The fittings like stoppers, fixing hold fast, locking cleats, brass handles and cast-iron rollers shall be of approved design and size.

M-55 Plastic sections for door / window partition etc.

Technical features for plastic section shall be as under:

- i) Material of construction shall be specially formulated PVC compounds.
- ii) **Water absorption:** 0.8% at 100 degrees Centigrade in 24 hours thus virtually water and moisture proof.
- iii) **Chemical resistance:** It shall be resistance to acid / alkalis.
- iv) **Fire resistance:** Self-extinguishing classified under first class construction material by insurance companies.
- v) **Termite and Fungal resistance:** Material shall be fully resistance to termite and fungal attack.
- vi) **Thermal conductivity:** Very low thermal conductivity co-efficient varies from 0.015 to 0.016 Kcal / HrmC.
- vii) **Acoustic property:** Max. Absorption shall be up to 38%.

M-56 Water Proofing Cement Paint:

Water proofing cement paint of approved shade shall conform to IS-5410-1969 or as revised from time to time. Primer shall be best quality, make and as approved by the Engineer-in-charge. The materials required for work of painting shall be obtained directly from approved manufacturer or approved dealer and brought to the site in maker's drums, keys etc. with seal unbroken.

M-57 STONE FOR BELA MASONARY:

Pucca approved white stone bella of sand of uniform size shall be dressed, earth / murrumy or discolnged or weathered or water worm stone shall not be used. The size of bella stone shall as directed by Engineer to suit the width of wall. Corner stones & quoins shall be of good quality and should be dressed to correct

angle. The corner stone shall be got approved before bringing to site.

The stone shall be free from defects like cavity, flaws, sand holes, and veins, patches of soft or loose material. The percentage of water absorption shall generally not exceed 5 % by weight. Generally, the stone shall not contain silica or chert, mica or any other deleterious material like iron oxide organics impurities etc. The crushing strength of bella stone shall not less than 300 Kg/cm². Transverse strength shall not less than 70 Kg/cm².

M-58 Vitrified floor tiles:

Vitrified floor tiles shall be of best quality & approved make as approved by the Engineer. They shall conform to the relevant I.S. codes.

Vitrified tiles using for floor finishing should confirm ISO13006/E176 group B.1.a of international standards and also should confirm of testing methods of norms EN 98.

The vitrified tiles shall be Monolithic and available in smooth, mirror polished and anti-skid finish. Their water absorption rate shall be less than 0.5%. They shall offer hard working and hardwearing floors for public buildings. The tiles shall be of ASTM or DIN standards.

The vitrified tiles shall be extremely strong breaking strength of the tiles being 1600 kg./cm², flexural strength 200 kg. / Cm² and bounding strength of 2500 kg/cm². There shall after good resistance to abrasion i.e. greater than 100. There shall be scratch resistance; their hardness on the Moh's scale shall be min. 7. They shall also to resist thermal shock up to 10 cycles. They shall have a density of 2.2 gm/cc. They shall have 0.6 co-efficient of friction for polished / unpolished surfaces.

M-59 85 mm thick pre-cast Rubber molded interlock paver concrete block:

The 85 mm thick pre-cast Rubber molded interlock paver concrete block shall be manufactured by electrical hydraulic operated block marking machine. The block should have minimum compression strength of 300 kg. Per sq.cm. The minimum thickness of the pre-cast Rubber molded interlock paver concrete block shall be 85mm and minimum size shall be 300x300mm. The block shall be of approved make & best quality as approved by the Engineer-in-charge. The size, shape, and shade of pre-cast Rubber moulded interlock paver concrete block shall be as approved by the Engineer-in-charge. There shall be true to shape. There shall be free from crack, crazing, and spots etc.

M-60 Acrylic roof Sheets:

Acrylic roof sheets shall be of thickness as specified in the item. The shape and size of sheet shall be as directed. Acrylic roof Sheets may be flat or curved. It should be light in weight. It shall be colourless or coloured or opaque. Colourless sheet shall be as transparent as the finest optical glass. Its light transmission rate shall be about 95%. Transparency shall not be affected for the sheets of larger thickness. It shall be extremely resistant to sunlight, weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet shall be impact resistant also. Sheet should be available in complete range of standard transparent, man lucent and opaque colors. Sheets shall be of such quality that they can be cut bent and jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

M-61 Plywood:

The plywood for general purpose shall conform I.S. 303-1975. Plywood s made by cementing to gather thin boards or sheets of wood into panels. There is always an odd number of layers 3,5,7,9 ply etc. The plies are placed so that grain of each layer is right angle to the grain in the adjacent layer.

The chief advantages of plywood over a single board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and greater resistance to cracking and splitting with change in moisture content.

Usually, synthetic resins are used for gluing, pherolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between bet plates which maintain a temperature of 90 degree. C. to 140-degree C. and a pressure of 11 to 14 Kg. / Sq.cm. on the wood. The times of heating may be anything from 2 to 60 minutes depending upon thickness.

When water glue is used, the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are used as adhesive finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture has been absorbed.

According to I.S. 303-1975 the plywood for general purpose shall be of three grades namely BWR, WWR and CWR depending upon the adhesives used for bonding and veneers, and it will be further classified into six types namely AA, AC, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A, B, and C. After pressing the finished plywood should be reconditioned to moisture content not less than 8 percent and not more than 16 percent.

Thickness of plywood Boards:

Board	Thickness
3 Ply	3 mm
	4 mm
	5 mm
	6 mm
5 Ply	5 mm
	6 mm
	8 mm
	9 mm
7 Ply	9 mm
	13 mm
	16 mm
9 Ply	13 mm
	16 mm
	19 mm
11 Ply	19 mm
	22 mm
	25 mm

M-62 PVC Pipes:

The low-density polythene pipe of specified diameter with 6 kg/esq. working pressure shall conform to IS 3076-1968.

The specials and fitting required shall be only of Prince, Supreme, & Kisan.

Bidders signature

**Executive Engineer
GIDC, VAPI**

CODE OF PRACTICE

GENERAL

The method of execution of the items shall conform to the relevant specifications as per the latest version of the Indian Standard unless specified otherwise and as far as applicable.

Wherever a reference to ANY Indian Standard appears in the specification, it shall be taken to mean as a reference to the latest version of the standard.

The following specifications, standards, and codes are made as a part of this specification.

Indian Standards: specification for building materials, specification for equipment, method of test, method of measurement of building works, code of practice for construction, safety code for demolition of building, safety code for scaffolds etc. published by the Bureau of Indian Standards

The contractor shall invariably carry out Materials & work Tests as specified in the tender document (**B1-Form**) and IS code. However, if the additional tests are required as per the opinion of the Engineer-in-charge, the same shall also have to be carried out. All such tests shall be got carried out in Government or as approved laboratories and cost thereof shall be entirely borne by the contractor. No collection of materials shall be made before it is got approved from the Engineer-in-charge.

All moulds, equipment etc. required of preparing specimens for the test shall be kept in sufficient numbers and in good state, as directed by the Engineer-in-charge on the site of work.

Specimen for tests shall sent to the laboratory along with representative of GIDC in time and the results thereof shall be promptly obtained and reported to the Engineer-in-charge.

Satisfactory test results shall not observe the contractor from dismantling and re-doing any work revealed to the defective at a later date. The contractor shall have no claim for any payment or compensation whatsoever on account of replacement of such defective work. Contractor shall take all precautions and care during dismantling and re-doing the work to ensure that any other work so far executed does not get damage or affected.

The work shall be carried out in true line and level and in conformity with the detailed drawing and specified patterns.

All the work shall be carried out in a workmanship like manner and as per the best techniques for the particular item.

All tools, tempts equipment etc. for correct execution of the work as well as for checking lines, levels, alignments of the works, during execution shall be kept in sufficient numbers on the side of work.

All installations pertaining to water supply and its fixtures as well as drainage lines and sanitary fitting shall be deemed to be completed only after giving satisfactory tests by the contractor.

Scaffolding being provided by the contractor at his own cost for such of the items for the execution of which it is essential.

C1/1 Excavation

General:

In all sorts of soil, sand, gravel, soft murrum and other similar soft or loose material. The excavation will generally refer to the open excavation for foundation.

Clearing the site:

The site on which the structure is to be built shall be cleared and all obstructions, loose stones, material, and rubbish of all kind, bush, wood, and trees shall be removed as directed. The materials so obtained shall be the property of the GIDC and shall be conveyed the stacked as directed by the Engineer-in-charge.

Setting out:

After clearing the site the centre lines will be given by the Engineer. The contractor shall assume full responsibility for alignment, elevation, and dimension of each and all parts of the work. Contractors shall supply labour materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required.

Excavation:

It shall be all sorts of soil, sand, gravel, soft murrum, or other similar soft or loose materials.

The excavating for foundation and for basement shall be carried out in true line and level and shall have the width and depth as shown in the drawing or as directed by the Engineer-in-charge. The contractor shall do the necessary shorting and shutting or slopes to a safe angel, if necessary, including bailing and pumping out water when separate provision does not exist for it in tender, at his own cost. The bottom of the excavated area shall be leveled both longitudinally and transversely as directed by the Engineer-in-charge. No earth filling will be allowed to bring it to level if by mistake or any other reasons excavation is made deeper or wider than shown on the plan or directed by the Engineer-in- charge. The extra depth or width shall be made up with concrete or masonry of the foundation grade as directed by the Engineer-in- charge and at the cost of the contractor.

Disposal of the excavated stuff:

The excavated stuff of the selected type shall be used in filling the trenches in layers including ramming and watering etc.

The balance of the excavated quantity shall be removed by the contractor from site of work to a place as directed by the Engineer-in-charge with all lead and lift but within the same estate.

C1/2 Excavation in Hard murrum:

Same as C-1/1 except that the excavation shall be in hard murrum.

C1/3 Excavation in Hard murrum and boulders.

Same as C-1/1 except that the excavation shall be in hard murrum and boulders.

C1/4 Excavation in soft rock:

Same as C-1/1 except that the excavation shall be in soft rock.

C1/5 Excavation in Hard rock.

Same as C-1/1 except that the excavation shall be in hard rock

C-2/A Plain Cement Concrete Laying in Foundation / for Floor Bedding:

General:

Before starting concrete, the bed of the foundation trenches shall be cleared of all loose materials and watered as directed.

Proportioning of Mix:

The proportion of the cement to sand and coarse aggregates shall be as specified in the item and shall be measured by volume.

Mixing:

The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be

allowed for smaller quantities of work if approved by the Engineer-in-charge. The mixing shall be done for a period of 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

Scaffolding:

All scaffolding, hoisting arrangement and ladders etc. required for the facility of concrete shall be provided by the contractor and removed on completion of work. The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work and afford easy inspection.

Form work:

The form work shall be provided, if necessary, as directed by the Engineer-in-charge and shall be as per I.S. 461-1972 or revised from time to time.

Transporting & placing the concrete:

The concrete shall be handled from the place of mixing to the final position by not more than 15 minutes by the method as directed by the Engineer-in-charge and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.

The concrete shall be laid in layers of 15 cms to 20 cms.

Compaction:

The concrete shall be thoroughly compacted by hammers immediately after depositing to get a dense concrete. Concrete shall not be disturbed once it has set.

Curing:

After the final set, the concrete shall be kept continuously wet, if required by pounding for a period of not less than 7 days from the date of placement.

C-3/A Lime Cinder Concrete Laying:

This shall be as per C-2 of code of practice. The coarse aggregate in this case shall cylinder.

C-4/A Ordinary Cement Concrete Plain or Reinforce:

I.S. 466-1978 or as revised from time to time shall be followed in general cement sand by black trap grit and coarse aggregate shall be measured by volume. For proportioning of cement by volume one bag of cement shall be taken as 0.0342 cu.m. (1.2 cft)

Mixing:

Concrete shall be mixed in a mechanical mixer. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in colour and consistency but in no case shall mixing be done for less and 1 1/2 minutes. When hand mixing is permitted by the Engineer-in-charge in case of small work or in case of breakdown of machineries and in the interest of the work it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However, in such cases 10% more cement than otherwise required have to be used without any extra cost.

Transporting:

Concrete shall be handled from the place of mixing of the final position as quickly as practicable by methods which will prevent segregation or loss of ingredients. In no case operation shall be taken more than 15 minutes.

Placing:

The concrete shall be placed into its final position and completed and finished within 30 minutes of mixing the water and before setting commence. Method of placing shall be such as to avoid segregation, approved

by the Engineer-in-charge. Concreting shall be carried out continuously up to construction joints, the position and arrangement of which, shall be pre-determined by the designer.

When the work has to be resumed on a surface which has hardened, such surface shall be roughened. It shall then be swept clean thoroughly wetted and covered with a thin layer of mortar composed of cement and sand in the same proportion as the cement and sand in the concrete mix. This layer of mortar shall be freshly mixed and placed immediately before the placing of the concrete.

When the concrete has not fully hardened, all laitance shall be removed by scrapping the wet surface with wire or bristles care being taken to avoid dislodgement of particles or aggregates. The surface shall be thoroughly wetted and all free water removed. The surface shall be coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150mm in thickness and shall be well rammed against old work. Particular attention is paid no corners and spots.

Compaction:

Concrete shall be thoroughly compacted during the operation of placing and thoroughly worked around the reinforcement, around embedded fixtures and into corners of the form work. Compacting shall be done by mechanical vibrations, in such a way that a dense mix is obtained.

Curing:

The concrete shall be kept covered with a layer of sacking canvas or similar materials or by pounding and kept constantly wet for twenty-one days from the date of placing concrete. Curing by pounding shall preferably be done by erecting suitable dykes of lean mortar.

Form work:

General:

The form work shall conform to the shape, lines and dimensions as on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete, and shall be sufficiently water tight to prevent loss of liquid from concrete. Adequate arrangements shall be made by the contractor to safeguard against any settlement of the form work during the course of concreting and after concreting. The design of the form work and centering shall be got approved from Engineer-in-charge before erection.

Cleaning & Treatment of Forms:

All rubbish, particularly chipping shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wetted or treatment with an approved composition. Care shall be taken that such approved composition is kept out of contact with reinforcement.

Stripping Time:

In normal circumstances and where ordinary cement is used, forms may be struck after expiry of following period

(a)	Walls columns & vertical side of beams	24 to 48 hours as may be decided by the Engineer-in-charge.
(b)	Side of slabs	3 days
(c)	Beam	7 days
(d)	Removal of props to slabs. (i) Slabs spanning up to 4.5 M (ii) Spanning over 4.5 M	7 days. 14 days.

(e)	Removal of props to beams & arches. Spanning up to 6 M Spanning over 5 M	14 days 21 days
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Procedure when removing the Form work:

All form shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffits and struts are removed and concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. The form work will be paid under the respective item if provided in the tender.

Centering:

The centering to be provided shall be got approved from the Engineer-in-charge. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during, and after pouring concrete. Watch should be kept to see that behavior of centering and formwork is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

The props of centering shall be provided on firm foundation of base of sufficient strength to carry the loads without settlement.

The centering and form work will be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor or his responsibility for strength, adequacy, and safety of form work and if there is a failure of form work or centering, contractor shall be responsible for the damages to work, injury to life and damage to the property.

Scaffolding:

All scaffolding, hoisting arrangements etc. required for the facility of concreting shall be provided and removed on completion of work by the contractor at his own expenses. The scaffolding, hoisting arrangement and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work, and workmanship etc.

The scaffolding, hoisting arrangement and ladders shall allow easy approach to the work spot and afford easy inspection.

Testing:

Work sample of concrete 150mmx150mm x 150mm shall be taken as under:

Qty. of work in M3	No. of sample
1.5	1
6.15	2
16-30	3
31-50	4
51 & above	4+1 for each additional quantity of 50 M or part thereof.

The contractor shall make his own arrangement for taking sample and testing of the sample in the Government or the approved laboratories. The test shall be carried out in accordance with IS 516-1959 or as revised from time to time. A register of cubes shall be maintained the site of work in the prescribed Performa. The result of the cubes shall be submitted to the Engineer-in-charge by the contractor.

Note: (1) At least one sample shall be taken from each shift

(2) Each sample consists of three test specimens for testing at 28 days.

Additional cubes may be required for various purposes. Such as to determine the strength of concrete at 7 days or at the time of striking the form work or to determine the duration of curing or to check the testing error.

Finishing unless otherwise specified in the item to keep the exposed concrete surface, the concrete surface shall be finished with cement mortar 1:4 (1- cement: 4-sand) in true line level in accordance with M-9 of specification of materials.

C-5/A Controlled concrete:

Grade:

The concrete shall be designed as M-150, M-200, M-250, M -300 & M-400 as prescribed in I.S. 456-1978 or as revised from time to time.

Aggregates:

Samples of the aggregates proposed to be used shall be got approved from the Engineer-in-charge prior to collection of the materials at the site of work field test for determining the content of silt, loam, clay etc. In fine aggregate and grading and moisture content in both fine and coarse aggregate shall be carried out before commencing the concreting work and record of the test shall be maintained till the completion of the work.

The grading of aggregate shall be controlled by obtaining the fine and coarse aggregate in different size being stocked in separate stock piles. The grading of coarse and fine aggregate shall be checked as frequently as possible. The frequency shall be as directed by the Engineer-in-charge, to ensure that the uniform grading as per approved samples used in the preliminary tests is maintained.

As soon as possible, after receiving the order to commence the work the contractor shall design the mix for different grades of concrete required in the work submit details in respect of proportion of cement and aggregates water cement ration etc. and arrangement to make trial mixes for preliminary tests to be carried out in the Government or any other approved laboratory to satisfy the Engineer-in-charge that the designed mix meets with the prescribed strength. The maximum total quantity to aggregates by weight per 50 Kg. of cement shall not exceed 450 Kg. except where otherwise specifically permitted by the Engineer-in-charge.

The minimum number of specimens for preliminary test and criteria for acceptance of test strength shall conform to Table –V **Acceptance criteria for concrete of I.S. 456-1978.**

On the satisfactory results of the above tests, the mix actually to be used shall be got approved from Engineer-in-charge. The approval of the Engineer-in-charge will not relieve the contractor of his responsibility for obtaining the required minimum strength in the work test. Record of all tests in support of mix design shall be maintained as a part of record of the contract.

STRENGTH REQUIREMENT OF CONCRETE:

The compressive strength requirements for various grades of concrete shall not be lower than the figures given below:

Grade concrete	Compressive strength of 15 cms cubes conducted in accordance with I.S. 516-1959.		
	After 28 days after mixing in preliminary test (Kg/cm ²)	At 7 days after mixing in work test	At 28 days after mixing in work test (Kg/cm ²)

M-100	135	70	100
M-150	200	100	150
M-200	260	135	200
M-250	320	170	200
M-300	380	200	300
M-350	440	235	350
M-400	500	270	400

PROPORTIONING & WORKS CONTROL:

The mix proportions shall be selected to ensure that the workability of the fresh concrete suitable for the condition of handling and placing, so that after compaction it surrounds all reinforcement and completely fills the form work. When concrete is hardened, it shall have the required strength, durability and surface finish.

The determination of the proportions of cement, aggregate and water to attain the required strength shall as follows:

- By designing the concrete mix; such concrete shall be called "Design Mix Concrete" or "Controlled Concrete".
- By adopting nominal mix, such concrete shall be called "Nominal Mix Concrete".

TABLE - 2.8

OPTIONAL WORK TEST REQUIREMENTS OF CONCRETE (All values in N/mm²)

(All tests conducted in accordance with IS: 516)

Grade of Concrete	Compressive Strength of 150mm cubes, min at 7 days	Modulus of Rupture by Beams Test Min.	
		At 72 + 2 hrs.	at 7 days
M - 10	7	1.2	1.7
M - 15	10	1.5	2.1
M - 20	13.5	1.7	2.4
M - 25	17	1.9	2.7
M - 30	20	2.1	3.0
M - 35	23.5	2.3	3.2
M - 40	27	2.5	3.4

The concrete mix shall be designed to have an average strength corresponding to the values specified for preliminary tests in Table. The proportions chosen should be such that the concrete is of adequate workability for the conditions prevailing on the work in question, and can be properly compacted with the means available. The maximum total quantity of aggregate by weight per 50 kg. Of cement shall not exceed 450 kg. Except where otherwise specially permitted by the Engineer-in-Charge.

Except where it can be shown to the satisfaction of the Engineer-in-Charge that supply of properly graded aggregate of uniform quality can be maintained over the period of work, the grading of aggregate should be controlled by obtaining the coarse aggregate in different sizes and blending them in the right portions when required, the different sizes being stocked in separate stock piles. The material should be stock piled for several hours preferably a day before use. The grading of coarse and fine aggregate should be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge to ensure that the suppliers are maintaining the grading uniform with that of the samples used in the preliminary test.

In proportioning concrete, the quantity of both cement and aggregate should be determined by weight, where the weight of cement is determined by accepting the maker's weight per bag. A reasonable number of bags should be weighted separately to check the net weight. Where the cement is weighed on the site and not in bags, it should be either measured by volume in calibrated tanks or weighed. All measuring equipment should be maintained in clean serviceable conditions, and their accuracy periodically checked.

It is most important to maintain the water cement ratio constant at its correct value. To this end, determination of moisture contents in both fine and coarse aggregates should be made as frequently as possible, the frequency for a given job being determined by the Engineer-in-Charge according to weather conditions. The amount of the added water shall be justified to compensate for any observed variations in the moisture contents. For the determination of moisture content in the aggregate for concrete: Part-III specific gravity, density, voids, absorption and bulking may be referred to. To allow for the variation in weight of aggregate due to variation in their moisture content, suitable adjustments in the weights of aggregate should also be made.

No substitutions in materials used on the work or alterations in the established proportions, except as permitted in the above para shall be made without additional tests to show that the quality and strength of concrete are satisfactory.

WORKABILITY OF CONCRETE:

The concrete mix proportions chosen should be such that concrete is of adequate workability for the placing conditions of the concrete and can properly be compacted with the means available. The definitions of the ranges of "workability" of concrete as measured by either the slump or V-B tests (IS: 1199) and the range to be adopted for different kinds of work unless specified otherwise is given in Table - 2.9.

TABLE - 2.9

WORKABILITY OF CONCRETE

Placing conditions	Degree Workability	Slump (mm)	Values of Workability	
			Vee-Bee	Compacting Factor
Blinding concrete; Shallow Sections; Pavements using pavers	Very Low	--	20- 10 secs	0.75 - 0.80
Mass concrete; Lightly reinforced sections in slabs, beams, walls, columns; Floors; Hand placed	Low	25 - 75	10 - 5 secs	0.80 - 0.85

pavements; Canal lining; Strip footings				
Heavily reinforced sections in slabs, beams walls, columns; Slip form work; Pumped concrete	Medium	50 - 100 75 - 100	5 - 2 secs	0.85 - 0.92*
Trench fill; In-situ piling Termite concrete	High Very high	100 - 150 Workability to be decided by determination of flow (IS: 9103)	--	Above 0.92** Above 0.92**

Note: For most of the placing conditions, internal vibrators (needle vibrators) are suitable. The diameter of the needle shall be determined based on the density and spacing of reinforcement bars and thickness of sections. For tremie concrete, vibrators are not required to be used.

A competent person should be employed whose duty will be to supervise all stages in the preparation and placing of the concrete. All works test specimens should be prepared and site tests carried out under his direct supervision

REQUIREMENT FOR DURABILITY:

Minimum cement content required in cement concrete to ensure durability under specified conditions of exposure should be as given in Table 2.12 unless otherwise specified. The general environment to which the concrete will be exposed during its working life is classified into five levels of severity, that is, mild, moderate, severe, very severe and extreme as described in Table 2.13.

TABLE - 2.12

Minimum Cement Content, Maximum Water Cement Ratio and Minimum Grade of Concrete for Different Exposures with Normal Weight Aggregates of 20mm Nominal Maximum Size

Sr. No.	Exposure	Plain Concrete			Reinforced Concrete		
		Minimum Cement Content kg/m ³	Maximum Free Water Cement Ratio	Minimum Grade Concrete	Minimum Cement Content kg/m ³	Maximum Free Water Cement Ratio	Minimum Grade Concrete
1.	Mild	220	0.60	--	300	0.55	M-20
2.	Moderate	240	0.60	M-15	300	0.50	M-25
3.	Severe	250	0.50	M-20	320	0.45	M-30
4.	Very Severe	260	0.45	M-20	340	0.45	M-35
5.	Extreme	280	0.40	M-25	360	0.40	M-40

The general environment to which the concrete will be exposed during its working life is classified into five levels of severity, that is, mild moderate, severe, very severe and extreme as described in Table 2.13.

TABLE 2.13

ENVIRONMENTAL EXPOSURE CONDITIONS

Sr. No.	Environment	Exposure Conditions
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1.	Mild	Concrete surfaces protected against weather or aggressive conditions, except those situated in coastal area.
2	Moderate	Concrete surfaces sheltered from severe rain or freezing whilst wet. Concrete exposed to condensation and rain Concrete continuously under water Concrete in contact or buried under non-aggressive soil/ground water Concrete surfaces sheltered from saturated salt air in coastal area
3.	Severe	Concrete surfaces exposed to severe rain, alternate wetting and drying or occasional freezing whilst wet or severe condensation. Concrete completely immersed in seawater Concrete exposed to coastal environment
4.	Very Severe	Concrete surfaces exposed to seawater spray, corrosive fumes or severe freezing conditions whilst wet. Concrete in contact with or buried under aggressive sub-soil/ground water
5.	Extreme	Surface of members in tidal zone Members in direct contact with liquid/solid aggressive chemicals

MIX DESIGN AND SAMPLING AND TESTING FOR CONCRETE

Facilities required for sampling materials, shall be provided when required by the Engineer. The methods used in sampling, laying curing and testing the concrete samples, either in the field or in the laboratory, shall be in accordance with the appropriate Indian Standards. This is to investigate the grading of aggregate, water cement ratio, workability and the quantity of cement required to give works cubes of the minimum strength specified.

The mix shall be designed to produce the grade of concrete having required workability and desired characteristic strength. As long as the quality of the materials does not change, a mix design done earlier may be considered adequate for later work. As already stated under "proportioning" the proportion of the mix shall be by weight. In case uniformity in the materials used for concrete making has been established over a period of time, the proportioning may be done by volume batching, by the use of bulk densities, provided periodic checks are made on mass/volume relationships of materials. Where weigh batching is not practicable, the quantities of fine and coarse aggregate (not cement) may be determined by volume. If aggregate is moist and volume batching is adopted, allowance shall be made for bulging in accordance with IS: 2386 (Part-III). Mix proportioning shall be carried out according to the ACI Standard ACI 631 or "Design of Concrete Mixes" Road Research Note No.4 of Department of Scientific and Industrial Research, U.K.

Whenever there is either a change in strength of concrete required, water cement ratio, workability or the source of aggregates and cement, preliminary tests shall be conducted again to determine the revised proportions of the mix to suit the later conditions. While designing mix proportions, over wet mixes should always be avoided.

PRELIMINARY TESTS:

The materials and proportion used in main preliminary tests shall be similar in all respects to those to be actually employed in the works as the object of this test is to determine proportion of cement, aggregates and water necessary to produce the concrete of consistency required to give the strength specified. It will be the contractor's sole responsibility to carry out these tests and he shall therefore furnish to the Engineer,

statement of proportions proposed to be used for concrete mix. For preliminary tests, the following procedure shall be followed. Materials shall be brought to the room temperature and all materials shall be in a dry condition. The quantities of water, cement and aggregate for each batch shall be determined by weight to an accuracy of 1 Part in 1000.

(a) Mixing:

Concrete shall be mixed in a mechanical mixer. The mixer should comply with IS: 1791. The cement and fine aggregate shall first be mixed dry until the mixture is in uniform colour. The coarse aggregate shall then be added, mixed and water added and mixed thoroughly for a period of not less than two minutes after all the materials are in the drum and until the resulting concrete is uniform in appearance. If there is segregation after unloading from the mixer, the concrete should be remixed.

(b) The consistency of each batch of concrete shall be measured immediately after mixing, by the slump test in accordance with IS: 1999. In the slump test, care shall be taken to ensure that no water is lost; the material used for slump test may be remixed with the remainder of concrete for making the test specimen. The period of remixing shall be as short as possible yet sufficient to produce a homogeneous mass.

Note: In exceptional circumstances such as mechanical breakdown of mixer, work in the remote areas or when the quantity of concrete work is very small, hand mixing may be permitted, subject to adding 10% extra cement at his (contractor's) cost. When hand mixing is permitted, it shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the concrete is uniform in colour and consistency.

CONCRETE CUBES:

(a) Size of test specimen & moulds:

Test specimens cubical in shape shall be 150 x 150 x 150 mm. If the largest nominal size of the aggregate does not exceed 200mm, 100 mm cubes may be used as an alternative.

A cube mould should be of metal and stout enough to prevent distortion. It shall be constructed in such a manner as to facilitate the removal of the moulded specimen without damage, and shall be so machined that, when it is assembled ready for use, the dimensions and internal faces shall be accurate within the following limits:

Height of mould and distance between opposite faces: Specified size + 0.2 mm.

Angle between adjacent faces: $90 + 0.5$ degree

Each mould shall have a plane face metal base plate of such size as to support the mould during the filling without leakage and shall be attached to the moulds; when assembled shall be positively and rigidly held together and suitable methods of ensuring this, both during filling and on subsequent handling of the filled mould, shall be provided. In assembling the mould for use, the joints between the sections of mould shall be thinly coated with mould oil and a similar coating of mould oil shall be applied between the contact surfaces of the bottom of the mould and the base plate in order to ensure that no water escapes during filling. The interior surfaces of the assembled mould shall be thinly coated with mould oil to prevent adhesion of the concrete. The tamping bar shall be a steel bar 16 mm. in diameter, 0.6 m. long and bullet pointed at the lower end.

(b) Compacting:

The test specimens shall be made as soon as practicable after mixing and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance. The concrete shall be filled into the mould in layers approximately 50 mm deep. In placing each scoopful of concrete, the scoop shall be

moved around the top edge of the mould as the concrete slides from it, in order to ensure a symmetrical distribution of the concrete within the mould. Each layer shall be compacted as described below. After the top layer has been compacted, the surface of the concrete shall be finished level with the top of the mould using a trowel, and covered with a glass or metal plate to prevent evaporation.

For compacting, standard tamping bar shall be used and the strokes of the bar shall be distributed in a uniform manner over the cross section of the mould. The number of strokes per layer required to produce specified conditions will vary according to the type of concrete but in no cases shall be less than 35 strokes per layer for 150 mm cubes or 25 strokes per layer for 100 mm cubes. The strokes shall penetrate into the underlying layer and the bottom layer shall be rodded throughout its depth. Where the tamping bar leaves voids, the sides of the mould shall be tapped to close the voids.

(c) Curing:

The test specimen shall be stored on the site at a place free from vibration under damp-matting, sacks or other similar material for 24 hours + 0.5 hours from the time of adding water to the other ingredients at a temperature range of 22° C to 32° C. After 24 hours, they shall be marked for later identification, removed from the moulds and stored in clean water at a temperature of 24° C to 30° C. They shall be sent to the testing laboratory well packed in damp sand, sacks or other suitable material so as to arrive there in a damp condition not less than 24 hours before the time of test. On arrival at the testing laboratory, the specimen shall be stored in water at 27° C +2° C temperature until the time of test. Records of the daily maximum and minimum temperature shall be kept both during the period the specimens remain on the site and in the laboratory.

(d) Tests for Cube Specimen:

The concrete cubes shall be tested in standard testing machines by skilled personnel. Tests shall be made at recognized ages of the test specimen, the most usual being 7 and 28 days. Tests may be made at 24 hours + 1/2 hour and 72 hours + 2 hours if early strengths are needed. The age shall be calculated from the time of the addition of water to the dry ingredients.

At least three specimens, preferably from different batches shall be made for testing at each selected age.

Specimens stored in water shall be tested immediately on removal from the water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fins removed.

The bearing surface of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimen, which are to be in contact with the compression platens. The specimen shall be so placed in the machine that the load shall be applied to the opposite sides of the cubes as cast, that is, not to the top and bottom. The axis of the specimen shall be carefully aligned with the centre of thrust of the spherically seated platen. No packing plates shall be used between specimen and platens of the machine. Once the uniform seating is obtained, load shall be applied without shock and increased continuously at a rate of approximately 14.0 N/mm² /Min. until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall be recorded and the appearance of the concrete and any unusual features in the type of failure shall be noted.

The measured compressive strength of the specimen shall be the maximum load applied to the specimen divided by the cross-sectional area of the specimen and shall be expressed to the nearest N. per sq. mm. Average of the values shall be taken as the representative of the batch provided the individual variation is

not more than + 15 percent of the average. Otherwise, repeat tests shall be made. Cube crushing strength shall conform to the values given in Tables 2. 7 and 2.8.

(e) Frequency of Sampling of Concrete Cubes:

A random sampling procedure should be adopted to ensure that each concrete batch shall have a reasonable chance of being tested; that is, the sampling should be spread over the entire period of concreting covering all mixing units. The minimum frequency of sampling of concrete of each grade shall be as follows:

Quantity of concrete in the work cu. m.	No. of samples
1 - 5	1
6 - 15	2
16 - 30	3
31 - 50	4
51 and above	5 Plus one additional sample for each additional 50m or part thereof

The test specimens shall be made from each sample for testing at 28 days. Additional cubes may be required for determining strength of concrete at 7 days. The test strength of the sample shall be the average strength of three specimens. The individual variation should not be more than 15 percent of the average.

Concrete shall be assessed daily for compliance. The contractor shall keep a record at site of all such tests identifying them with the proportion of the work to which they relate. The Architects will check this record from time to time. The said record shall give the following details and shall be initiated by the Engineer-in-Charge.

- (i) Reference to specific structural member receiving the batch of concrete from which the cubes were cast.
- (ii) Mark on cubes.
- (iii) Mix of concrete.
- (iv) Data and time of casting.
- (v) Water cement ratio by weight and slump.
- (vi) Crushing strength as obtained at the end of 7 days for 3 cubes out of a set of 6 cubes and the end of 28 days for the remaining 3 cubes.
- (vii) Laboratory in which tested and reference to test certificates.
- (viii) The quantity of concrete, incorporated in work that is represented by the quantity of concrete of the set of the cubes.
- (ix) Any other information required by Architects.

(f) Consistency:

The consistency of each sample of concrete shall be measured immediately after remixing by the slump test. The slump shall be as directed by the Engineer, which would be based on the preliminary test result

keeping in view, the workability of the concrete. The approved slump shall be maintained through the field operations unless otherwise directed by the Engineer. In order to ensure the maintenance of uniform consistency, slump tests shall be carried out as often as demanded by the Engineer and invariably with the batch of concrete from which test cubes are made.

(g) Record of Temperature:

A record of maximum and minimum temperature at the places of storage of the cube shall be maintained, during the period they remain at site, by the Contractor.

OPTIONAL TESTS:

The Engineer, if he so desires, may order tests to be carried out on cement, sand, coarse aggregate in accordance with the Indian Code of Practice or any other approved code.

Tests on cement shall include:

- (i) Fineness Test,
- (ii) Test for Normal Consistency,
- (iii) Test for Setting Time,
- (iv) Test for Soundness,
- (v) Test for Tensile Strength,
- (vi) Test for Heat of Hydration (by experiment and by calculations) in accordance with BIS or any other approved standard for cements.

Test on sand shall include:

- (i) Sieve Test
- (ii) Test for Organic Impurities
- (iii) Decantation Test for Determining Clay
- (iv) Specific Gravity Test
- (v) Test for Sieve Analysis and Fineness Modulus.

Tests on coarse aggregate shall include:

- (i) Sieve Analysis
- (ii) Specific Gravity and Unit Weight of Dry Loose and Rodded Aggregate (Bulk Density Test)
- (iii) Determination of Yield of a Dry Mixture
- (iv) Petrographic Examination of Deleterious Minerals in Aggregates.
- (v) Test for Aggregate Crushing Value and 10% Fine Value Test.
- (vi) Aggregate Impact Value
- (vii) Toughness Test
- (viii) Soundness Test
- (ix) Hardness Test

(x) Alkali Aggregate Reaction

(xi) Deleterious Material

Any or all these tests would normally be ordered to be carried out, if the specified concrete strengths are not obtained, at the Contractor's cost. If the works cubes do not give the stipulated results, the Engineer reserves the right to ask the Contractor to dismantle such portions of the work, which in his opinion are unacceptable and re-do the work to the standard stipulated at his (Contractor's) cost. It shall be very clearly understood by the Contractor that no extra claims shall be entertained by the Owner for excess use of cement over the minimum quantity stipulated to give the works cubes of required strength. The unit rate for design and test cubes, works cubes, testing them as per specifications, optional tests etc.

Unless otherwise stipulated, the concreting, testing, etc. shall be carried out as directed by the Engineer and to the appropriate BIS Specifications. In the event of any work being suspected of faulty materials or workmanship or both, the Engineer before requiring its removal and reconstruction, may order, or the contractor may request, that it should be load tested in accordance with the following provisions.

LOAD TEST ON MEMBERS OR ANY OTHER TEST:

The test load shall be 125 percent of the specified super imposed load for which the structure was designed in addition to the full dead load (self weight of structure members plus weight of finishes and walls or partitions, if any as considered in the design). Such test load shall not be applied before 28 days after the time of placing of concrete.

During the tests, struts strong enough to take the whole load shall be placed in position leaving a gap under the members. The test load shall be kept for 24 hours before removal.

If within 24 hours of the removal of the load, the structure does not show a recovery of at least 75 percent of the maximum deflection shown during the 24 hours under load, the test loading shall be repeated after a lapse of at least 72 hours. The structure shall be considered to have failed to pass the test if the recovery after the second test is not at least 80 percent of the maximum deflection shown during the second test.

If during the test, or upon removal of the load, the structure shows signs of weakness, undue deflection or faulty construction it shall be reconstructed or strengthened as necessary.

Any other test, e.g. taking out concrete cores, examination and test on such cores removed from such parts of the members in an approved manner and as directed by the Engineer shall be carried out by the Contractor at his own cost, if so directed.

TESTING CONCRETE OF TANKS FOR LEAKAGE:

In addition to the structural test given in clause above, structures (tanks, chests, pits, etc.) to be used for storage of liquids shall also be tested for water tightness at full storage level as described below:

(a) In case of structure whose external faces are exposed such as elevated tanks, the requirements of the test shall be deemed to be satisfied if the external faces show no sign of leakage or sweating and remain completely dry over the period of observation of seven days after allowing a seven days period for absorption after filling with water.

(b) In case of structures whose external faces are backfilled and are not accessible for inspection, such as underground tanks, the tanks shall be filled with water and after the expiry of seven days after the filling; the level of the surface of the water shall be recorded. The level of water shall be recorded again at subsequent intervals of 24 hours over a period of 7 days. The total drop in surface level over a period of seven days shall be taken as an indication of the water tightness of the tank. The Engineer shall decide on

the actual permissible rate of this drop in the surface level, taking into consideration whether the tanks are open or closed and the corresponding effect it has on evaporation losses. Backfilling shall be withheld till the tanks are tested if directed by the Engineer

Costs of Tests:

The entire cost of tests as specified, in clause above shall be borne by the Contractor.

Unsatisfactory Test:

If the results of any test prove unsatisfactory, the Contractor shall remove and rebuild the member or members involved or carry out such other remedial measures as may be required by the Engineer or his representative. The Contractor shall bear the cost of so doing, unless the failure of the member or members to fulfil the test condition is solely due to faulty design.

PLACING:

The procedure for placing of concrete shall be as follows:

- a. Preparation before placing of concrete shall be as given below.

(i) **Engineer's Approval of Equipment & Method:**

Before any concrete is placed, the entire placing programme, consisting of equipment, layout, proposed procedure and methods shall be submitted to the Engineer for approval if so demanded by the Engineer and no concrete shall be placed until the Engineer's approval has been received.

- (ii) Hardened concrete and foreign materials should be removed from the inner surface of the conveying equipment.
- (iii) Form work shall have been completed; snow, ice and water shall have been removed. Reinforcement shall have been secured in place, expansion joint material, anchors and other embedded items shall have been positioned and the entire preparation shall have been approved.
- (iv) No concrete shall be placed on watered surface.

(v) **Rain or Wash Water:**

No concrete shall be placed in wet weather and any concrete that has been washed by heavy rains shall be entirely removed, if there is any sign of cement and sand having been washed away from the concrete mixtures. To guard against damage which may be caused by heavy rains, the works shall be covered with gunny bags immediately after the concrete has been placed in position on the surface of the newly placed concrete and shall be removed by approved means and no further concrete shall be placed thereon.

b. Time interval between mixing and placing:

Concrete shall be placed in the forms within 30 (thirty) minutes as rapidly as practicable, after addition of water to cement and aggregate, unless otherwise authorised by the Engineer.

c. Concrete placing by manual labour:

Except when otherwise approved by the Engineer, concrete shall be placed in the shuttering by shovels or other approved implements and shall not be dropped from a height or handled in a manner, which will cause segregation. Accumulation of set concrete shall be avoided. Concrete shall be placed directly in its permanent position and shall not be worked along the shuttering to that position.

d. Avoiding segregation:

Concrete shall, in all cases, be deposited as nearly as practicable directly in its final position, and shall not be caused to flow in a manner, which will cause segregation, loss of materials and impair its strength. For locations where direct placement is not possible, and in narrow forms, the Contractor shall provide suitable drop chutes and "Elephant Trunks" to confine the concrete in movement.

e. Concrete placing by Mechanical Equipment:

The following specification shall apply where placing of concrete by use of mechanical equipment is specifically called for while inviting bids or is warranted considering the nature of the work involved.

The control of placing shall begin at the mixer discharge. Concrete shall be discharged by the vertical drop into the middle of the bucket or hopper and this principle of a vertical discharge of concrete shall be adhered to throughout all stages of delivery until the concrete comes to rest in the structures.

f. Type of Buckets:

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

g. Operation of Bucket:

In placing concrete in large open areas, the bucket shall be spotted directly over the position designated and then lowered for dumping. The open bucket shall just clear the concrete already in place and the height of drop shall not exceed 1.00 M. The bucket shall be opened slowly to avoid high vertical bounce. Dumping of buckets on the swing, or in any manner which results in segregation of ingredients or disturbances of previously placed concrete will not be permitted.

h. Placement in Restricted Forms:

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

i. Chuting:

Where it is necessary to use transfer chutes between mixer, containers or hoppers, and point of deposit in the forms, specific approval of the Engineer must be obtained as regards the type, length, slopes, baffles and vertical terminals. Concrete shall not be permitted to fall from the end of the chutes or tube more than 1.00 M. Chutes, when approved for use shall have slope not flatter than 1to3 and not steeper than 1to2.

j. Placing by Pumping:

Concrete may be conveyed and placed by mechanically operated pressure equipment only with the written permission of the Engineer. Water cement ratio may not be increased above that for the same class of concrete placed by bucket and the slump shall be held to the minimum necessary for conveying concrete by this method.

k. Bonding Mortar:

Immediately before concrete placement begins, prepared surfaces except formwork, which will be in contact with the concrete to be placed, shall be covered with a bonding mortar as specified.

l. Thickness of Layers:

Concrete shall be placed in successive horizontal layers ranging in thickness from 15 to 90 mm. as directed by the Engineer the bucket loads, or other units of deposit shall be potted progressively along the face of

the layer with such overlap as will facilitate spreading the layer to uniform depth and texture with a minimum of shovelling. Any tendency to segregation shall be corrected by shovelling stones into mortar then mortar on the stones. Such a condition shall be corrected by redesign of mix or other means, as directed by the Engineer.

m. Bedding of layers:

Bedding planes shall be approximately horizontal unless otherwise instructed.

n. Compaction:

Concrete shall be compacted with approved mechanical vibrating equipment until the concrete has been consolidated to the maximum practicable density, and is free of pockets of coarse aggregate, and fits tightly against all form surfaces and embedded materials.

TYPE OF VIBRATORS:

(i) Vibrators shall be the internal or immersion high frequency type, with speed of not less than 6000 revolutions per minute when immersed in the concrete. Vibrators shall be used in sufficient number of units and power of each unit shall be adequate to properly consolidate the concrete.

(ii) Use of Vibrators:

Vibrators shall be inserted in a vertical position at intervals of about 600 mm depending upon the mix; the equipment used, and continued experience on the job. Vibrators shall be withdrawn slowly. In no case shall vibrators be used to transport concrete inside the forms.

(iii) Successive Batches:

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

(iv) Vibrator Penetration of under layer:

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

(v) Vibrating Against Reinforcement:

Care shall be taken to prevent contact of vibrators against reinforcement steel. Vibrators shall not be allowed to come in contact with reinforcement steel after start of initial set. Vibrators shall not be allowed to come in contact with forms of finished surface.

(vi) Use of form attached Vibrators:

The use of form attached Vibrators shall be used only with specific authorization of the Engineer.

(vii) Use of Surface Vibrators:

The use of surface vibrators will not be permitted under ordinary conditions. However, for thin slabs such as highways, runways, and similar construction surface vibration by specially designed vibrators may be permitted, upon the approval of the Engineer.

(viii) Stone pockets and Mortar Poundage's:

The formation of stone pockets and mortar poundage in corners and against form face shall not be permitted. If these occur, they shall be dug out, reformed and refilled to sufficient depth and shape for the rough blending, as directed by Engineer.

CONSTRUCTION JOINTS AND KEYS:

Concrete shall be placed continuously unless otherwise specified.

If stopping of concreting becomes unavoidable anywhere, the construction joint shall be made, where the work is stopped, concrete that is in the process of setting shall not be disturbed or shaken by traffic either on the concrete itself or upon the shuttering. Horizontal and vertical construction joints and bonding keys shall be located and shall conform in details to the requirements of the plans unless and otherwise directed by the Engineer. Where not described, the joint shall be in accordance with the following:

(a) Column joint:

In a column, the joint shall be formed 75 mm. below the lowest soffit of the beams joining to it.

(b) Beam and Slab joint:

Concrete in a beam shall be placed throughout without a joint but, if the provision of a joint is unavoidable, the joint shall be vertical and at the middle of the span. A joint in a slab shall be vertical and parallel to the principal reinforcement. Where it is unavoidable, the joint at right angles to the principal reinforcement, shall be vertical and at the middle of the span.

CURING, PROTECTING, REPAIRING AND FINISHING:

All concrete shall be cured by keeping it damp for the period of time required for complete hydration and hardening to take place.

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

(i) Curing with water:

Fresh concrete shall be kept continuously wet for a minimum period of at least 21 days since lapse of 24 hours after laying concrete. Quantity of water supplied shall be controlled so as to prevent the erosion of freshly placed concrete.

(ii) Continuous Spraying:

Curing shall be assured by use of an ample water supply under pressure in pipes, with all necessary appliances of hose (sprinklers to be used), unless otherwise specified or approved by the Engineer.

(iii) Alternate Curing Methods:

Whenever, in the judgement of the Engineer, it may be necessary, the continuous spray method may be omitted and a covering of sand, or other approved mulching such as wet gunny bags, which will prevent loss of moisture from the concrete, may be used. No type of covering will be approved which should strain or damage the concrete during or after curing period. Covering shall be kept continuously wet during the curing period.

(iv) Curing compounds:

Surface coating type-curing compounds shall be used only by special permission of and under the direction of the Engineer. Curing compounds shall be colourless / pigmented, liquid type, conforming to approved

specifications. No curing compound shall be used on surfaces where future blending with concrete or painting is specified.

(v) Ponding:

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

(vi) Curing Equipment:

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

(vii) Protection of Fresh Concrete:

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

(viii) Repair and Replacement of Unsatisfactory Concrete:

Immediately after the shuttering is removed, the surface of concrete shall be very carefully one over and holes noticed shall be filled up and made good with mortar composed of one part of cement to one part of sand after removing any loose stones adhering to the concrete. Concrete surfaces shall be finished as described under the particular items of work. Superficial honeycombed surfaces shall be made good immediately after removal of shuttering, in presence of Architect's representative and superficial water and air holes shall be filled in. Unless otherwise instructed by the Engineer, the surface of the exposed concrete placed against shuttering shall be rubbed down immediately on removal of shuttering to remove fins or other irregularities.

Unsatisfactory concrete shall be cut out and replaced with new concrete, as soon as practicable after removal of forms. Anchors, tees, or dovetail slots shall be provided wherever necessary to attach the new material securely in place. Surface of prepared voids shall be wetted for 24 hours immediately before the patching material is placed. Use of an epoxy for blending fresh concrete used for repairs will be permitted upon written approval of the Engineer. Epoxies shall be applied in strict accordance with the instructions of the manufacturer.

FINISHING - GENERAL:

The specification is intended to cover the treatment of concrete surfaces of all structures. Area requiring special finish not covered by this specification may be clearly indicated on the drawings and specifications will be furnished.

(a) Finish for Formed Surfaces:

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

(i) Cement plaster finish:

The concrete shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing concrete. The roughening shall be done by hacking. Before the surface is plastered, it shall be cleaned and wetted so as to give good bond between concrete and plaster.

- (ii) For surface against which backfill or concrete is to be placed, 'no' treatment is required except tie holes & repair of defective areas shall be patched with cement mortar.
- (iii) For surfaces below grade, which will receive waterproofing treatment, the concrete shall be free of surface irregularities, which would interfere with proper application of the waterproofing material, which may be specified for use.
- (iv) Surfaces which will be exposed when the structure is in service shall receive no special finish except repair of damaged or defective concrete, removal of fins and abrupt irregularities, filling of holes left by form ties and rods, and clean-up of loose or adhering debris.

(b) Finishing:

Finishing of exposed concrete surface shall conform to the following.

Smooth form finish:

The form facing material shall produce a smooth, hard, uniform texture on the concrete; it may be plywood or other approved material capable of producing the desired finish. All ties, burns and fins are to be removed. Mix one part of Portland cement and one-part fine sand with sufficient water to produce a stiff mortar. The mortar after drying shall match the rest of the surface in colour. Before application of mortar, concrete surface is to be dampened. Mortar is to be applied by firm rubber float or trowel, filling all surface voids. Compressing mortar into voids by using carborundum stone shall be continued till uniform colour and texture is produced. If the mortar surface dries too rapidly to permit proper compaction and finishing, apply a small amount of water with a sprayer. Quoted rate of exposed shuttering shall be inclusive of this treatment.

(c) Finish for Unformed Surfaces:

Surfaces which will be exposed to the weather and which would normally be a specified level, a horizontal surface or shows the slope required, the tops of narrow surfaces, such as stair treads, walls, curbs and parapets shall be sloped approximately 10mm in 300mm width, broader surfaces such as walkways, roads, parking areas and platforms shall be sloped about 1 in 50. Surfaces that will be covered by backfill or concrete, sub-floors to be covered with concrete topping, terrazzo or quarry tile, and similar surfaces shall be smooth screened and levelled to produce even surfaces. Surfaces which will not be covered by backfill, concrete or tile toppings such as outside desks, floors of galleries and sumps, parapet, gutters, sidewalks and slabs shall be consolidated, screened and flattened. Flattening may be done with hand and started as soon as the screened has attained a stiffness to permit finishing operations, and shall be the minimum required to produce surface uniform in texture and free from screened marks or other imperfections. Joints and edges shall be tooled as called for on the drawings or as directed by the Engineer.

(d) Protection:

All concrete shall be protected against damage until final acceptance by the Architect or his representative.

CONCRETING IN HOT WEATHER:

Concreting in extreme hot weather shall be avoided. Special care shall be exercised and measure undertaken when temperature on site exceeds 105° F or 40° C. Such measures shall include:

- (i) Provision of a shade for coarse aggregate so that the same do not absorb heat from the directly indenting rays of sun.
- (ii) Continuously wetting coarse aggregates to keep their temperature down, fog sprays.
- (iii) Providing a shade for the mixing machine.
- (iv) Depositing the concrete from the machine as quickly as possible.
- (v) Adjusting water proportions throughout the day to account for water in the wet aggregate, giving desired strength and workability.
- (vi) (Covering the deposited concrete by a membrane as soon after the placing as possible without damaging the fresh concrete.
- (vii) Wet gunny bags shall be laid immediately after two hours of concreting on the top surfaces of slab and shall be kept wet for curing period.
- (viii) Use of retarder (2% of Calcium Chloride).
- (ix) Use of Zero Heat Portland Cement or even the Portland Pozzolana Cement.
- (x) Use of higher water cement ratio.
- (xi) Keep moist, the formwork continuously for the period of 2 hours at least.

On such days of hot weather, concreting records shall be kept of the atmospheric temperature and corresponding temperatures of concrete discharged from the mixing machine.

CURING OF DIFFERENT ITEMS:

For all the time during construction, curing shall be carried out especially from 7.00 AM to 7.00 PM even on holidays with proper manpower, necessary pumps and pipe lines, connections, etc.

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 material and kept constantly wet for at least seven days from the date of placing concrete in case of OPC 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. For the concretes containing PPC or Portland Slag Cements, period of curing may be increased.

FORM WORK:

General:

The form work shall conform to the shape, lines and dimensions as shown on the drawings and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete and shall be sufficiently tight to prevent loss of slurry.

- (a) All forms shall be checked frequently during the concreting operations and until removed so that they may be driven up if any settlement occurs.

The design, fabrication and erection of formwork are solely the responsibility of the Contractor. The formwork should be safe and stable to withstand dead load of concrete, men etc. Further, the form should yield security to the structure or its members.

(b) Materials:

The selection of materials suitable for formwork shall be based on economy and consistency with safety and quality required in the finished work. Formwork shall be of timber, plywood, steel or any other materials as approved by Architect/Engineer-in-Charge whose decision in this respect shall be final. Props and shores shall be of steel, timber posts, bullies or any other material as approved by Architects.

(c) Chamfer strips shall be placed in corner of forms to produce bevelled edges on permanent exposed surface, if specified.

(d) Temporary openings shall be provided at the base of column forms and wall forms and at other points where necessary to facilitate cleaning and observation immediately before concrete is placed.

(e) Mould Oil:

Care should be taken to see that the formwork is perfectly cleaned and two coats of mould oil or any other approved material is applied before placing the concrete. Such coating shall be insoluble in water, non-staining and non-injuries to the concrete. It shall not become flaky or be removed by rain or wash water. Block boards or equivalent shall be used for shuttering columns, beams, etc. and steel sheets for slab shuttering will be allowed.

(f) Chamfers and fillets:

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

(g) Vertical construction joint chamfers:

Vertical construction joints on faces, which will be exposed at the completion of the project, shall be chamfered as above except where not permitted by the Engineer for structural or other reasons.

(h) Reuse of Forms:

Before reuse, all forms shall be thoroughly scraped, cleaned, joints examined and when necessary, repaired and the inside retreated to prevent adhesion, to the satisfaction of the Engineer. The Contractor shall equip himself with enough shuttering to complete the job in the stipulated time.

(i) The contractor shall record on the drawing or a special register the date upon which the concrete is placed in each part of the work and the date on which the shuttering is removed there from. Striking of forms in the case of sides of beams, columns and slabs can be carried out after 24 hours of concreting. The striking of forms shall be done as para 2.12.4. Striking shall be done with utmost care without shock or vibration by gently easing the wedges. If, after removing the formwork, it is found that the timber is embedded in the concrete, it has to be cut out and made good with fine concrete. Due care shall be given to the provision of correct form work for holes and openings in the slabs, inserts, grounding cables, conduits and pipe sleeves, foundation or anchor bolts etc. as per approved drawings or as directed by the Engineer.

CLEANING AND TREATMENT OF FORMS:

The forms shall be carefully examined to see that they are vertical and horizontal and the joints are properly closed. If forms are to be reused, they should be carefully examined before such reuse, properly aligned and open joints shall be repaired and coated with crude oil. The centring planks for columns shall be joined together and provided with threaded bolts and nuts.

The centring and props for the various members shall be fixed in a workman like manner to be approved by the Engineer-in-Charge. They shall be of such size as the Engineer-in-Charge thinks fit and proper. The centring shall be removed only after the permission has been obtained from the Engineer-in-Charge. Props shall be supported on wedges placed on planks and the planks shall be 25 mm thick.

All rubbish, particularly chippings, shavings and saw dust shall be removed from the interior of the forms before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted or treated with an approved composition. Care shall be taken that such approved composition is kept out of contact with the reinforcement.

(a) In columns of any forms where access to the interior is not available otherwise, a sufficient area of one side shall be left loose so that it may be removed for cleaning out all chips, dirt, sawdust and other extra materials.

(b) Where the shoring bores on the ground, the Contractor shall spread the load from shores by suitable brick platforms in order to prevent settlement.

ARCHITECTURAL EXPOSED REINFORCED CEMENT CONCRETE:

(i) General:

Generally specification for reinforced cement concrete work shall also apply to this type of work and additional specification set-forth below.

(ii) Materials:

(i) Cement used for such work shall be of a uniform colour and obtained from one source of manufacture.

(ii) Aggregate:

a) Fine Aggregates:

Colour being an important consideration for exposed concrete, colour of sand used shall also be uniform through out the entire construction. Preferably total quantity required for the work shall be collected and well mixed together to a uniform shade.

b) Coarse Aggregate:

The colour of the aggregate shall be maintained the same throughout. Unless otherwise specified, exposed concrete in walls, fences and parapets which are no-load bearing and are less than 120 mm. in thickness the maximum size of coarse aggregate shall be limited to 12 mm for which nothing extra shall be admissible. Flat and flaky pieces shall not be allowed.

(iii) Reinforcement & Cover of the Concrete:

Correct placing of the reinforcement with proper cover is important in all exposed work to avoid discolouration by rusting. The minimum cover specified in the Specification shall be maintained throughout.

Concrete blocks or spacers shall be sparingly used at exposed surfaces. When used, such blocks shall preferably be cast on vibrating tables or in some other similar manner so that it may match the concrete

surface in texture and colour. Cover blocks of materials other than precast blocks shall not be allowed to be used.

(iii) Construction of shuttering:

All centring and framework shall be rigid and of robust construction. All vertical props shall be cut square at ends and shall rest on double wedges, placed on continuous horizontal runners on firm natural soil. Resting of props or runners on made up soil shall not be permitted on any account. All members of the formwork shall be closely fixed without any gap between them so as to safeguard against any settlement or displacement of shuttering at the time of concreting.

i) Timber Shuttering:

Formwork for exposed work shall be of seasoned wrought hard wood timber planks free from loose knots. The planks shall be 50 mm thick, 100 to 125 mm wide with tongue and groove joints, assembled to a pattern approved by the Architect. The formwork shall be so constructed, braced, and stayed as to remain absolutely rigid and true during and after concreting. The boards shall be planed to a suitable thickness in order that the surface against the concrete shall not be broken at joints between boards. Chamfers, grooves, drips mouldings, bevelled edges etc. shall be made in the form itself to the size, profiles and details called for on the drawings.

ii) Plywood Shuttering:

The contractor shall provide shuttering quality plywood not less than 12 mm thickness as per IS.4990 (type-I) of approved make or equivalent approved by the Architect in place of timber plank shuttering mentioned above for such location as called for by the Architects. The joints in plywood shuttering shall be located as directed by the Architects. Shuttering, centring and form work for all exposed concrete work like exposed columns, beams, ribs, slabs, chajjas, fascia, walls etc. shall be of such finish and rigidity as to produce all faces fair and smooth, true to line level and plumb. No rendering or touching shall be permitted on these faces.

iii) Steel shuttering:

Steel shuttering for exposed concrete work shall be made of shuttering plates of standard sizes and to suit the pattern of exposed concrete indicated in Architect's drawings. The shutter plates used will be made of steel sheets strengthened at the edges and in middle to prevent sagging or any deflection and concrete deformity or dents and should fit with each other properly without any space or groove being left between adjacent plates to avoid and leakage of concrete slurry. If any concrete projects out between plates this will be neatly cut away.

The contractor shall be required to produce details of working showing the general construction of formwork and panels with details such as nail position and holes for supports that may be required; nail heads shall be positioned as instructed by the Architects. Grooves and chamfers shall be formed as shown on the drawings without any extra cost.

Any holes for the supports, which the contractor may need, shall be permitted only if approved by the Architects. All such holes shall be subsequently filled in carefully as to match with the other surface. Walls, columns etc. shall generally be cast to the full height in one operation and the formwork shall be provided accordingly. If permitted by the Architects, these may be completed in two or more heights when the formwork shall be carefully and correctly raised for further height so as to ensure a neat joint without disturbing the pattern. Any groove desired by the Architect at the joint shall be provided by the Contractor at no extra cost. .

(iv) Coating for shuttering:

Shuttering oil, colourless and emulsifiable in water shall be used for oiling the woodwork, when only a thin film shall be neatly applied avoiding collection at one place. Any mark left by the shuttering oil shall be washed clean.

(v) Measurements and proportioning of concrete materials:

This shall be as laid down generally for R.C.C. work. In no case extra dust or sand or additional water shall be allowed with the intention of getting better finish, which shall only be obtained by erecting centring as specified above and proper vibrating of the mix after placing. In no case, the slump limit, specified in the Specification shall be exceeded.

(vi) Preparation for placing concrete:

Special care is essential to see that all saw dust, chips, nails or any foreign material is washed out or otherwise removed from the shuttering.

(vii) Mechanical vibration:

All concrete for exposed concrete work shall be vibrated, using needle vibrators -30/32 mm. Surface or trough vibrators may be permitted to be used for thin slabs. External vibrators for walls may be allowed but this shall be done carefully to safeguard the displacement of the shuttering. Vibrators shall only be operated by skilled labour; over or under vibration shall not be permitted. Any spillage, or leakage, which is unavoidable and which flows down the exposed concrete surfaces, shall be immediately washed away with clean water and brush. Exposed concrete members shall be finished to desired surface while the concrete is still green.

(viii) Curing and protection of concrete:

Curing will be done with clean water, so as not to discolour the concrete. All exposed concrete work shall be properly protected by Alkathene film, gunny bags, wooden boards etc. so the surfaces and edges are not damaged or discoloured till the entire construction is handed over, at no extra cost. All such damages shall be set right or replaced by the contractor at his own cost; the contractor is deemed to have considered this in quoting his rate.

(i) Removal of shuttering:

Striking and removing of formwork for exposed concrete shall be done very carefully without damaging the surface or edges. All such damages shall be set right or replaced by the contractor as his own cost.

(ii) Finishing:

Finishing of exposed concrete surface shall be as specified.

Exposed concrete surface shall on no account be permitted to any sort of repairs or patching after striking the formwork. In the event of any portion not coming up to standard, this shall be taken down by the contractor at no extra cost. Decision of the Architects as to the rejection of such work shall be final and binding on the contractor.

STRIPPING TIME:

In normal circumstances (generally where temperatures are above 20° C) and where Ordinary Portland Cement is used, forms may generally be removed after expiry of following periods:

Type of Formwork		Minimum Period Before Striking Formwork
(a)	Vertical formwork to columns, walls, beams	16 - 24 h
(b)	Soffit formwork to slabs (Props to be refixed immediately after removal of formwork)	3 days
(c)	Soffit formwork to beams (props to be refixed immediately after removal of formwork)	7 days
(d)	Props to slabs:	
	(a) Spanning up to 4.5 m. (b) Spanning over 4.5 m.	7 days 14 days
(e)	Props to beams and arches:	
	(a) Spanning up to 6 m (b) Spanning over 6 m	14 days 21 days

The number of props left under, their sizes, load and disposition shall be such as to be able to safely carry the full dead of the slab, beam or arch as the case may be together with live load likely to occur during curing or further construction.

However, this period may be increased or decreased at the discretion of Architects. In case when the cube strengths at seven days are found to be low or in the cases when other cements are used, the curing period and stripping time for forms and removal of props may have to be extended. This shall be decided by the Architect and the contractor shall not claim any extra costs for such increased periods of curing and stripping of forms etc. Special care shall be taken while removing the cantilever slab, canopies, portal frames, folded plates construction etc. Stripping time for such special structure as shell roofs etc. shall be determined from tests of stripping cubes taken especially for the purpose. These cubes shall give strength of 75% of the 28 days strength.

For rapid hardening cement 3/7 of the above period will be sufficient in all cases except vertical sides of slabs, beams and columns, which should be retained for 24 hours.

Note:

The props left under shall mean that the form work for slabs and beams soffits at 3 days and 7 days respectively can be removed only if the same can be done without disturbing the props which are required to support the slab or beam completely. In normal cases this will mean that period for removal of formwork for slabs and beam soffits will be 7 days and 14 days respectively.

PROCEDURE WHEN REMOVING THE FORMWORK:

All formwork shall be removed without such shock or vibration as would damage the reinforced concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary, in order to ascertain that the concrete has sufficiently hardened. Proper precautions shall be taken to allow for the decrease in the rate of hardening that occurs with all cements in the cold weather.

CAMBER:

It is generally desirable to give forms an upward camber to ensure that the beams do not have a sag when they have taken up their deflection, but this should not be done unless allowed for in the design calculation of the beams.

TOLERANCES:

The Contractor shall, before putting any concrete in any unit, check all dimensions according to the drawing governing the accuracy of the dimension of all the units and the necessary formwork shall be approved by the Engineer-in-charge and if any error is found in dimensions, the Engineer-in-charge will not allow in any case more than the tolerances specified as below and any unit which does not comply will be liable to rejection at the discretion the Engineer-in-charge.

The formwork shall be designed and constructed to the shapes, lines and dimensions shown on the drawings within the tolerances as given below. The tolerances in footings apply to concrete dimensions only and no to positioning of vertical reinforcing steel or dowels.

(a)	Deviation from specified dimensions of cross sections of columns and beams	- 6 mm +12 mm
(b)	Deviation from dimensions of footings: (i) Dimensions in plan (ii) Eccentricity (iii) Thickness	-12 mm 0.2 times the width of the footing in the direction of deviation but not more than 5 mm. +0.05 times the specified thickness

TRANSPORTING AND PLACING OF CONCRETE:

The concrete shall be mixed in quantities required for immediate use and shall be deposited on the sub-grade/sub-base to the required depth and width of the pavement section in successive batches and in continuous operation without the use of intermediate form between the joints. Care shall be taken to see that no segregation of materials results whilst the concrete is being transported from the mixer to the place where it is to be deposited. The spreading shall be as uniform as possible to avoid re-handling of concrete. Where, however a certain amount of redistribution is necessary, it shall be done with shovels and not with the rakes.

While being placed the concrete should be rodded with suitable tools so that formation of voids or honeycomb pockets is prevented. The concrete shall be well placed and tamped against the forms and along all joints.

COMPACTION OF FLOOR CONCRETE:

The concrete at the side of the forms and between the reinforcements at joints and at corners to be compacted with internal vibrator (needle vibrators) to avoid honeycombing and to get perfect compaction at these locations.

The vibrating screed shall rest on side forms and it shall be lowered vertically on the concrete surface, (evenly spread to an appropriate level above the base) to provide the required surcharge for compaction; allowed to remain in position for few seconds until compaction is completed, then lifted vertically and lowered on to the adjacent strip of un-compacted concrete. The amplitude of vibration of the screed shall not be less than 1.5 mm and speed of travel not more than 0.60 m per minute. The screed shall again be taken slowly over the surface, sliding with its axis slightly fitted away from the direction of sliding and operation repeated until the required dense, close knit textured finish surface is obtained.

Notes: Precautionary measures to be taken before starting concrete floor.

(a) The working of vibrators shall be regularly checked and standbys shall always be maintained for emergency use.

(b) The segregated particles of coarse aggregates which collect in front of the tamper or screed shall be thrown outside the forms. Under no circumstances shall such segregated particles be carried forward and pushed on to the base in front of the mass.

CONCRETE FLOOR FINISHING:

Immediately after completing the compaction by screed vibrator and excess water has disappeared but while the concrete is still plastic, the floor top surface shall be tested for true-ness with a 3.65 M long straight edge (Aluminum Box Section).

The straight edge shall be held in successive positions parallel to the guide channels in contact with top surface of floor laid and the whole area gone over from the one side of the floor to the other. Advance along the floor shall be in successive stages of not more than one half length of straight edge. Any area of the depressions found shall be scooped to a depth of 40 to 50 mm filled immediately with freshly mixed concrete, struck, compacted and refinished. High areas shall be cut down and refinished. The straight edging and re-floating shall continue until the entire surface is found to be free from observable departures from straight edge and top surface has the required levelled surface.

The floor top surface shall be re-tested for trueness before the concrete begins to set with the 3.60 M long master straight edge (Aluminum Box Patti). Any irregularity in surface to be rectified.

PREPARATION OF SURFACE AND USE OF FLOOR HARDNER (FIRST DRY SHAKE):

Following types of floor hardeners are used for increasing strength of concrete floors.

- Ironite based
- Silica / Quartz based
- Carborundum based

The quantity of floor hardener shall be used as specified by the Consultants (or as per manufacturers specification) and according to light / medium / heavy-duty floor as specified.

Scrap the concrete deposited, if any, on the top of side form during concreting. As soon as concrete is firm enough to support the weight of workmen and their equipment and no water is observed on surface; apply first shake of hardener evenly using 2/3 of total mix e.g. 2/3 of 7.5 Kg./Smt. Treat areas adjacent to walls and columns first, spread the materials evenly by sprinkling at right angles in two passes close to floor level. Do not broadcast (spread) the hardener from a station position but use a wooden scraper to spread the hardener. Alternatively, a mechanical spreader can be used for better application.

FLOATING: (With Finishing Machine Having DISC)

Power float the shake application promptly, work near wall, columns and door area first. Avoid excessive floating but ensure that the shake application is completely wetted and incorporated in to the base slab.

C-6/A Form work for “off the form exposed concrete surfaces having board marked pattern and time texture.”

Relevant specification of form work above (Given in C-5 above) shall be made applicable.

Concrete surface, which are to be “form finish shall be cast in an approved form work and shall be free from honey combined, fine, projections, and air holes. All external angles to form finish concrete surfaces shall be chaffed if and as directed. All interesting flush surfaces, surfaces horizontally or vertically between columns and beams of other structural members shall be separated by grooves if and as directed by the

Engineer-in-charge.

The pattern of the form boards, the disposition of construction joints and lifts, and the incorporation of recessed or raised joints shall be carefully studied by the contractor for its proper implementation.

The contractor shall submit shuttering drawings and details of pattern and the method of forming joints in the exposed (form finish) concrete to the Engineer-in-charge. For his approval and all changes and modification specified by the letter shall be appropriated by the former and final approval whereof obtained from the Engineer-in-charge.

No work of form finished exposed concrete shall be carried out until the contractor has produced acceptable sample of shuttering and concrete to the approval of the Engineer-in-charge.

Utmost care shall be then be constantly exercised by the contractor in the :

- a. Design workmanships and fixing of form work.
- b. Control of concrete ingredients, mixing and placing.
- c. Adequate technical supervision of all process involved.

Listed below are some form work specifications, for form finished exposed concrete to be used on site as directed by the Engineer-in-charge.

i. Smooth Board Surfaces:

The smooth board marked surfaces are produced by new dressed tongued and grooved boards of uniform thickness of not less than 45 mm. These boards should be brought and dressed on both faces as well as on all side.

ii. Rough Board Surfaces:

A rough texture is obtained by the use of new sawn boards with dressed square edges.

iii. Steel Mould Surface:

Steel moulds must be rigid enough are perfectly plane and clean. They must be painted with a protective point and absolutely free from rust or have a special section at their edges to prevent cement leakage and produce a water tight joint.

This type of form work is to be entrusted to a skilled and specialized manufacture who has produce satisfactorily similar form work and who must be approved by the Engineer-in-charge.

In all type of form work to form finished exposed concrete. Only non-staining mould oil supplied by an approved manufacturer will be used.

The repetitive usages of the same form work to cast form finished exposed concrete shall be as decided by the Engineer-in-charge and no case form work not guaranteed to produce the required form finish to the satisfaction of the Engineer-in-charge shall be used.

The exposed concrete shall have uniform finish. The finish of the concrete when shuttering and form work is removed will generally be without blemish and will be such as will not require touch up. Slight touch up a small work or two if necessary, shall be carried out immediately on removal of form work by 1:1 proportions. This shall be carried out expertly on removal of form work with entire surface.

C-7/A Fabricating placing reinforcement in position:

Fabrication:

The reinforcement bars shall be out to be required length including necessary bends hooks, overlaps, etc. as shown on the plan or as directed by the Engineer-in-charge and shall conform to I.S. 2502-1963 or as revised from time to time. Details of length and bending diagrams shall be got approved from the Engineer-

in-charge.

Placing and Binding:

All reinforcement shall be accurately placed in position with spacing as shown in the drawing and firmly held so during placing and setting of concrete. The bars shall be tied diagonally both ways, at all inter-sections with M.S. binding wire of 1.22mm or 1.63mm dia (16 or 18 gauge). Spot welding instead of tying brass by wires will be permitted by the Engineer-in-charge, if required. Spacing of bars shall be maintained by means of stays, blocks, tiles, spacers, hangers or other approved supports or devices at sufficiently close intervals.

All bars protruding from concrete to which other bars are to be spliced and which are likely to be exposed for indefinite period shall be protected from rusting by thin coat of cement wash.

Welding:

Welding (instead of overlaps) by gas or electricity will be permitted under suitable conditions and with suitable safe-guards. In case such permission is granted, relevant Indian Standards for welding of steel reinforcement bars including carrying out necessary tests shall be followed.

Inspection:

No concrete shall be deposited unless the Engineer-in-charge has inspected the reinforcement work, recorded measurements, and given permission to place the concrete. After the approval of the reinforcement by the Engineer-in-charge, it will be the contractor's responsibility to see that reinforcement is not disturbed from its position till the concreting is completed.

C-8/A Fixing Expansion Joints:

The expansion joints shall be provided in R.C.C. structural members:

1. For the joints between twin internal beams of RCC frame structure, copper strip of 1.5mm thickness and width and shape as shown in the detailed drawing shall be placed near the bottom in the first beam such that one Kg. of the specified width is embedded in the beam and "U" fold (of 80mm depth unless otherwise specified) will come in the joint.

The "U" shape gap of the copper strip shall be filled with poured bituminous joint filler and nearly finished on top. Before casting of the jointing member pre-molded bitumen joint filler or required thickness shall be placed in position as directed and concrete then cast, embedding the other leg.

2. The joint between the twin terrace beam shall be prepared in a manner similar to (1) above except that the raised concrete edge shall be provided and the copper plate shall be fixed in the raised edge as directed. It shall be covered by lead flashing 1.5mm thick fixed to one seat with copper screws to the wood blocks embedded in the concrete as shown in the detailed drawing.
3. For the joints between twin internal or external columns, while casting the first column, one leg of each of the copper strips of 1.5mm thickness shall be embedded into the column and "U" fold will come in the joints nearer the exterior faces of the column. The copper strips shall be fixed with hold fast of copper rod as shown in the detailed drawing. Before casting the second column pre-molded bituminous joint filler shall be placed against the face of the first column all along between the two steps as directed by the Engineer-in-charge.

C-9/A Constructing Brick masonry:

C-10/A Classification of brick work :

The bricks work shall be classified as first sort or second sort according as first class and second-class brick respectively are used.

Wetting of Bricks:

Bricks required for masonry shall be thoroughly wetted with clean water for at least two hours before use or as directed by the Engineer-in-charge. The cessations of bubbles, when the bricks are wetted with water, are an indication of through wetting of bricks.

Lying:

Bricks shall be laid in English bond directed otherwise.

Half or cut bricks shall not be used except when necessary to complete the bond. Closers in such cases shall be cut to required size and used near the ends of walls. A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gentle tapping with handle or wooden mallet. Its inside face shall be flashed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.

The walls shall be taken up truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. Vertical joints in alternate course will generally directly one over the other. The thickness of brick courses shall be kept uniform. The bricks shall be laid with frogs upwards. A set or tools comprising of wooden straight edge, masons spirit level square half meter cub and pins string and plumb shall be kept on the site of work for frequent checking during the progress of work.

Both the faces of thickness greater than 23 cm shall be kept in proper plane. All the connected brick work shall be carried up nearly at the level and no portion of the work shall be left more than one meter below the rest of the work. Where this is not possible, the work shall be racked back according to bond (and not left toothed) at angle not steeper than 45 degrees.

All fixtures, pipes, outlets of water hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

Joints:

Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be racked as directed by racking tool, daily during the progress of work, when the mortar is steel green so as to provide key for plaster or pointing to be done.

The face of brick work shall be cleaned on the same day the brick work is laid and mortar dropping shall be removed.

Curing:

Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days, the top of masonry work shall be kept well wetted at the close of the day.

Scaffolding:

The supports or scaffoldings shall be sound and strong tied together with horizontal pieces over which the scaffolding planks shall be fixed. Single scaffolding shall be allowed normally in this case inner end of the horizontal scaffolding pole shall rest in a whole header course only. Only one headed for each pole shall be left out. Such holes shall not however, be allowed in pillars under one meter in width. The holes left in masonry shall be filled and made good before plastering.

The contractor shall be responsible for providing and maintaining sufficient strong scaffolding so as to withstand all loads likely to come upon it.

C-11/A Construction of brick masonry partition walls:

The partition walls shall be half brick.

- (A) All the bricks shall be laid stretcher wise breaking joints with those in the upper and lower course. The wall shall be taken truly plumbed. All courses shall be laid truly horizontal and all of vertical joints will be truly vertical. The bricks will be laid with frog upwards. Fixtures, plugs holdfasts, frames of doors, windows etc. shall be housed in the brick work while laying only and at the correct levels and position. Holes of required size and shapes shall be left in the brick work for fixing pipes or service lines etc. After service lines etc. are fixed, the extra hollow left in the hole shall be filled with 1:3 cement mortar or 1:3:6 cement concrete. A set of mason's tools shall be maintained on work as required for frequent checking. The ends of walls shall be bonded into the side walls where necessary joints, curing and scaffolding shall be as per C-10 of code of practice.
- (B) Laying 2 numbers of mild steel bars of 6mm diameter in brick masonry partition walls. Two mild steel reinforcement bars of 6mm diameter shall be used longitudinally at every fourth course of the brick work. The first reinforcement shall be placed on the top of bottom most course. The bars shall be fully embedded in the mortar and the end shall be properly bonded in the vertical joints of brick work or to the main wall as directed by the Engineer-in-charge. Bars shall be of length equal 45 times diameter of mild steel bars. The joints in the course, where reinforcement is placed, shall be admitted the mortar cover of at least 5mm in thickness of the reinforcement.

C-12/A Constructing Brick Masonry Cavity Walls:

General:

The cavity wall shall be constructed with 2 Nos. 90mm thick reinforced brick partition with cavity of 50mm in between wall shall be connected with metallic walls ties.

Reinforced Brick Partition:

Wall ties shall be of mild steel bars of 6mm dia of the shape as directed by the Engineer-in-charge. The wall ties shall be placed at not more than 800mm apart horizontally and not more than 500mm vertically and shall be placed staggered. Before placing the ties same shall be dripped in hot tar and sanded to protect from rust. The additional ties shall be placed at the opening.

Construction:

The bond used for each skin or leaf of a cavity wall shall be stretcher bond. Flemish bond or any other arrangement of bricks shall not be used during erecting of wall. Sufficient care shall be taken to keep the wall ties and cavity free from mortar dropping, 25mm thick and 40mm wide teak wood batten shall be placed across the wall ties and raised as each row of ties are raised for reducing the mortar dropping in the cavity. The temporary openings shall be provided to permit the daily removal of mortar dropping from the bottom of cavity. At the points where the two leaves of the hollow wall come into contact or above the lintels of doors and windows and at solid at jambs, necessary damp proof membrane of approved quality shall be provided as per the direction of Engineer-in-charge. Except as above the work in general shall be executed as per provision of I.S. 2212-1962 or as revised from time to time so far applicable.

C-13/A Preparing and fixing doors, windows and ventilators, teak wood paneled or glazed or partly paneled and partly glazed.

General:

The code covers the requirement of preparation of doors, windows, & ventilators with frames and their supply and fixing.

They shall be made on site of work only.

Frames:

All members of frame shall be exactly at right angle shall be checked from inside surface of the respective

members.

All members of frames shall be straight without any wrap and shall have smooth surface well planned on the three sides exposed at right angle to each other. The surface touching the wall may not be planned unless it is required in order to strengthen up the members or to obtain the overall sizes within tolerance as specified.

Frames shall have overall joints when ventilator is included it shall be provided by having full-length one-piece post for door or window and ventilator extending the frame on top of the head to the required extent. Horns shall not be provided in the head of the frame when no sills are provided the vertical post of the frame in the ground floor shall be embedded in the sill masonry for 100mm. On upper floors the vertical posts shall be fixed in the floor by forming notches 10mm deep. Slight adjustment of spacing as necessary shall be done to have the holdfasts in the joints of masonry course. The frame shall be done to have the holdfast in the joints of masonry course. The frame shall be erected in position to hold plump with strong supports from both sides and built in masonry as it is being built. The transom shall be thorough tended into the mortises of the jamb post to the full width of the jamb post and the thickness of the tendon shall be not less than 15mm. There shall be closely fitted into the mortise and suitably pinned with wood dowels not less than 10mm diameter. The depth of rebate for housing the shutter shall be as shown in detailed drawings or as directed by the Engineer-in-charge.

The contact surfaced or tendon and mortises shall be treated before putting together with an adhesive of approved make.

M.S. hold fasts shall be protected with a coating of primer. The surface of frame abutting the masonry or concrete a face shall be properly treated by applying a coat of approved premier coal tar shall not be used for this purpose.

Shutter:

Paneled shutters shall be constructed in the form of timber frame work of styles and rails with panel inserted of type as specified in the item of work. Panel shall be fixed by providing grooves in the style and rail. The styles and rails shall be jointed to each other by mortise and tendon joint at right angles.

All members of the shutters shall be straight without any wrap or how and shall have smooth well planned faced of right angles to each other.

Styles and rails of shutters shall be made out of one piece only.

Schedule of fixtures and fastening for Doors, Windows, Ventilators, Wardrobe, and Cupboards.

Notations.

Da- Teakwood doors fully paneled or fully glazed or partly paneled and partly glazed.

Db- Bathroom & W.C. door with single shutter.

Si- Single shutter.

B- Breadth of door shutter.

T- Thickness of door shutter.

900mm & below

900 above 970 mm

Sr. No.	Particular of Fixture & Fastening.	Size in mm	Da. SI:B:900 T-38	Da. SI:B:900 T-38	Db.SI
	Hold fast	150x16x3m	4	6	4

	But hinges	10	3	3	3
			4		
	Sliding door bolts	300x16 250x16	1	-	-
	Tower bolts (Barrel bolts)	200x10	1	1	-
	Tower bolts (Barrel bolts)	150x10	-	-	-
	Door latch	260x16x5	1	1	1
	Handles	100	2	2	2
	Door stopper	75	1	1	-

Timber Paneling:

Thickness of the panel shall be as specified in item. When made from more than one place, as shown in the drawing or as directed by the Engineer-in-charge, the places shall be finished as shown in the detailed drawings and shall be jointed with specified size of plywood filled. The end pieces of the panel and the top and bottom of the panel shall be provided with continuous tongue to frame is into groove of the frame of shutter. An air space of 15mm will be left groove of frame of shutter while framing the panels in it.

The faces of the panel as well as various pieces of the panel shall be closely fitted to the side of the grooves. Finishing of the corners of raised panel edges shall be done as shown on drawings or as directed by the Engineer-in-charge.

Glass Paneling:

The glass panels shall be embedded putty and secured to the rebate of wooden beads or moldings of shape and size as approved with counter sunk screws of suitable size.

Fixtures & Fastenings:

All fixtures and fastenings shall be fixed with appropriate screws in sound and efficient manner to ensure easy operation. They shall be appropriately positioned and shall be truly horizontal or vertical as required.

Height of the shutter shall be such as not allow clearness of more than 6mm above the flooring level.

C-14/A Lime Brick bat Concrete:

This shall be as per C-2 of code of practice. The brick bats shall conform to M-12.

C-15/A Glazing:

The glass panels shall be properly cut to fit the rebates of the frames and sashes truly with a slight minus margin of about 1.5mm on all sides. Before glazing, the frames shall be primed and prepared for painting so that wood may not draw oil out of putty. The rebate shall be putted to an extent to provide bedding all around the glass edges.

The glass shall then be bedded in putty and fitted with wooden beads or molding as directed and secured with counter sunk screws.

The size of the rebate in the frame and size and shape of beads or moldings shall be as per detailed drawings or as directed by the Engineer-in-charge. The beads or moldings shall have mitred corners. The glazing in metal frame shall be done in the same way as in wooden frames. Except as stated above glazing in metal frames shall be done as specified in I.S. 1081-1960 or as revised from time to time.

C-16/A Oil Painting / Synthetic Enamel Painting:

Preparation of surfaces:

The surface to be painted shall be thoroughly.

The screw shall be spaced not more than 100mm from each corner and not more than 200mm apart clean

and rubbed smooth with sand paper to bring it is none plane, when finished. No scratches for sand paper should be shown.

Application:

This shall be applied in 2 coats as per normal practice. After preparing surface as above one coat of white oil paint shall be applied as priming coat. After priming coat, all small holes, cracks, open joints and similar other minor defects of every kind shall be stopped with putty made from pure whiting mixed to the appropriate consistency with raw linseed oil little white lead being worked in after mixing to help in hardening of putty.

The work shall be little rubbed down smooth with sand paper and the consequent coats of paint of the specified shade approved by the Engineer-in-charge shall be applied. The paint shall be applied with brush. It shall be spread as smoothly as possible. Final coat shall be very carefully crossed and laid off, so that brush marks are not visible. Each coat of paint shall be allowed to dry thoroughly and shall be little rubbed down for the next one is laid. Finished surface shall now show any hair marks, ridges or dry patches of paints and no puddles shall be left in the corner of panels' angle of molding etc.

C-17/A French Polishing:

French polish to be used shall conform to I.S. 348-1968 in the requirement of quality.

Preparation of surface:

All unevenness shall be rubbed down to smoothness with sand paper and the surface shall be well dusted. The wood to be polished should be first painted with a filler by mixing whiting in hyphenated spirit to obtain a good glossy surface shall be again rubbed down perfectly smooth with paper.

Application:

The number of coats of polished to be applied shall be as specified in the item. On the wood work thus treated a thin coat of French polish shall be applied by a pad of woolen cloth covered by fine cloth. The pad shall be moisture with polish rubbed hard on the surface in a series of over lapping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil on the face of the pad facilitates that operation. The surface shall be allowed to dry and the remaining coats applied in the same way to finish off the pad should be covered with a fresh piece of clean fine cloth, slightly dumped with mentholated spirit, and rubbed lightly and quickly with circular motions. The finished surface shall have a uniform texture and high gloss.

C-18/A Laying in Situ Cement Concrete Flooring (I.P.S.):

The flooring shall be provided with ordinary cement concrete 1:2:4 (1- cement: 2- coarse sand & 4- graded stone aggregate 20 mm nominal size). The work of plain cement concrete 1: 2: 4 shall be carried out as per C-2 above. The thickness flooring shall be specified in the item of work.

The surface of the sub-grade shall be cleaned and all loose materials and moistened immediately before laying flooring.

The concrete shall be laid immediately after mixing white being placed, the concrete shall be vigorously sliced and spaced with suitable tools to prevent formation of voids or honey comp pockets. The concrete shall be brought to the specified levels by means of heavy straight edge resting on the side forms and drawn ahead with a sawing motion in combination with a series of lifts and drops alternating with small lateral shifts immediately after laying concrete the surface shall be checked for high or low sports and any needed corrections made up by adding or removing the concrete. After striking off the surface it shall be compacted with wooden float. The blows shall be fairly heavy in the beginning but as consolidation takes place light rapid strokes shall be given to complete the ramming. The floating shall be followed by steel traveling after

concrete has hardened sufficiently to prevent excess of fine material from working to the surface. The finish shall be brought to a smooth and even surface free from defects and blemishes and tested with a straight edge. Dry cement or mixture of dry cement and sand shall not be sprinkled directly on the surface to absorb moisture or to stiffen the mix. After the concrete has dried, sufficiently to allow rendering to a thin floating coat of neat cement slurry uniformly floated.

If so, specified in the item of a work approved mineral colour, pigment shall be added to cement mortar to give mortar rendering is sufficiently stiff lines may be marked on it so specified or directed. With strings or any other devices to give the appearance of 250 mm x 250mm tiles of any other size diagonally or square as directed. The junctions of floor with the walls shall be rounded off, if so directed.

Curing:

Curing shall start on the next day after finishing and shall be continued for fourteen days.

C-19/A Laying In-Situ Terrazzo Flooring:

Under layer of cement concrete:

The under layer shall be laid as described in C-17 of the code of practice except that only black trap grit shall be used in place of coarse aggregate and no finishing shall be done to make the surface smooth. The compacted thickness of concrete under layer shall be as specified in the item. This layer shall be laid to the required level and grade. The top surface of the under-layer concrete shall be kept sufficiently rough to form a key to the top layer.

Dividing strips shall be fixed on the base to the exact surface level of floor so as to divide the surface of the base into the required arrangement of panels. Anchorage arrangement shall be provided either by fixing 4 cms. Long cross nails through the strips or by cutting the edge as directed.

Before spreading the under layers, the base shall be cleaned of all dirt laitance or loose material and then well wetted with water without forming any water pools on the surface it shall then be smeared with cement slurry just before the spreading of under layer.

After application of cement slurry, the under layer shall be spread and leveled with a Screening board. This slightly rough surface left by the screening board will form a satisfactory key for the terrazzo.

Mixing of Materials:

Mixing shall be done manually in a tub. To avoid variation in colour the complete quantity of cement and pigment required for one operation shall be mixed at the beginning of the work and stored properly.

Where the different colour chips are used they shall be well mixed in required proportion of various colour and size. Coloured cement may be ready mix or properly mixed at site. White cement (with or without pigment as directed) or colour cement and marble powder shall be in the proportion of 3 parts of cement and 1 part of marble powder by weight. For every part of this marble mix, the proportion of the aggregate by volume shall be $\frac{1}{2}$ parts.

While mixing the aggregates care shall be taken not to get the materials into a heap as this would result in the coarsest chips failing to the edge of the heap and the cement working to the centre at the bottom. The materials shall be kept, as far as possible in an even layer during mixing.

After the materials have been through mixed in the dry state, water shall be added in small quantities; preferably in a fine spray while the materials are being proper consistency is obtained. The mixing shall be plastic but not so wet that it will flow; a rough indication for the addition of proper quantity of water in the mix is that it shall be capable of being molded when squeezed in hand without water flowing out. The mix shall be used in the work within half an hour of the addition of water during preparation.

Laying Terrazzo Topping:

Terrazzo topping shall be laid while the under layer is still plastic but it has hardened sufficiently to prevent cement from rising to the surface, this is normally achieved between 18 to 24 hours after the under layer has been laid. A cement slurry preferably of the same colour as the topping shall be brushed on the surface immediately before laying is commenced. If possible, the entire work of laying the topping shall be completed at one stretch.

The terrazzo mix shall be placed on the screed bed and be compacted thoroughly by tamping or rolling and toweled smooth. The time interval allowed between each successive toweling is important at only that much toweling which is just sufficient to give a level surface is needed immediately after laying. Further compacting shall be carried out at intervals, the amount depending upon the temperature and rate of set of the cement. Excessive trowelling or rolling in early stages shall be avoided as this will tend to work up cement to the surface which produce a finish liable to cracking and will also necessitate more grinding of surface to expose the marble chips.

The surface shall then be rammed in order to consolidate the terrazzo, it is not sufficient just to "float" lightly, as this would cause depression which have to be filled with mortar. A piece of smooth marble stone of size 15 cm x 2.5 cm may be advantageously used for ramming. Following the rammer a trowel may be used. When using the trowel, the object should be making the surface level smooth with a little use of the float as possible relying upon pressure rather than upon a trowelling action to achieve this end. Rolling will be easier than tamping and patting, but a rolled terrazzo is more like to crack since the roller would draw the cement to the surface unless the mixture is very dry. The best results will be obtained by tamping combined with a minimum of trowelling. The compaction shall ensure that air bubbles are cleared from the mix.

Curing:

The surface shall be left dry for air curing for duration of 12 to 18 hours depending upon atmospheric temperature conditions. It shall then be cured by allowing water to stand in pools over it for a period of not less than four days. Precautions shall also be taken to prevent the floor from being subject to extreme temperature.

Grinding:

The grinding processing and polishing of terrazzo may be commenced not less than 7 days from the time of completion of laying. The grinding shall be done by machine only. The filling shall be done with a grout using the same-coloured cement (without marble powder) as it is original mix for terrazzo topping and a portion of the coloured cement shall be kept for this purpose when the floor is laid and this will make sure that patches do not differ in appearance from the remainder of the floor.

After the first grinding is done, the surface shall be washed clean and grouted with neat coloured or white cement grout as the case may be of cream like consistency. It shall be allowed to dry for 24 hours and watered for 4 days. The second, third and fourth grinding shall be done in the above manner excepting that the grinding shall be done with finer carborundum stones as directed for each successive grinding.

The floor shall finally be washed clean with dilute oxalic acid solution and dried. In case wax polished surface is required by the Engineer-in-charge. The wax polish shall be sparingly applied with soft Indian on the clean and dry surface then the polishing machine fitted with bobs shall be run over it. Clean saw dust shall then be spread over the floor and polishing machine again applied, mopping up surplus wax and leaving glossy surface. Care shall be taken that the floor is not slippery.

C-20/A Laying and finishing of Marble / granite slab Flooring:**General:**

The marble stone flooring shall be laid on the cement mortar bedding with neat cement finishing.

Proportion of mix:

The cement mortar bedding shall be as per **M-9** of specification of materials in 1:6 proportions of cement and sand by volume unless otherwise specified in item of work.

Preparation of Bed of cement Mortar:

The bed of cement mortar shall be laid on the compacted base to reasonably true plane surface and to the required slopes. Care shall be taken in preparing ring the mortar bed to ensure that there are no hard lumens that would interfere with the sub-floor or base shall be cleaned of all dirt, scum, or laitance and of loose materials and then well wetted without forming any pool of water on the surface. All points of level for the finished playing surface shall be marked out. The mortar shall then be evenly and smoothly spread over the based by the use of screed battens only over so much area as will be covered with slabs within half an hour. The thickness of the mortar bedding shall not be less than 20 mm and not more than 25mm. The required slope shall be given to the bed.

Fixing stone slab:

Before laying the marble, stone slab shall be thoroughly wetted with water, neat cement grout of honey like consistency shall be spread on the mortar bed over as much area as could be covered with the slab within half an hour. Marble slab shall be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slope on the mortar bed. Each slab shall be generally tapped with a wooden mallet till it is firmly and properly bedded. There shall be no hollows left. If there is a hollow sound on gently tapping of the slab such slab shall be removed and reset properly. The joints shall be of uniform thickness and in straight line. The joint shall not be more than 1.5mm thick and filled solidly with mortar, for their full depth. The joints shall be struck smooth but there shall be no smearing or mortar over the slabs. The slabs shall be laid so as to give continuous parallel long joint with cross joint at right angles to them. The edges of the adjoining slabs shall be in one plane when the slabs cover open edges of the floor or window, sills the edges shall be neatly rounded off.

Pointing:

When pointing is to be done the joints shall be pointed with cement screening of the colour matching the colour of the marble stone slabs. The cement mortar spread on the marble slabs shall be cleared immediately after pointing.

Curing:

The flooring shall be kept well wetted with the damp & or water fourteen days.

Polishing:

The polishing shall be done generally by polishing machine. After the floor is completely dry a hot mixture of turpentine and bees wax (4:1 by weight) shall be applied to the surface and rubbed clean with cotton waste.

Wherever big area of floor is to be tiled the level of the central portion of the floor shall be kept about 10 mm higher than the level marked at the walls unless specified otherwise.

C-21/A Laying Kotah stone flooring paving:

Bedding:

Before spreading the mortar, the sub base of the floor shall be cleaned of all dirt, scum, and loose materials and then well wetted without forming any pools of water on the surface.

In case of R.C.C. floors, the top shall be left a little rough. All points of level for the finished surface shall be

marked out. The mortar shall then be evenly and smoothly spread over the base. Bedding layer of cement mortar in proportion 1:6 or 1:3 shall not be less than 20 mm or 12 mm average.

Laying:

Before laying the stones, they shall be thoroughly wetted with water. Neat cement grout of required consistency shall be spread on the mortar bed. The stones shall be laid on the neat cement grout and shall be evenly and firmly bedded to the required level and slope. There shall be no hollows left. The joints shall be of uniform thickness and in straight lines. They shall be filled solidly with a mortar / cement slurry for the full depth. The joints shall be struck smooth. But there shall be no smearing of mortar over the stones. When pointing is to be done, the joints shall be raked out for not less than the width of the joints while the mortar is still green. The flooring shall be in true plane.

The thickness of joints shall normally be as follows unless otherwise specified or:

- (i) Polished kotah stone with fine chisel 1.55mm dressed edges.
- (ii) Rough kotah stone with dressed 8 mm to 12 mm edges.

Curing:

The flooring shall be kept wetted with damp sand or water for fourteen days. It shall be kept undisturbed at least for seven days.

Cleaning:

Flooring shall be thoroughly cleaned as directed by the Engineer-in-charge.

Polishing:

The polishing shall be done generally by polishing machine. After the floor is completely dry a hot mixture of turpentine and bees wax (4:1 by weight) shall be applied to the surface and rubbed clean with cotton waste.

Wherever big area of floor is to be tiled the level of the central portion of the floor shall be kept about 10 mm higher than the level marked at the walls unless specified otherwise.

C-22/A Laying Dholpur Stone paving:

This shall be as per C-20 of code of practice as applicable to rough kotah stone. The stone in this case shall be Dholpur stone.

C-23/A Laying and finishing of cement concrete flooring tiles:

The work shall be carried out as per IS 1443-1972 or as revised from time to time as far as is applicable.

Bedding:

Before laying the tiles, they shall be thoroughly wetted with water. Neat cement grout of required consistency shall be spread on the mortar bed. The tiles shall be laid on the neat cement grout and shall be evenly and finally bedded to the required level and slope as per pattern given during the execution of the work. There shall be no hollows left. The joints shall be of uniform thickness and in straight line as per the pattern.

Joints:

The flooring shall be kept wetted with damp sand or water for fourteen days. It shall be kept undisturbed at least for seven days.

Polishing:

After the tiles are properly cured, it shall be polished by machine and shall be waxed to give thoroughly polished even surface. If any part of the building like doors, windows etc. is spoiled or damaged, it shall be

repaired to its original condition by the contractor at his own cost.

C-24/A Laying & Finishing to marble/ granite skirting or dedo:

The work consists of laying of marble stone slab, skirting or dedo in cement mortar.

Preparation of surface:

Before fixing marble stone slab on brick or concrete wall the wall surface shall first be wetted with water. Thereafter about 10mm thick backing of cement mortar in the specified proportion shall be applied on the surface in true line and level generally as per C-31 or practice.

Fixing:

The back of each marble stone slab, to be fixed shall be smeared with cement paste of matching colour and the marble stone slab shall then be gently tapped against wall with a wooden mallet. The skirting shall be done only after the flooring is completed. Any pipe coming out of the wall through the marble stone slab of dedo or skirting shall be approximately so positioned that its center shall only be at the intersection of horizontal and vertical joints. The tiles shall not have staggered joints, the joints shall be true to center line both way and the vertical joints shall be in line with the joint in the marble stone flooring. The joints shall not be more than 1.5 mm thick. Each marble stone slab shall be fixed as close as possible to the one adjoining and any difference in the thickness of the marble stone slab shall be even out in the cement paste. So that the entire tile faces are set in conformity with one another. The skirting shall project uniformly and not more than half the tile thickness beyond the finished surface above.

Curing:

Curing shall be done as per C-22 of Code of practice.

Finishing:

Skirting and dedo will be hand polished to have an even smooth and shining surface chamfering shall be done on the junction of cement plaster and cement tiles.

C-25/A Laying and finishing of kotah stone skirting or dedo:

This shall be carried out as per C-20 of code of practice except that the skirting or dedo in this case shall be of polished kotah stone and joints shall be 15mm in case of stones with machine cut edges and 3 mm in case of fine chiseled dressed edges.

C-26/A Laying & finishing of in Situ Terrazzo Skirting or Dedo:

Under layer of concrete mixing of materials laying terrazzo topping curing and grinding shall be as per C-18 of Code of practice except that the grinding will have to be done manually and the skirting / dedo shall not project more than 7mm and the plaster at the junction at top shall be leveled suitably.

C-27/A Laying & Finishing of cement concrete tiles skirting or dedo:

This shall be carried out as per C-23 of code of practice except that the skirting or dedo in the case will be of cement concrete tiles and that joints shall be fitted in with slurry of matching colour cement.

C-28/A Laying White Glazed Tiles / Ceramic vitrified tiles flooring:

Bedding:

Mortar shall give sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleaned and well wetted. The mortar then shall be spread in thickness not less than 12 mm and not more than 20mm to have a required slope.

Fixing Tiles:

The tiles before laying shall be soaked in water for at least two hours. Neat cement grout of honey like consistency shall be spread over the mortar beddings as directed. The edges of the tiles shall be smeared

with neat white cement slurry. The tiles shall be well pressed and gently trove with a wooden mallet till it is property bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints between the tiles shall not exceed 1.0 mm.

The tiles shall not have staged joints. The joint shall be true to center line both ways. The nahni trap coming in the flooring shall be positioned that its grating shall replace only one tile. After fixing the tiles finally in an even plane, the flooring shall be kept wet and allowed to mature undisturbed for 14 days.

Cleaning:

The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set it shall be carefully washed cleaned by dilute acid and dire proper precautions and measures shall be taken to ensure that the tiles are not damaged any way till the completion of the construction work.

C-29/A Laying White glazed tiles / vitrified tiles skirting or dedo :

This shall be carried out as per C-27 of code of practice except that the skirting or dedo in this case shall be of white glazed tiles and the edges of the tiles shall be smeared with and fixed in with neat white cement slurry.

C-30/A Laying Tar felt treatment:

General:

The tar felting shall be done on smooth surface previously preparing for making them water proof and damp proof.

Prepare of surfaces:

The surface on which the tar felt is to be laid shall be cleaned with brush and all dust and foreign materials removed. Any cracks in the surface shall be cut to V- section, cleaned and filled up flush with cement and slurry or a suitable grade of bitumen or both.

Laying:

The five layers of the treatment shall be laid as under.

Premier coat:

The first coat of bitumen primer shall be applied as directed by the Engineer-in- charge. The second and fourth coats shall be of hot blown bitumen of approved grade applied at the rate of 1.5 kg. Per sq.mtr.

The third layer shall be of the fiber base self-finished felt. The felt shall be laid as mentioned below:

- (a) The felt shall be first cut to required length, brushed clean of dusting materials and laid out flat on a level, dry and clean surface.
- (b) After the surface has been prepared and cement rendering and the corner fillets have set and a primer coat has been applied, the strip of tare felt for laying is rolled up.
- (c) The rolled up felt is laid on one end of the floor, the hot bonding materials is prepared on to the floor in front of it across the full width of the felt, which is then unrolled gradually with a slight pressure to squeeze out the excess bitumen fit and final coat shall be of screened grave or grit laid at the rate of 0.008 cmt / sq.cmt.

The water proofing treatment shall be continuous throughout as far as possible. However, where the points are unavoidable the minimum over lapping shall be 100mm and the joints shall be made perfectly water tight.

C-31/A Cement pointing:

The joints shall be brushed clean of dust and loose particles with a stiff brush. The area shall be washed and the joints thoroughly wetted before pointing is commenced. The racking out of joint shall be 20mm

deep. The surface shall be applied with two coats of Geru wash.

The racked-out joints shall be filled with cement mortar as specified in the item. The mortar shall be of required consistency & well pressed and rubbed smooth. The pointing shall be flush or as directed by the Engineer-in-charge.

C-32/A Application of cement plaster finish:

Preparatory work:

The smooth surface of concrete / masonry shall be suitable roughened to provide necessary bond. All dirt, swat, oil, or any others material that might interfere with satisfactory be shall be removed. The surface shall be cleaned and scrubbed with fresh water and kept wet for 6 hours prior to plastering. It shall be kept damp during the progress of the work.

Gauge:

Patches of plaster 150mm x 150mm shall be put on above 3 mtr. Apart as gauges to ensure even plastering in one plane.

Plastering:

(a) BASE COAT:

In all plaster work, the mortar shall be firmly applied with somewhat more than required thickness and well pressed into the joints and the surface rubbed and leveled with a flat wooden rule to give required thickness. Long straight edges shall be freely used to ensure a perfectly plane and even surface. All corners shall be finished their true angles or founded as directed by the Engineer-in-charge. The surface shall be finished to plane or curved surface as shown on the plan or as directed by the Engineer-in-charge and shall present a neat appearance. The mortar shall adhere to the concrete surface firmly when set and there shall be no hollow when struck. Cement plastering shall be done in squares or strips as directed. Plastering shall be done from top-down wards. All exposed angles and junctions with door frame etc. shall be carefully finished.

(b) FINISHING COAT:

Finishing coat shall be provided to the plaster as specified. A coat of cement slurry shall be applied to the plaster surface with a trowel to provide uniform texture while the base coat is still plastic. In any continuous faced of a wall, finishing treatment should be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly injunction. All tools and accessories used in plaster work shall be cleaned by scraping and washing at the end of each day's works after use. Metal tools shall be cleaned after operation.

(c) Watering & Curing:

All plaster work shall be kept damp continuously for a period of fourteen days.

C-33/A Application of Water proof cement plaster:

The cement plaster of specified thickness shall be provided in cement mortar with integral cement water proofing compound of approved quality.

The plastering work of specified thickness shall be done as per C-31 of Code of practice. Except that while preparing the cement mortar, the approved water proofing compound at the rate 1 kg / 1 bag as per manufacturers specifications of cement shall be added while mixing the mortar. The contractor shall bring the water proof materials to site of work in their original packing the water proofing material shall be mixed in dry cement and sufficient care shall be taken while mixing to see that the water proofing materials gets integrally mixed with the cement and does not run out separately when water is added.

C-34/A Application of sand faced plaster:

Base coat:

The base coat plaster shall be of cement mortar of specified properties and thickness. The base coat shall be laid in a similar manner of laying plaster as per **C-31** of code of practice. However, instead of finishing the top surface smooth keys shall be formed on the surface by thoroughly combing it with way horizontal lines about 12mm apart and about 3 mm deep when the mortar is still plastics. The base coat shall be cured for minimum 2 days.

Second coat:

Second coat shall be cement mortar with specified kind of cement and specified preparation of thickness. The coat shall be applied evenly in true lines and level by using approved quality of coarse and the surface shall be finished with a wooden float. The necessary rubber sponge as approved by the Engineer-in-charge shall be applied over this coat to obtain the surface textures as per previously approved sample.

When the finishing coat has hardened, the surface shall be kept watered continuously for 14 days.

C-35/A Application of coloured cement plaster:

The plaster shall be applied in two coats namely base coat and finishing coat. The base coat of thickness specified in the item shall be applied as per that under C-31 of Code of Practice. The finishing coat shall be thickness as specified in the item and shall be carried out as per that under C-31 of Code of Practice except that cement of colour and shade as approved by the Engineer-in-charge shall be used.

C-36/A Laying and finishing stone veneering / Lining:

The code covers the requirement of preparing the Dholapur stone of machine polished machine cut edge for stone veneering, lining including laying and finishing.

The exposed veneering / lining face of the stones shall be double machine polished patches or streaks on the face shall not be allowed. The machine cut machine polished stones shall be provided with appropriate six rectangular groove on the top edge to receive one leg of gun metal cramp.

The groove shall be positioned centrally thickness wise or as directed by the Engineer-in-charge.

Circular holes of appropriate depth in the vertical edges shall be provided to receive 6mm diameter copper pin dowels of 75mm length. The holes shall be positioned as directed by the Engineer-in-charge.

The samples of stones prepared as above shall be first got approved from the Engineer-in-charge. In case wax polished surface is designed the wax polish shall be sparingly applied with soft linen on the clean and dry surface and clean saw dust shall then be spread over the surface, and the sample wax mopped up, leaving glossy surface. Care shall be exercised to see that the wax shall not at all stain the edges.

The stones shall be well wetted before laying while applying mortar for fixing the stones in position, no chips or filling of any short shall be used. The surface to be veneered shall be cleaned of all dirt, maintenances of loose materials and then will wet with water.

The stones shall be secured to the backing by channeled shape gum metal cramps, 30 cm long, 25mm wide and 6mm thick. The legs of the channel shall be 25 cm high. The adjoining stone shall be secured to each other by 6mm dia 75mm long copper pin dowels. The swamps and pin dowels shall be spaced not more than 600mm apart. The samples of pin, dowels and cramps shall be got approved form the Engineer-in-charge. One end of the cramp shall be positioned in the groove in the top edge of the stone and the other end in the joint of the brick masonry at the back.

The pin dowel shall remain inserted in the adjoining stone so that equal length remains in each stone.

The pin dowels and cramps shall be laid in cement mortar of cement and fine sand in proportions as

specified in the item.

While laying face work all care shall be taken to see that the edges and corners of the stones are not damaged in any way and that the stone face are not disfigured or stained or any indentation formed on the face if any stone is damaged in any of the above way the same shall be replaced by unblemished and work redone.

The pattern of stone veneering shall be as per the detailed drawing or as directed by the Engineer-in-charge. Few samples of finished stone veneering shall be prepared by the contractor for the approval of the Engineer-in-charge. The work shall be carried out solely in conformity with the approved sample.

The backing joints shall be filled with cement mortar of appropriate proportion and shall be of thickness not more than 10 mm. All these joints shall be full of mortar if any hollow sounding is detected by tapping the stone this shall be taken out and re-laid properly without hollow. The backing joint shall be carried out simultaneously with the face work.

The thickness of the face joints shall not exceed 5mm or as directed by the Engineer-in-charge. The face joints shall be uniform throughout. A uniform recess of 10mm depth from face shall be left with the help of steel plates sections. The cement to be used for face joints shall be of matching colour and shade as approved by the Engineer-in-charge.

In case of cement concrete backing, the stone shall be secured with backing after it has set and got cured. The craps shall be fixed in concrete in the required position while laying.

The method of executing this work shall be got approved from the Engineer-in-charge in all its details such as scaffoldings, method of handlings transporting keeping in position of stones, manner and operational phasing of applying the back joints etc. in submitting the data, the contractor shall give due weight age and consideration to the fact that the work is to be carried out at a very great height and such other critical factors.

The curing shall be carried out continuously for 14 days and if possible, curing may be carried out by providing perforated pipes horizontally laid.

The face work shall be cleaned off all mortar markings, stain etc.

The face joints of the veneering shall be neat, true to line i.e. perfectly horizontal and perfectly vertical. The face work shall be truly in plane. It shall present a neat appearance.

C-37/A Application of flat paint:

The surface on which the flat paint is to be applied shall be thoroughly cleaned of all mortar droppings, dust, algae, grease, and other foreign matter by brushing. The holes and undulations shall be filled up with plaster of Paris and rubbed smooth. The surface so prepared shall be got approved from the Engineer-in-charge prior to painting work is commenced.

Application of paint:

Primer coat:

The specified primer shall be applied with brush in a uniform layer over the surface prepared as above.

Painting coats:

Flat paint shall be applied with brushes when the surface is dry, Paint shall be applied in even and uniform layers. The number of coats shall be specified in the item of work. Each coat shall be allowed to dry overnight and lightly rubbed with very fine grade of sand paper and loose particles shall be brushed off before the next coat is applied. The paint shall be applied evenly and smoothly by brushes with crossing and laying process. The crossing and laying process shall consist of covering the area over with paint and then painting alternatively in opposite direction two or three times and then finally painting lightly in a direction at right angle to the same. This entire process of crossing and laying shall constitute one coat.

No hair marks or clogging of paint puddle in corners etc. shall be left on the surface.

All wood work, glazing, floors etc. shall be protected by covering and stains meals, splashing, if any shall be removed and any damage done shall be made good by the contractor at his cost.

C-38/A While Washing or Colour Washing:

White wash:

Lime shall be dissolved with sufficient quantity of water (about 4 to 5 liters per kg. of lime) thoroughly mixed and stirred to attain consistency within screen. The wash shall be strained through a clean cloth. Clean colour dissolved in hot water shall be added in suitable proportion Indigo will be added to obtain required white tint.

Preparation of Surface:

The surface shall be prepared by removing the mortar droppings and foreign matter and thoroughly cleaned with a wire or fiber brush or any other suitable means as directed by the Engineer-in-charge. All loose pieces and scale shall be scrapped off and holes filled with mortar.

Application of white wash:

On the surface so prepared the white wash shall be laid with brush. The first coat shall be from top downwards, and similarly second coat shall be from the right to the left or to right. Each coat must be allowed to dry before the laid it shall present smooth and uniform finish free from brush marks and it should not come off easily when rubbed with finger.

Splashing and dropping, if any, on the doors, windows, ventilators etc. shall be removed and the surface cleaned.

Colour Wash:

Colour wash shall be prepared by adding necessary approved colour matter of the white wash which has been strained and prepared as above. Other provisions as mentioned in white wash shall apply for colour wash.

C-39/A Constructing Cooking Platform: (Kitchen, Pantry, Services etc.)

The code covers constructing platform for kitchen service meant for other similar work purpose.

The cooking platform shall have following components.

(a) Raised Masonry platform of specified height and width as required:

The vertical face of masonry shall be covered with 12mm thick plaster. The top surface work, cement plaster and I.P.S. specified thickness. The masonry work, cement plaster and I.P.S. shall be as per C-9, C-31 & C-17 respectively of this code of practice.

(b) Partition wall:

Hall brick partition wall duly plastered on the faces as per detailed drawings or as directed by the Engineer-in-charge shall be carried out as per C-12 and C-31 of code of practice.

(c) Cooking Platform Proper:

This shall be of R.C.C. slab topped with Double polished Telephone black Granite Stone with exposed machine cut edges. The size of various components and kind of stone shall be as specified as per detailed drawings or as directed by the Engineer-in-charge.

The work of cement concrete and reinforcement for 75mm thick slab shall be executed as per C-4, C-6 and C-7 of code of practice.

The vertical exposed face of the slab shall also be veneered with matching stone. The top of the slab shall

be suitably slopped towards sink as directed. The veneering shall be provided such that the edge of the veneering shall not be less than 10 mm above the finished surface of the platform.

C-40/A Application of Anti Termite Treatment:

The purpose of providing the treatment is to create a chemical barrier between the ground from where the termites come and wood work cellulose material and other components of building, which may form food for the termite. The treatment is expected to provide complete chemical barrier all around, which will prevent the termite from reaching the super structure of the building and its contents, it may, therefore be understood clearly and distinctly that this is a very important treatment is to be given to the building and therefore has to be carried out through specialized firms only having established reputation and reputed past performance. The name of such specialized firms shall have to be got approved from the Engineer-in-charge. Use of chemical and method of treatment shall be as detailed below:

(1) Chemical and Preparation:

- (a)** The chemicals used for soil treatment shall be any one or a combination of the following with the concentration shown against each in emulsion:

Chemicals	Concentration
Aldrin	0.51% (by weight)
Chlordane	1.0%
Dieldrin	0.5%
Heptachlor	0.5%

- (b)** The dilution guide for preparing the emulsions is given below:

Emulsion liters				
Aldrin 30 EC	Dieldrin 18 EC	Chlordane 75 BC	Heptachlor 29 EC	20 EC
1267	2280	1000	500	2500

(2) Treatment of column pits, wall, trenches & basement excavation:

The bottom surface and (up to a height of 300mm from the bottom) of the excavation made for column pits, trenches, and basements shall be treated with the chemical emulsion mentioned above at 5 lit. As per sq.mtr of surface area.

(3) Treatment to backfill earth:

After the column foundation, wall foundation, and retaining walls of the basement come up the backfill in immediate contact with the foundation structure shall be treated with the chemical emulsion at the rate of 15 lit. Per sq.m. of the vertical surface of the structure for each side. The selected earth is to be refilled in layers and the treatment shall be carried out in similar stage. Chemical emulsion shall be directed towards the concrete or masonry surface of the columns and walls so that the earth in contact with this surface is well treated with the chemical.

(4) Treatment of top surface of plinth filling:

After the earth filling is completed with plinth area and before dry sand packing of sub grade is laid, the entire surface of the filled earth shall be treated with chemical emulsion at 5 lit. per sq.m.

Light rodding of the surface may be carried out to facilitate proper absorption of the emulsion.

(5) Treatment at junction of walls and floor:

Special care shall be taken to establish continuity the vertical chemical barrier on inner wall surface from the ground level (where it has stopped with the treatment described in 3 above) up to the level of the filled earth surface. To achieve this a small channel 3x3 cm shall be made at all the junctions of wall and columns with the floor (Before laying the sub-grade) and rod holes made in the channel up to the ground level 15 cm apart and the rod moved backward and forward to break up the earth and chemical emulsion poured along the channel at the rate of 45 lit. per sq.m. of the area of the vertical surface of the sub- structure so as to soak the soil right to the bottom. The soil should be tempted back into place after this operation.

- (6) When the building is completed in all respects or when the plinth protection work is commenced. Whichever is earlier, the earth around the external perimeter of the building up to a depth of 30 cm. shall be finally treated at the rate of 4.5 liters per running meter of the plinth wall. To facilitate this treatment, solid M.S. rods should be driven into the soil as close as possible to the plinth wall at intervals of 15 cm. and up to a depth of 30 cm. and the rods moved backward and forward in a direction parallel to the wall to break up the earth so that the chemical emulsion mixes immediately with the soil.

(7) Treatment of soil surrounded pipes wastes and conduits:

When the pipes wet and conduits enter inside the area of the foundation, the soil surrounding the point of entry must be loose around in such pipe, waste of conduit for a distance of 15 cm. and up to a depth of 7.50 cm. before treatment is commenced. When they enter the soil external to the foundation, they shall be similar treated unless they stand clear of the walls of the building by about 7.5 cm. for a distance of over 30 cm.

(8) Spraying Equipment:

A pressure pump shall be used to carry out spraying operations to facilitate proper penetration of chemical into earth.

Guarantee of Anti-Termite Treatment:

The treatment against termite infestation shall remain fully effective for a period of not less than ten years from the date of issue of the final certificate of completion of the work. If at any time during this period, any defect in any part of the building or structure is noticed, the contractor shall have to rectify defects within fifteen days of receipt of the notice from Engineer-in-charge. On the contractor's failure to do so the Engineer-in-charge may get the same rectified through any other agency at the contractor's risk and cost and the decision of the Engineer-in-charge as the cost payable by the contractor for the same shall be final and binding to the contractor.

A guarantee bond on appropriately stamped papers shall be given by the contractor to the department in the manner and form as prescribed below:

Form of Guarantee Bond:

I/We (contractor) hereby guarantee that the work will remain unexpected and will not be in any way damaged by white ant or any other germs of similar types for a period of 10 (ten) years after completion of the work of anti-termite treatment as per terms and condition of the contract and the contractor hereby identifies and agree to save harmless and GIDC from any loss and /or damage that might be caused on account of white ant and/or other similar type of germs and hereby guarantees to make good and loss or damages suffered by GIDC and further guarantees to redo the defective work without claiming any extra cost.

This guarantee shall remain in force for the period of 10 years from the completion of the work under the

contract and it shall remain binding the contractor for the said period of 10 (ten) years.

The deposit at the rate of 5% of the cost of this item from the running and final bill shall be recovered and shall be refunded only after the completion of the guarantee period.

C-41/A Laying and fixing Galvanized Iron Pipes with fittings:

The trench of laying the pipes shall be excavated true to lines and levels as shown on the plans or as directed by the Engineer-in-charge. The bed of the trench shall be made even. Unless otherwise specified as instructed by the Engineer-in-charge. The trenches shall be excavated 30 cms. Wide and not less than 45 cms. Deep. All pipes, water mains, cables etc. met in the excavation shall be carefully protected and supported. Any damages done shall be made good by the contractor at his own cost. The refilling work in the trenches shall be done in layers and shall be properly rammed except at joints. The refilling at joints shall be done after satisfactory testing of joints and on approval of the Engineer-in-charge. Suitable additional filling shall be done to account for subsequent settlement. Any surplus excavated stuff shall be disposed off as directed.

Laying & Fixing:

The completed lay out of the water supply system of the building shall be got approved from the Engineer-in-charge. The pipes shall be laid plumb, and in straight and parallel lines unless directed otherwise.

In making the joints few turns of line hemp smeared with white zinc shall be taken over the threaded end of the pipes and the socket shall be fastened with a pipe wrench. When the pipe is to be fixed clear to the walls, it shall be fixed with standard brackets or clips held by wooden blocks. The supporting brackets clips etc. for the pipes shall be spaced at an interval of 1 mtr. Or as directed.

Whenever such pipe is to be taken through wall or slab, suitable square hole shall be driven in the wall or slab carefully without damaging the reinforcement or slab. After the pipe is laid, the hole shall be made good with cement concrete and cement mortar. Finishing shall be done similar to wall and slab finishing.

Painting:

The pipes laid underground shall be painted with one coat of hot asphalt.

Testing:

On completion of laying the pipe line shall be tested for any leakage at the joints. The defects if any revealed after test shall be remedied to the satisfaction of the Engineer-in-charge.

C-42/A Fixing Wash basin:

The code covers fulfilling of wash basin including assembling and fixing brass chromium plated pillar cock, cast iron cantilever brackets, rubber plug, chromium plated brass chain, chromium plated brass stop cock, chromium plated brass waste coupling 32mm diameter, P.V.C. bottle trap, P.V.C. connection etc.

The wash basin shall be fixed on the wall at the location and level as shown on the detail drawing or as directed by the Engineer-in-charge. The wash basin shall be supported on brackets fixed to the wall with wooden cleats and screws. The size of the brackets shall be as per detailed drawings or as directed by the Engineer-in-charge. The brackets shall be securely fixed to the wall and the basin fixed on the brackets.

The PVC bottle trap and union shall be fixed in the hole waste kept at the bottom of wash basin. It shall be ensured that the joints are water tight. This bottle trap shall be then coupled with the waste water pipe.

The waste pipe of required length shall run through the wall. If holes are not left in the wall, they shall be cut and the chase surrounding the pipe made good after fixing the pipe.

C.P. brass stop cock of required size shall be fixed in the supply line. PVC flexible pipe of required diameter shall be provided for supply of water from stopcock to pillar cock. The joints of PVC connections shall be

made water tight. The pillar cock shall be fixed on the hole provided in the wash basin. Chain and rubber plug shall be fixed in the hole provided in the wash basin.

The exposed pipe & CI brackets shall be painted with one coat of red lead and three coats of approved oil paints as per C-15 of this code.

The wash basin shall be with one tap hole unless otherwise specified in the item or as directed by the Engineer-in-charge and the case when the tap holes are more than one, equivalent number of taps and allied provisions shall be provided & appropriately connected as directed by the Engineer-in-charge.

C-43/A Fixing Indian Type Water Closet:

(a) W.C. pan:

The water closet pan shall be fixed into the place indicated on the drawing or as directed by the Engineer. The vent and soil pipe shall run through the holes left in wall and the wall made good. If holes not left in the wall, they shall be cut and the cavity surroundings the pipe made good properly after fixing the pipes. The pan shall be placed into position with the trap jointed in cement mortar 1:1 and the connecting pipes duly connected including the flush pipes from the flush cock. The jointing of cast iron pipes with the trap shall be with 1:1 cement mortar as directed.

Brick bat cement concrete 1.5:10 shall be cast and pressed around the embedded surface of the pan fittings and pipes to get a solid embedment without any hollows. The whole are for W.C. shall be provided with 1.5:10 blocks bat cement concrete. The pan shall be fixed at slightly lower level than the floor level of the general flooring which should slope on side towards the pan. The pan shall be fixed such that its top glazed ring around under the surrounding flooring shall be in the same level. After the flooring is completed the rectangular foot rests shall be fixed in cement mortar 1:1

C-44/A Fixing Orissa Type Water Closet Pan:

The work shall be carried out as per C -41 of the code of practice except that the Orissa type water closet pan shall be provided instead of Indian type water closet pan and that the separate foot rests are not provided.

C-45/A Fixing European Type Water Closet:

The European type water closet pan and the low-level flushing tank shall be fixed at the places indicated on drawing of as directed by the Engineer-in-charge. The vent and soil pipe shall run through the holes left in the wall and floor. If the holes are not left in wall and floor, they will be cut. The cavity surrounding the pipes shall be made good properly after fixing the pipe. The pan shall be fixed into the position in cement mortar 1:1 (1-cement: 1-sand) with connecting pipe duly connected including flush pipe from the cistern. The joints at the lid then shall be fixed to the pan with chromium plated hinges. The brackets shall be painted with white enamel paint.

C-46/A Fixing of urinal:

This code includes fixing of floor mounted wall type urinal necessary spreader arrangement chromium plated pipe connection with stop cock and C.P. brass tap etc. The wall urinal shall be fixed on to the wall as per the detailed drawing or as directed by the Engineer-in-charge in mortar. The floor slab in not shall be suitably sunk to receive the wall urinal. Where the floor slab is not sunk, the wall urinal shall be provided over platform. The lip of the wall urinal shall be flushed with the finished plan level adjacent to it. The wall urinal shall be laid over a fine sand cushion of average 25mm thickness. A space of not less than 3 mm shall be provided all around in front and side and filled with water proofing compound of approved quality.

The C.P. brass trap shall be fixed as directed by the Engineer-in-charge and the trap shall be connected with necessary C.I. waste pipe, the waste pipe shall run through the wall or outside of the wall if necessary.

C.P. brass stop cock of specified diameter shall be provided as shown in the detailed drawing or as directed by the Engineer-in-charge. Chromium plated flushing pipe of specified diameter and length shall be provided and fixed with the stop cock and spreading arrangement.

Spreading arrangement shall be made by providing a spreader nozzle at the end of flushing pipe.

C-47/A Fixing Nahni Trap:

The Nahni trap with bend and pipe price up to the outside face of the wall and grating as specified shall be fixed as per drawing or instruction of the Engineer-in-charge. The joints shall be sealed with cement mortar.

The hole shall be kept in the floor and masonry if not left and the same be made good properly after the nahni trap and pipe are fixed. The nahni trap in the white glazed tiles flooring shall be positioned that its grating shall replace only one tile.

C-48/A Fixing of Gully Trap:

The gully trap shall be set into 1:4:8 cement concrete extending 300 mm beyond the trap on three sides over which shall be constructed one brick masonry chamber of the dimensions indicated on the drawings or as directed by the Engineer-in-charge. The building wall will be the fourth side. The brick masonry shall be constructed in cement mortar 1:3. The inside shall be plastered with cement mortar 1:3. The top lid of pre-cast concrete cover of 40mm thickness of required size shall be provided on the chamber as directed. The trap in the chamber shall have cast iron grating.

C-49/A Fixing Cast Iron Pipes:

The code covers fixing of pipes on walls, filling joints with cement mortar 1:1. Cast iron pipe shall be secured to the face of wall at all joints by standard holder bat clamp.

The bat clamps shall consist of a cast iron base with a projecting shaped lug, to the web of which the 2 semicircular halves of the flat iron clamps are bolted. The base of the holder bat clamps shall be screwed on a pair of wooden plugs fixed in the wall with wood screws driven through the holes in the base. The screws shall be not less than 75mm long for 80mm diameter pipe and 100 mm long for 100 mm dia pipe. The plugs shall be fixed in the wall to depth of 150mm in cement mortar 1:2 (1-cement: 2- fine sand) centrally to the holes in the base in the base of the bat clamps and with the front face projecting to such a length from the brick face that when the bat clamps are fixed the outer face of its base shall be flush with the plaster face of wall. The plugs shall be 110 mm x 50 mm wide at face increasing to 160mm x 70mm wide at rear and shall be 70 mm deep throughout.

Laying of pipe & specials:

The pipes before being laid, shall be examined to see that there are no cracks or defects. Care shall be taken to clean the pipes inside of the socket and outside of the spigot. Spigot of the upper pipe shall be properly fitted in the socket of the lower pipe. The depth of the annular space between socket and spigot shall be filled in with cement mortar 1:1. The joints shall be finished smooth and shall be flush with the top ring or the socket.

The joints of the horizontal pipes running below flooring shall also be filled with cement mortar 1:1. The joints ends of the pipe coming out of the wall shall be provided with required specials, such as Tees, "Y" bends etc. with or without inspection eyes as required and all the joints shall be filled with cement mortar 1:1 as above.

The pipe lines shall be truly vertical or to lines and slopping as directed and shall be at a uniform distance of 20mm from the finished face of the wall.

C-50/A Fixing Asbestos Cement pipes:

The provision made in C-48 of code of practice shall be followed in this case also excepting the following changes:

- (1) Instead of cast iron pipes, this code provides for fixing of asbestos cement pipes.
- (2) The joints shall be filled in with stiff cement mortar 1:1 (1-cement: 1- fine sand) instead of lead joints.
- (3) The joints shall be finished smooth at top at an angel of 45 degree sloped up with cement mortar and will be cured for period of 7 days by tying piece of gunny bags to the joints keeping it wet.

C-51/A Laying & stoneware pipe:

Excavation:

The trench shall be excavated to the exact grading and 450mm wide or as directed by the Engineer-in-charge. The bottom of the trench shall be trimmed off to present a plane surface and excavation below joints shall be taken sufficiently deep so as to accommodate the socket of pipe and all irregularities shall be removed.

Laying:

Before laying the pipes, all pipes and fittings shall be inspected and shall be rung with a light hammer to detect cracks. The pipe shall then be laid in trench to the alignment, levels and gradients as shown. The spigot end of one pipe shall be centered in the socket and of other pipe with socket up the gradient. The cutting of pipe for inseting fit or close pipe shall be done in neat and workmanship like manner.

Jointing of pipe:

The stoneware pipe shall be jointed with cement mortar 1:1 (1-cement: 1- sand). The jointing shall be done as follows:

In each joint spun yarn socked in a neat cement slurry shall be passed round the joint and inserted init by means of a caulking tool. Yarn so rammed as shall not occupy more than $\frac{1}{4}$ the of the depth of socket. Cement mortar 1:1 (1-cement: 1-sand) prepared as per M-11 of specification of materials. The mortar shall be slightly moistened and shall be inserted by hand into remaining space of the joint after yarn. The mortar shall then be caulked into the jointed with a caulking tool. More cement mortar shall be added until the space of the joint has been completely filled with tightly.

The joint shall then be finished off neatly outside the socket at angle of 45 degree.

Curing:

The cement mortar joint shall be cured for seven days.

Testing:

The pipe line shall be tested for leakage before refilling of the trenches etc.

Back Filling:

After satisfactory testing the trenches shall be back filled as per C-53 of code of practice.

C-52/A Constructing Inspection Chamber:

This code covers excavation for foundation, laying of cement concrete bedding brick masonry wall with cement plaster on inside surface, cement concrete, benching (channel) fixing of inspection chamber frame and cover R.C.C. slab etc.

The inspection chamber shall be of size as specified in the item or as shown on the drawing or as directed by the Engineer. The various components shall be executed as detailed below.

Excavation:

The excavation shall be done as per C-1 of code of practice or as directed by the Engineer-in-charge so as

to have at least 150mm offset from outside face of the brick masonry.

Cement concrete:

The bedding of 150mm thick cement concrete shall be done as per C-2 of code of practice.

Brick masonry:

One thick brick masonry wall in cement mortar 1:6 shall be done as per C-10 of code of practice.

Benching:

Plain cement concrete for benching (channel) of required thickness shall be done as per C-17 of code of practice.

Cement plaster:

Cement plaster work shall be carried out as per C-31 of code of practice, cast iron frame shall be fixed in the slab and then concrete shall be cast. Concrete work shall be finished with cement mortar 1:3 (1-cement: 3 sand)

Pre-cast RCC slab with C.I. manhole cover & Frame:

C.I. manhole cover shall be placed into the CI frame fixed in the slab. It shall be painted with one coat of red lead paint and two coats of black oil paint.

Cement plaster:

Cement plaster work shall be carried out as per C-31 of code of practice. Cast iron frame shall be fixed in the slab and then concrete shall be cast. Concrete work shall be finished with cement mortar 1:4 (1-cement: 4- sand).

C-53/A Filling in plinth with selected materials:

The code provides for filling in plinth with selected materials lying and layers of uniform thickness, watering ramming etc.

The ground over which the filling is to be done shall be cleared of all grass, loose stones, rubbish of all kind as well as trees, roots of trees etc.

The approved selected materials shall be cleared of all rubbish; larger size stones etc clods broken down to a size of 59mm or less and conveyed to site of work of filling. The material shall be laid and layers of about 200mm as directed by the Engineer-in-charge. Each layer shall be watered and compacted with heavy hammers before the upper layer is laid till the final level is reached so as to form a thoroughly compacted base.

The process of filling in plinth, watering and compaction shall be carried out in such a way as not be endanger the foundation, columns, plinth, walls etc. already built up. Under no circumstances, black cotton soil shall be used for filling the plinth.

C-54/A Fixing of Steel Rolling Shutters:

Fixing of rolling shutter shall be done in a workmanship like manner so that the operation of the shutter is easy and smooth. The hold fast shall be embedded in CC 1:2:4 (1-cement: 2- coarse sand: 4- graded stone) aggregate 20mm nominal size and shall be properly fixed with 100mm long catch bolts of 10mm. All the works disturbed or cut away shall be made good.

The guide channels, shall be attached to the jams in plumb and true either in the over lapping fashion, projection fashion or embedded in grooves, depending on the method of fixing.

The bracket plate shall be fitted at the centre. A "U" shape cast iron or mild steel clamp riveted or welded to it. Since the bracket plate carries the full load of the shutter it should have sufficient cross-sectional area to resist the force and it shall be held in position rigidly by means of suitable foundation bolts. When the

bracket is to fix on concrete the angle is suitable bent and fixed to the concrete beam of lintel with anchor bolts of at least 16x75 mm size. The pipes of the suspension shaft which are crimped to the bracket shall be fitted with rotted cast iron pulleys to which the curtain is attached. The pulleys and the pipe shaft be connected by means of pretension helical spring to counter balance the weight of the curtain and to keep the shutter in equilibrium in any partly opened position.

The hood cover shall be fixed to the bracket plate by means of angle cleats and supported at the top at suitable intervals for preventing sagging.

Rolling shutter shall be painted with two coats of approved oil paints of approved shades on anti-corrosive paint as directed by Engineer-in-charge.

C-55/A Fixing of Urinal:

The fixing of flat back lip type urinal a wall include of PVC connection with stop cock and waste pipe etc.

Urinal shall be fixed on the wall as per the detailed drawing or as directed by Engineer-in-charge. Urinal shall be fixed to the wall wooden putty previously embedded in walls and screw of suitable size.

The C.P. brass stop cock shall be fixed as directed by the Engineer-in-charge and PVC connection of suitable length be provided and connected with G.I. pipe of water supply. PVC reducer shall be connected with PVC waste of specified size and fixed on wall properly with CI clamp, screw etc. The waste pipe run through the wall of outside of the wall as per instruction of Engineer-in-charge.

After fixing of urinal all the floor and wall shall be made good to the satisfaction of the Engineer-in-charge.

Fixing of remaining procedure shall be reversed.

C-56/A Fixing of Windows / Ventilators:

Fixing of window and ventilators shall be done workmanship like manner. The hold fast shall be embedded in CC 1:2:4 of size 10 cm x 10 cm x 10 cm (1 cement: 2 coarse sand: 4 graded stone aggregate 20mm nominal size)

The window frame shall be erected in position and held plumb with strong support from both sides and built in masonry as it is being built.

The glass paneling shall be carried out as per C-14 of Code of Practice or as directed and oil painting shall be carried out as per C-15 of Code of Practice.

All fixtures and fastening shall be fixed with appropriate screws in sound and efficient manner to ensure case of operation. They shall be appropriately positioned and shall be truly horizontal or vertical as required.

Oil painting shall be carried out with one coat of primer and 2 coats of approved oil paints of approved shade and shall conform to C-15 of Code of practice.

C-57/A Fixing of Door frame:

Fixing of door frame shall be done in workmanship like manner. The hold fast shall be embedded in CC 1:2:4 of the size 10 cm x 10 cm x 15 cm (1- cement: 2 coarse sands: 4 graded stone aggregate 20mm nominal size).

The door frame shall be erected in position and held plumb with strong support from both sides and built in masonry as it is being built.

The shutter shall be prepared as per the detail drawing and shall conform to C-13 of Code of practice or as directed.

Timber/PVC/Aluminum paneling shall be carried out as per C-13 of Code of practice or as directed.

All fixtures and fastening shall be fixed with appropriate screws. Nos. of fixtures and fastening shall be

provided as per C.

Oil painting shall be carried out with one coat of primer and 2 coats of approved oil paints of approved shade and shall conform to C-15 of Code of practice.

C-58/A Construction of Rubble Uncoursed Stone Masonry:

Pucca approved stone of approved size for un-coursed rubble masonry shall be collected on site. The rubble shall be laid on broad faces. Earthy or dis-coloured weathered or weatherworn stone shall not be used.

The length of the stone shall not exceed three times the height and the breadth on base shall not be greater than three fourths of the thickness of wall nor less than 15 cm. The height of stone for rubble masonry may be up to 30 cm.

Stone shall be hammer-dressed on the face, the sides and the beds to enable it to come in proximity with the neighboring stone. The bushing on the face shall not be more than 40 mm on an exposed face.

Chips and spalls of stones shall be used wherever necessary to avoid thick mortar beds or joints and it shall be ensured that no hollow spaces are left anywhere in the masonry. The chips shall not be used below hearting stones to bring these upon level of face stones. The use of chips shall be restricted to the filling of interstices between the adjacent stones in hearing and these shall not exceed 20 percent of the quantity of a stone masonry.

The hearting or interior filling of a wall face shall consist of rubble stone not less than 150mm in any direction carefully laid hammered down with a wooden mallet in the position and solidly bedded in mortar. Treating should be laid nearly with facing and backing.

Though bond stones shall be provided in the walls up to 60 cm. thick, in case of highly absorbent type of stone (Limestone or sand stones) the bond stone shall extend about 2/3 in the wall. Each bond stone shall be provided for every 0.5 m² of the wall surface.

Quoin stone shall not be less than 0.03 m³ in volume.

The plum stone at about 90 cm. interval shall be provided.

The masonry shall be laid with or without courses as the case may be as per general requirement. The quoins shall be laid header and stretcher alternatively. Every stone shall be carefully fitted to the adjacent stone so as to form neat and close joint. Face stone shall be extended and bond well in the back. These shall be arranged to break joints as much as possible and to avoid long vertical lines of joints.

The cement mortar or proportion as specified in the item shall be spread over width and the stone shall be well embedded in it. Joints in the surface shall be carried out in line level plum and of dimensions as mentioned in the drawing. The stone shall be used only after spreading plenty of water over it. No side filling shall be done without obtaining permission of Engineer-in-charge. The work shall be kept wet at least fourteen days.

C-59/A Filling of plinth with selected sand:

The code provides, for filling in plinth with sand of approved quality, laying in layers of uniform thickness, watering ramming etc. The ground over which the filling is to be done shall be cleared of all grass, loose stones, rubbish of all kind, as well as trees, roots of trees etc. The approved quality of sand shall be cleared of all rubbish and shall be conveyed to site of work of filling the sand shall be laid in layers, of about 200mm as directed by the Engineer-in-charge. Each layer shall be watered and compacted with heavy rammer before of the upper layers is laid, till the final level is reached, so as to form a thoroughly compacted base.

The process of filling in plinth, watering and compaction shall be carried out in such a way as not to endanger the foundation columns, plinth walls etc. already built up.

C-60/A Application of Water proofing cement paint:

The surfaces shall be thoroughly wetted with clean water before cement water proofing paint is applied. Cement paint shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufacturer's instruction shall be followed. The paint shall be mixed in such quantities as can use of within an hour of mixing as otherwise the mixture will set and thickness, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use. To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket. For undecorated surface, the surface shall be treated with minimum two coats of water proof cement paint. Not less than 20 hours, shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used if hot dry weather, the preceding coat shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficient hard to resist the marking by the brush being used. In hot dry weather, the preceding coat slightly moistened before applying the subsequent coat. The finish surface shall be even a uniform in shade, without patches, brush marks, paint drops etc. The cement paint shall be applied with a brush with relatively short stiff hob or fiber bristles. The paint shall be brushed in uniform thickness and shall be free from excess heavy brush mark. The lamps shall be well brushed out. The water proofing cement paint shall not be applied on surface already treated with white wash, colour wash, distemper, dry or oil bound varnishes paint etc. It shall not be applied on gypsum, wood and metal surface. Painted surface shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damage by the sprinkling of water say about 12 hours after the application.

C-61/A Construction of bela or block in course rough dressed stone masonry:

The work shall be carried out with pucca approved white stone bela of uniform size and well dressed. Earthly or discolored, weathered or water worm stone shall not be used. The size of bela stone to suit the width of wall, shall be as directed by the Engineer. The corner stones and quoins shall be of good quality stones dressed to correct angle.

The cement mortar of proportion specified in the item shall be spread for full width of wall. The stone shall be placed in it. Joint in the surface shall be flushed or raked out 20mm deep during construction as directed by Engineer. The work shall be carried out, in line, level, and plumb & of the dimensions as mentioned in the drawing. The stones shall be used only after spreading, plenty of water over it. The work shall be kept wet for at least 14 days. The scaffolding shall be provided as per C-9 of code of practice.

C-62/A Application of plastic emulsion paint:

The work of preparing the surface shall be carried out as per C-36.

The scaffolding work shall be carried out as per the C-9.

Preparation of mix:

This shall be done as per the Manufacturer's instruction. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per Manufacturer's instruction or as directed by the Engineer.

Application:

Before putting into small containers for use, the paint shall be stirred thoroughly in its container. When applying also, the paint shall be continuous stirred in the small container, so that its consistency is kept uniform.

The paint shall be laid on evenly and smoothly by means of crossing and laying of the crossing and laying

of consist of covering the area over with paint, brush the surface hard for the first time over and then brushing alternately in opposite direction two or three times and then, finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying of is finished. No hair marks from the brush clogging of paint puddles in the corner of panels, angle of moldings etc. shall be left on the work. The full process of crossing and lying off will constitute one coat.

The paint shall be applied with brush or rollers. For undercoated surface, the surface shall be treated with minimum two coats of cement water proofing paint. The second or substitute coat shall not be started until the preceding has before sufficiently hard to resist marking by brush being used.

The surface on finishing shall present a flat velvety smooth finish. It shall be even a uniform in shade without patches, brush marks, paint drops etc.

Precautions:

Old brushes, if they are to be used with emulsion paints, shall be completely dried of turpentine oil paint by washing in warm soap water.

Brushes shall be quickly washed in water immediately after use and kept emerged in water during break period to prevent the paint from hardening of the brush.

In the preparation of wall for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes, etc.

Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.

The washing of surface treated with emulsion paint shall not be done within 3 to 4 weeks of application.

C-63/A Fixing of Asbestos cement corrugated sheet roofing:

Fixing accessories such as J-bolts, L-bolts, roof washers etc. shall conform to IS – 730-1956.

The sheet shall be laid with a side lap of half corrugation. For normal roof pitches (that is inclinations greater than or equal to 18). The end laps in sheet shall not be less than 150mm. For law roof pitches (that is inclinations less than 18) or for normal pitched on roof exposed positions the end laps shall be increased.

The side lap shall as far as possible be sheltered from the prevailing wind direction. The free over-hang at caves measured as the length of sheet from its lower edge to the center of bolt holes shall not be more than 300mm for 6mm thick and 400mm for 7mm thick sheets.

Wherever four corners of sheets overlap to of them shall be mitred in order to secure a perfect fit.

All A.C. sheets shall be stored and protected from any damage.

No persons other than workman employed shall be permitted access to any area over which the sheeting is being laid.

Ridge purlins shall be fixed with suitable type of bolt 75mm to 115mm from the apex of the roof.

Sheets shall be cut as necessary with a wood saw. Holes in the sheets shall be drilled, they shall on no account be punched. The holes for fixing shall be 2mm larger than the diameter of the fixing bolts, and shall always be drilled through the crown of the corrugation and not on the valleys. No hole shall be nearer the 40mm to any edge of a sheet or an accessory.

Galvanized iron J-type hook bolts or cranked hook bolts, and nuts bearing on galvanized iron washers and bitumen washers shall be used for fixing sheets on angle iron purling.

It is essential that the bolts holes are made water tight by the use of bituminous felt washers in conjunction with suitable galvanized iron washers.

The length of bolts shall be 75mm longer than the depth of the purling for single sheet fixing and 90mm longer than the depth purling where two sheets overlap or where ridges or other accessories are to be

fixed with the sheet. The number and length of bolts and number of bitumen and galvanized iron washers for fixing asbestos cement corrugated sheet shall be as given in table below.

Number and Length of Bolts and Number of Bituminous Felt and galvanized iron washers.

Sr.No	Situation	No. of Bolts and Bituminous washers and Galvanized Iron washer.	Length of bolts.
i	At horizontal (end) laps of sheets at eves when filler pieces are used. At rigid non-corrugated sheets and ridge pcs. Are secured by the same bolts.	Twice the number of sheets in one horizontal course	Depth of purling plus 90mm
ii	At eves when filler pieces are not used at ridge when corrugated sheet and ridge pieces are not secured by the same bolt.	Twice the number of sheets in one horizontal course	Depth of purling plus 75mm
iii	At intermediate purling where horizontal laps do not occur.	Twice the number of sheets in one horizontal course	Depth of purling plus 75mm.

Asbestos cement corrugated sheets shall be laid starting at the caves, either from left to right or from right to left depending upon the prevailing direction of the wind. If laid from left to right, the first sheet shall be laid uncut, but the remaining sheets in this bottom row shall have the top left-hand corners cut or mitred. The sheet in the second and other intermediate rows shall have the bottom right-hand corner of the first sheet cut all other sheets except the last sheet shall have both the bottom right-hand corner and top left hand corner cut; the last sheet shall have only the top left hand corner cut. The last or the top, row sheets shall have the bottom right-hand corner cut with the exception of the last sheets which shall be laid uncut. If the sheets are laid from right to left the first sheet shall be laid uncut and the remaining procedure shall be reversed.

C-64/A Structural steel work

All steel shall be tested and Indian approved manufacturers. One sample would with exact dimensions of all the members of the truss shall be got approved by the Engineer before erecting and fixing the same. Welding shall be properly done to the exact length and shall be got approved by the Engineer and welding shall conform to IS – 816-1956 or as revised from time to time. This item including providing, supplying, fabricating and erecting the same in proper position.

The entire steel surface shall be made clear and free from rust, scales, dust etc. before painting. All the steel work shall be painted with one coat of anti-corrosive paint and two coats of approved enamel paint and shade complete as directed.

There shall be no holes left after welding. The welding shall be carried out by welders, well experienced in the job and possessing certificate. The cutting should be smooth and the steel shall be made perfectly straight as required. The bolts, nuts, washers, etc. used shall be of best approved quality. After welding is done the welding surface shall be made clear by removing all the flux by cheeping hammer wire brush.

The entire steel structure after erection shall be in perfect line and level and plumb and shall structure after erection shall be in perfect in line and level and plumb and shall be approved by the Engineer-in-charge before the sheeting work is started.

Signature of contractor

**Executive Engineer
GIDC, Vapi.**

LIST OF INDIAN STANDARDS

No.	I.S. No.	I.S. Particulars
1.	I.S. 287	Recommendations for maximum permissible moisture Content of timber
2.	I.S. 401	Code of practice for preservation of timber.
3.	I.S. 851	Specification for synthetic resin adhesives for construction Work in wood.
4.	I.S. 1141	Code of practice for seasoning of timber
5.	I.S. 1200 (Part-XXI)	Method of measurement of building and civil engineering Works. (Wood work and joinery)
6.	I.S. 1708	Method of testing of small clear specimens of timber
7.	I.S. 7196	Specification for hold fast.
8.	I.S.204 (Part – I)	Specification for tower bolts (ferrous metal)
9.	I.S. 204 (Part – II)	Specification for tower bolt (nonferrous metal)
10.	I.S. 208	Specification for door handles
11.	I.S. 723	Specification for steel c o u n t e r s u n k head wire Nails.
12.	I.S. 848	Specification for synthetic resign adhesives for plywood
13.	I.S. 1200 (Part-XXI)	Method of measurement of building and civil Engineering works. (Wood work and joinery)
14.	I.S.1341	Specification for steel butt hinges.
15.	I.S.1659	Specification for block boards.
16.	I.S.1734	Method of test for plywood.
17.	I.S.2202	Specification for wooden flush door shutters. (Solid core type).
18.	I.S.2209 (P-I)	Specification for mortise lock of timber.
19.	I.S.3564	Specification for door closers.
20.	I.S.4992	Specification for door handles for mortise lock.
21.	I.S.6760	Specification for slotted counter sunk head wood Screws.

LIST OF APPROVED MAKES/BARNDs

The following are approved brand makes/manufacture's makes listed below. In case it is established that material as listed below is not available in market, approved equivalent material and finished of any other specialized brand names/ manufacturer's makes may be used as per approval of architect/client/PMC.

Material tests: material tests as required by the engineer, if any shall be carried out by the contractor from the approved laboratories and the tests reports shall be submitted in the required formats before used of such materials. The engineer shall have right to reject any materials or work, if he finds that the quality of material used/intended to be used and work are not satisfactory. The contractor shall make good such defective material or the works at his own cost (within the contract price) and without causing any delay to the completion time as specified in the TENDER. Before placing order, contractor shall get approval of sample from architect/client/PMC.

RECOMMENDED BRANDS/ MANUFACTURES OF CIVIL ITEMS

Note: If any item make is not mention in tender, then contractor has to approve the make from GIDC authority /Architect.

MATERIAL	APPROVED MAKE / MANUFACTURER
Ordinary Portland Cement	Ultratech, Ambuja,Birla or any other brand as selected by authority.
White Cement	Birla, J.K. or any other brand as selected by authority.
Epoxy coated TMT FE500D	Tata, Jindal, JSW, E.T or any other brand as selected by authority
Structural Rolled Steel sections- beams, Channels, tee, flats, angles, bars (Round, square, hexagonal, bright), etc	Tata, Jindal, JSW or any other brand as selected by authority.
Structural Rolled Steel sections	Tata, Jindal, JSW or any other brand as selected by authority
Structural Hollow Steel section	Tata, Jindal, JSW or any other brand as selected by authority
Structural tubular section	Tata, Jindal, JSW or any other brand as selected by authority
Stone rubbles and gravels	Sevalia, Vadagam, Ambakanta, Sayala or any other as selected by authority
Shuttering Plywood	Marino, Duro ,Green ,Century, Archidply, Monarch or any other brand as selected by authority
Commercial plywood	Marino, Duro ,Green ,Century, Archidply, Monarch or any other brand as selected by authority
Decorative Ply [veneer]	Marino, Duro ,Green ,Century, Archidply, Monarch or any other brand as selected by authority
Prelam particle board	Novapan, Bhutan .(exterior grade only), Archidply or any other brand as selected by authority
Laminate sheet	Formica , Greenlam, Alfaica, Decolam, Century, Durian, Silicon, Uro, Bloom or any other brand as selected by authority
Bison Panel [cement bonded particle board]	NCL Industries Ltd. / Swastik or any other brand as selected by authority
Flush door	Kitply, Anchor, Greenply, Monarch, Archidply, Century or any other brand as selected by authority
Pressed steel door frames/windows	NCL Industries Ltd. , AGEW steel manufacturer [pvt] ltd., Trigam , perfect. or any other brand as selected by authority
Locks	Godrej, Yale, Armour, Hettich, Atich, Dorma or any other brand as selected by authority
Float Glass	Modiguard, IAG, Triveni, Saint Gobain or any other brand as selected by authority

Mirror	Modiguard, IAG, Triveni, Saint Gobain or any other brand as selected by authority
M.S. rolling shutter	Sarvottam, Suryoday, Gandhi, Sagar or any other brand as selected by authority
Pre cast terrazzo tiles & skirting [mosaic]	Alcock, Nitco, Hindustan, Dinesh or any other brand as selected by authority
Polished Kota stone slab	From approved quarry & As per tender specification & sample approved by Architect & Client or any other brand as selected by authority
Polished Granite stone	From approved quarry & As per tender specification & sample approved by Architect & Client or any other brand as selected by authority
GVT Glazed Vitrified tiles	NITCO, KAJARIA, AGL or any other brand as selected by authority
Construction chemicals / concrete and mortar	Roffee, Fosroc, Pidlite / Samrock, Sika, STP or any other brand as selected by authority
Joint filler	GE silicon, Cibatul / Wecker, laticrete, Dr. Fixit, Nitco or any other brand as selected by authority
Pre coated Steel roofing / walling sheets	Tata blue scope Interarch, Nippon Dendro (poly steel) Meta color, JSW or any other brand as selected by authority
Paints	Asian, Nerolac, Bugger, Royal, or any other brand as selected by authority
Texture paint	Asian, Nerolac, Bueger, Royal or any other brand as selected by authority
Polish	MRF, ASIAN or any other brand as selected by authority
Hardware	EBCO, Royal, Hettich, Kitch, Gaze, Hafele, or any other brand as selected by authority
Adhesive	Fevicol, Araldite or any other brand as selected by authority
Floor spring [heavy duty]	Hitco, Efficient, Supreme, or any other brand as selected by authority
Floor spring	Ozone, Godrej, Hyper, Starling, Dorma or any other brand as selected by authority
Door closer	Godrej, Dorma, Yale or any other brand as selected by authority
Aluminum sections	Jindal, Hindalco, Banco or any other brand as selected by authority
UPVC window	Aluplast/Rehau/Wintech or any other brand as selected by authority
Bans park Stone	From approved quarry & As per tender specification & sample approved by Architect & Client
Rust Remover	Perma, Roff Rust Clear (Pidilite Industries), Dr. Fixit product or any other brand as selected by authority
Polymer bonding agent	Perma, Roff Bond Repair (Pidilite Industries), Dr. Fixit product or any other brand as selected by authority
Non-shrink grout	Perma, Roff Grout GP (Pidilite Industries), Dr. Fixit Product or any other brand as selected by authority
Super plasticizer for jacketing	Perma, Roff Plast 330 / Concrete Master, Dr. Fixit Product or any other brand as selected by authority
Rebar and Anchor Fasteners	Hilti or Fischer OR FOSROC or any other brand as selected by authority
Acrylic SBR base bonding agent	Perma, CICO, Dr. Fixit Product BASF, Pidilite or any other brand as selected by authority

Epoxy Bonding	Perma, RoffConcrete Bond (Pidilite), Dr. Fixit Product or any other brand as selected by authority
Anti-Termite Chemicals	Perma, Chloropyriphos/ Biflex TC / lindane/BayerCrop Science or any other brand as selected by authority
PVC Sleeve	Supreme / Astral / Prince / Truflo or any other brand as selected by authority
Expansion Board	Capcell HD Board or any other brand as selected by authority
CP Fixture	Jaquar / Kohler / American standard or any other brand as selected by authority
Sanitary wares	Jaquar / Kohler / American standard or any other brand as selected by authority
Water Proofing	Perma / BASf/ Fosroc / Sika or any other brand as selected by authority
Over deck Insulation	BASf/ Fosroc / Sika or any other brand as selected by authority
Tile Chemical	Perma, Bal, Laticrite, Kerakoll or any other brand as selected by authority
PVC spacer	BAL Endura / Kerakoll / BASF or any other brand as selected by authority
Self Levelling Chemicals	Perma / BASF / Cico / Sika or any other brand as selected by authority
Anti-bacterial Paint	Sikka/Liquid Plastic/SSK/Viessmann/artilin/BASF /Huntsman or any other brand as selected by authority
Galvalume roofing sheet	Jindal, Tata, JSW or any other brand as selected by authority
Pre coated Sheet	TATA, JSW, JinDAL or any other brand as selected by authority
Hardeners	'Ironite' , 'Ferrok' , 'Hardonate.' or any other brand as selected by authority
Wire Mesh	Sterling Enterprises, Trimuriti, Welded Mesh or any other brand as selected by authority
S S Railling	Kitch, gaze, Hafele, Fitwell or any other brand as selected by authority
Gypsum ceiling	SAINT GOBAIN-GYPROC, USG BORAL, KNAUFF or any other brand as selected by authority
Grid ceiling	AEROLITE, RAMCO, ARMSTRONG or any other brand as selected by authority
Shera plank ceiling	EVEREST, SHERA, ECP PRO or any other brand as selected by authority
Cement sheet ceiling	EVEREST, SHERA, ECP PRO or any other brand as selected by authority

ITEMWISE DETAIL SPECIFICATIONS

CIVIL WORK

DETAILED SPECIFICATION OF THE ITEMS OF WORK TO BE CARRIED OUT.

Item No. 1

Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle.

1. Clearing the site:

The site on which the structure is to be built shall be cleared and all obstructions, loose stone, materials and rubbish of all kind bush wood and trees shall be removed as directed.

2. Mode of Measurement:

The rate shall be for a unit of one Hectar.

Item No. 2

Excavation for foundation in Loose or soft soil up to 1.5 m. depth including sorting out and stacking of useful materials and disposing of the excavated stuff within GIDC Estate as directed by engineer in charge.

Item No. 3

Excavation for foundation in Loose or soft soil 1.5 m. to 3.0 m depth including sorting out and stacking of useful materials and disposing of the excavated stuff within GIDC Estate as directed by engineer in charge.

Item No. 4

Excavation for foundation in Dense or Hard soil 3.0 m. to 5.0 m depth including sorting out and stacking of useful materials and disposing of the excavated stuff within GIDC Estate as directed by engineer in charge.

General:

The excavation will generally refer to open excavation of trenches in wet or dry condition.

Clearing of sites:

The site on which the structure is to be laid and shown on plan and the area required for setting out and other operations shall be cleared and all obstructions, loose stones and materials, rubbish of all kinds, stumps, brushwood as well as trees shall be removed as directed. The roots shall be entirely grubbed up.

The products of the clearings to be stacked in such a place and in such a manner, as directed by the Engineer-in-charge.

All wood and materials from the clearing shall be the property of Board and shall be arranged as directed by the Board Engineer or his authorized agent, the materials pronounced as useful by the Engineer will be conveyed properly stacked as directed within the specified limit. Unless materials will be burnt or otherwise disposed of as directed.

Setting out:

The center lines of all types of structure etc. shall be given by the contractor for approval of the Engineer-

in-charge and it will be the responsibility of the contractor to install substantial reference marks, bench marks, etc. and maintain them as long as required true to line, level curve and slopes. The Contractor shall ensure full responsibility for alignment elevation and dimensions of each and all parts of the work. The labour, materials, etc. Required for setting out and establishing bench marks and other reference marks shall be arranged by the contractor at his own cost.

Excavation:

The excavation for the foundation shall include remove of all materials of whatever nature and whether wet of dry, necessary for the construction of well and substructure exactly in accordance with lines, levels, grades and curves shown on the plans or as directed by Engineer-in-charge.

Well shall be excavated to the exact width of the lowest step of the footing and the sides shall be left vertical as far as possible or according to the angle of repose of various soils. Unless there is a specific extra provision in the contract for shoring, strutting or for cutting side slopes, contractor shall at his own cost do the necessary shoring, strutting or for cutting of slopes to a safe angle of repose as approved by the Engineer. When the strata need such treatment, the Engineer before starting excavation to enable him to take cross sectional levels for purpose of measurements before the ground is disturbed.

The bottom of the well shall be leveled both longitudinally and transverse or stepped as directed by the Engineer. The contractor shall at his own cost remove such portions of boulders or rock, as are required to make the bottom of the trench level. No filling shall be allowed to bring the foundation to level. If by contractor's mistake, excavation is made deeper than shown on the plan or ordered by the Engineer. The extra depth shall have to be made up with concrete or masonry of the foundation grade as directed By the Engineer and at the cost of the contractor, all rock or other hard foundation shall be cleared of all soft and loose material and cut to a firm surface, either level, stepped as directed by the Engineer. The Engineer may order such changes in the dimensions and elevation of foundation as may be deemed necessary to secure satisfactory foundation. The contractor shall at his own cost, make provision for all pumping, dredging, bailing, boiling out or draining water and the trenches shall be kept. Free of water, during construction work. After each excavation is completed, the contractor shall notify the Engineer to that effect and no pipe will be allowed to be laid until the Engineer has approved the depth and dimensions excavation and the nature of the foundation material and the levels and are recorded.

Shoring and strutting:

Unless specifically mentioned in the contract, excavation of slopes to prevent, falling in of sides of providing, fixing, maintaining and removing shoring, breaching, etc. Shall not be paid for. The contractor shall get approval of design of shorting. The shorting shall be of sufficient strength to resist side pressure and ensure safety from slips and blows and to prevent damage to work and property and injury to persons. It shall be removed as directed after all the item for which it is required are completed.

Protection:

The well pits, trenches, etc. shall be strongly fenced and red-light signals will be provided to prevent accidents, Sufficient care and protective measures shall be taken to see that the excavation shall not affect or damage the adjoining structures. The contractor shall be entirely responsible for any injury to life and damage to the properties etc. Necessary protection works such as guide ropes, crossing places, barricades, caution board etc. shall be provided by the contractor at his own cost.

Classification of Strata:

The decision regarding classification of state shall rest with the consulting Engineer and his decision shall be final and shall remain binding to the contractor.

All the materials encountered in the excavation shall be classified as under:

All sports of soil, sand, gravel and other similar soft and loose materials. These will include all materials of

an earthy or sandy nature which can easily be ploughed and removed. Removal of small boulders not exceeding 0.03 cmt. Or 30 liters (about one cft.) occurring in such strata will be included in the rate for this item.

This shall include materials which can be easily removed with the shovel after loosening with a pick.

Average Murrum :

This type of stuff is intermediate between soft murrum and hard murrum.

Hard Murrum :

This shall include all kinds of disintegrated rock or shall or inundated clay free from boulders larger than 0.03 cu.m. or 30 liters (about 1 cft.) and which can be removed with pick and shovel though not without some difficulty and which do not require blasting.

This shall include all kinds of disintegrated rock or shall or inundated clay interspersed with boulders less than half a cubic meter (after half cu.yd) and larger than 0.03 cu.m or 30 liters (approximately One Cft.) which do not normally require, blasting and can be removed with pick bar wedges and hammer. Boulders bigger than 1/2 cu.m. will be paid for as soft or hard according to it is soft or hard rock.

The classification of various strata met with during excavation will be decided by the Executive Engineer and his decision shall be final and binding to the contractor. Rock referred to above would include Basalt, trap granite, quartzite, gneiss, limestone and other types. The use of explosives in excavation will not be considered as a reason for other classification than the above unless clearly necessary in the opinion of Executive Engineer.

Dewatering:

Unless specially provided for as a separate item in the contract the rate of excavation shall include billing or pumping out all water which may accumulate in the excavation during the progress of the work, either by percolation, seepage spring, rain or any other cause and diverting, surface flow, if any, by earthen bunds or by other means. The bunds shall be removed as soon as the work is completed.

Unless specially provided as separate Item of contract Pumping of water from foundation pit wall trenches, shall be carried at his cost and he should out by the contractor at his own cost and he should arrange for required Number of Dewatering pump sets for the above work.

Disposal of excavated stuff:

No excavated stuff from foundation is to be placed even temporarily nearer than 1.5 meters (5'-0") approximately) or greater distance up to 50 meter or as prescribed by the Engineer from the outer edge or excavation. If site condition demanded to earthen shall be deposited even beyond 30m. Land if actually without claiming extra cost All excavated materials will be the property of The Municipality. The rate of excavation includes sorting out of useful materials and stacking them separately as directed within specified load. The excavated stuff suitable and useful for refilling or for other use shall be stacked at convenient places. The materials not useful in any way shall be disposed of as directed by the Engineer-in-charge. If useful excavated rubble is required by the contractor for use in other Items, it shall be paid for at the rate fixed in the tender, it shall be paid for at the rate fixed in the tenders and if not at the rate of S.O.R. of the Region at the time of tendering of mutually agreed rate of there is no rate in S.O.R. The site should be cleared off all debris on completion of work.

Measurement and Payment:

The payment of various class of excavation shall be made at the unit rate per cubic meter for the quantity actually excavated and accepted by the Engineer limited to dimensions shown in the sanctioned plans or as directed by the Engineer. Excavation in excess of the sanctioned dimensions shall not be measured not paid for and if so, ordered by the Engineer. The contractor shall have to fill up to excess depth with masonry

specified for foundation without any extra payment to the contractor.

Dimensions shall be measured correct to two places of decimals of a meter and individual quantity shall be calculated to two places of decimals of cubic meter.

The rate for the item of excavation shall include (Unless and otherwise mentioned):

- a. Clearing of Site,
- b. Setting out work including all materials strutting labour.
- c. Providing and subsequently removing shoring and strutting or cutting slopes etc.
- d. Excavation and sorting and stacking of all excavated stuff as directed.
- f. Necessary protection including labour, materials equipment etc. to ensure safety and protection against risk or accident.
- g. Providing facilities for inspection and measurements at any time.
- h. Compensation for injury to life and damage to property if caused during progress of work.

Item No. 5

Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.

Workmanship:

- The earth to be used for filling shall be free from salts, organic or other foreign matter all clots of earth shall be broken.
- As soon as the work in foundation has been completed and measured the site of foundation shall be cleared of all debris brick bats mortar dropping etc. and filled with earth in layers not exceeding 200 mm. each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the ends of crow-bars, where rammer cannot be used.
- The plinth shall be similarly filled with earth in layers not exceeding 200 mm adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.
- The finished level of filling shall be kept to shape intended to be given to floor.
- In case of large heavy-duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

Mode of Measurements & Payment:

- The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.
- The rate shall be for a unit of **one cubic meter**.

Item No. 6

Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.

Materials:

Murum shall be clean, of good binding quality and of approved quality obtained from approved pits/quarries of disintegrated rock which contain siliceous materials and natural mixture of clay of calcareous origin. The size of murum shall not be more than 20 mm.

Workmanship:

The relevant specification of item No. 5 shall be followed except that the murrum of selected soil shall be filled in foundations and plinth 20 cm. layer including consolidating ramming, watering, dressing etc. complete.

Mode of measurement & payments:

- The relevant specification of item No.5 shall be followed.
- The rate includes cost of collecting and carting murrum or selected earth of approved quality with all lead and labor required for filling in trenches and plinth.
- The rate shall be for a unit of **one cubic meter**.

Item No.7

Applying general insecticide pest control treatment to floors, cupboards etc. including labour, material etc. complete. Using Hepta chloride 20 EC. As per 6113 pests' concentration weight 0.50 % is recommended one-liter chemical emulsion dilute with 39 liter of water will give. Total dilute concentration will be 40 liter inclusive of one liter chemical emulsion application 0.5 Liter chemical / Sqm of surface is recommended as per I.S.

Materials:

The chemicals used for the soil treatment shall be only one of the following with concentration shown against each in emulsion.

1. Aldrin 0.50% (By weight)
2. Heptachlor 0.50% (By weight)
3. Chlordane 1.00% (By weight)

Workmanship:

- The junction of walls and columns with the floor shall be treated with the chemical emulsion at the rate of 7.5 Lts/m². Special care shall be taken to establish continuity of the vertical chemical barrier on inner wall surfaces from the ground level of filled earth surface. To achieve this, a small channel 3 x 3 cm. shall be made at the junctions of the wall and columns with floor (before laying the sub-grade) and rod holes made in the channels emulsion poured along the channel at the rate of 7.5 Lits. /m.² of the vertical walls or columns surfaces of substructure, so as to soak the soil right to the bottom. The soil should be tamped back into place after this operation.
- The chemicals barrier shall be completed and continuous under whole of the structure to be protected.
- The treatment against termite infection shall remain full effective for a period not less than 10 years from date of issue of the final certificate of completion of work, if at any time during this period any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the contractor shall rectify the concerned defects within 15 days on receipt of notice from Engineer-in-charge. On contractor's failure to do so, the Engineer-in-charge, may get same rectified through any other agency at contractor's risk and cost, and decision of Engineer-in-charge as to the cost payable by the contractor for the same shall be final and binding to the contractor.
- A guarantee bond on appropriately stamped paper shall be given by the contractor to the department in the manner and in the form as prescribed by the Corporation.

Mode of measurement & payments:

- The rate shall be for a unit of one square meter of the plinth area treated and guaranteed for.

Item No.8

Filling in plinth with sand under floors including watering ramming, consolidating and dressing complete (upto 10 ton).

Materials:

Sand shall conform to M-6.

Workmanship:

The relevant specification of item no. 5 shall be followed except that sand shall be filled in under floors, including watering, ramming, consolidating and dressing etc.

Mode of measurement & payments:

- The relevant specification of item No.5 shall be followed.
- The rate includes cost of collecting, carting sand with all lead and labour for filling the same plinth under floors.
- The rate shall be for a unit of **one cubic meter**.

Item No.9

Providing and filling rubbles including hand packing and filling interstices with quarry spalls behind abutments and between returns as directed. (upto 10 ton).

Materials:

Rubble of selected Material should be used. Its should be hard and durable.

Workmanship:

The relevant specification of item no.5 shall be followed except that rubble shall be filled in under foundation and floors, including watering, ramming, consolidating and dressing etc.

Mode of measurement & payments:

- The relevant specification of item No.5 shall be followed.
- The rate includes cost of collecting, carting rubble with all lead and labour for filling the same plinth under floors and below foundations.
- The rate shall be for a unit of **one cubic meter**.

Item No.10

P/L PCC 1:3:6 (1-cement: 3 coarse sand: 6 M/c stone aggregate 20 / 40mm nominal size) in foundation concrete / floor concrete incl. machine mixing, ramming, consolidation & curing etc. incl. cost of form work if required etc. complete at all levels. (In Foundation & plinth).

Materials:

Water shall conform to M-1.

Cement shall conform to M-3.

Sand shall conform to M-6.

Stones aggregate 40 mm. nominal size shall conform to M-12.

The shuttering to be provided shall be of ordinary timber planks and shall conform to M-24.

Workmanship:

Before starting concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed.

Proportion of Mix:

The proportion of cement, sand and coarse aggregate shall be one part of cement, 3 parts of sand and 6 parts of stone aggregates and shall be measured by volume.

Mixing:

The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by Engineer in charge. When hand mixing is permitted by the Engineer in charge in case of break-down of machineries and in the interest of work it shall be carried out on a water-tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in color and consistency. However, in such cases 10 % more cement than otherwise required shall have to be used without any extra cost. The mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability to the purpose.

Transporting & Placing the Concrete:

- The concrete shall be handed from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.
- The concrete shall be laid in layers of 15 cm. to 20 cm.

Compacting:

The concrete shall be rammed with heavy iron-rammers to get the required compaction and to allow the interstices to be filled with mortar.

Curing:

After the final set, the concrete shall be kept continuously wet if required by ponding for a period of not less than 7 days from the date of placement.

Mode of Measurements & Payments:

- The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plan or as directed.
- The rate shall be for a unit of one cubic meter.

Item No.11

Providing and laying controlled cement concrete M-250 for RCC work as per detailed drawings including centering, shuttering (Only Fresh Ply), machine mixing, vibrating, scaffolding, curing, centering having double or more height wherever required & finishing etc. but excluding cost of reinforcement etc. complete at all levels for RCC FOOTING

Item No.12.A, 12.B, 12.C, 12.D

Providing and laying controlled cement concrete M-250 for RCC work as per detailed drawings including centering, shuttering (Only Fresh Ply), machine mixing, vibrating, scaffolding, curing, centering having double or more height wherever required & finishing etc. but excluding cost of reinforcement etc. complete at all levels.

- A) RCC COLUMN UPTO PLINTH**
- B) RCC PLINTH BEAM**
- C) RCC Grad Slab**
- D) RCC WALL**

Materials:

Water shall conform to M-1.

Cement shall conform to M-3.

Sand shall conform to M-6.

Grit shall conform to M-8

Coarse aggregate shall conform M-12 B.

The shuttering to be provided shall be of ordinary timber planks and shall conform to M-24.

The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

General:

- The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be M-200 (1 cement: 1 coarse sand: 2 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.
- The designation ordinary M-100, M-150, M-200, M-250. specified as per I.S. Corresponding approximately to 1:3:6, 1:2:4, 1:1½:3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.
- Ordinary concrete shall be followed except that the concrete mix shall be designed from preliminary tests, the proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350, & M-400, with prefix controlled added to it. The letter 'M' refers to mix and numbers specify 28 days works cube compressive strength of 150 mm. cubes of the mix expressed in Kg./Cmt.
- The proportion of cement, sand and coarse aggregates shall be determined by weight the weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design.
- The strength requirements of different grade of concrete shall be as under:

Grade Of Concrete	Compressive strength of 15 cms. Cubes in Kg./Cmt. At 28 days, conducted in accordance with I.S. 516-1959.	
	Preliminary test Min.	Work test Min.
M-150	200	150
M-200	260	200
M-250	320	250
M-300	380	300
M-350	440	350
M-400	500	400

In all cases, the 28 days compressive strength specified in above table above be the criteria for acceptance or rejection of the concrete. Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes as concrete belonging to the lower of the two grades between which its strength lies.

- The ingredients required for ordinary concrete containing one beg of cement of 50 Kg. By weight (0.0342 Cu. M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. Of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs. Of cement maximum.
M-100 (1:3:6)	300 Liters	Generally, 1:2 for fine aggregate to coarse aggregate by volume but subject to and upper limit of 1:1 ½ and lower limit 1:3	34 Liters
M-150 (1:2:4)	220 "		32 "
M-200 (1:1 ½:3)	160 "		30 "
M-250 (1:1:2)	100 "		27 "

- The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the Table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water-cement-ratio specified in the Table is not exceeded.
- Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.
- The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill corners of the form.
- For reinforced concrete work, coarse aggregate having a nominal size of 20 mm. are generally considered satisfactory.
- For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.
- Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as or greater than the minimum cover.
- Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.
- The form work shall conform to the shape lines and dimension as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe-guard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding bracing etc. shall be as per design.

Cleaning & Treatment of forms:

All rubbish, particularly chippings shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly wetted or treated. The surface shall be then coated with soap solution applied before concreting is done, Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively, a coat of raw linseed oil or form oil of approved manufacture may be applied in case steel shuttering is used. Soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coating does not get on construction joint surface and reinforcement bars.

Stripping time:

In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.

(a) Sides of walls columns and vertical faces of beam	24 to 48 hours.
(b) Beam soffits. (Props left under)	7 days.
(c) Removal of props slabs	
i) Slabs spanning up to 4.5 m.	7 days.
ii) Spanning over 4.5 mm.	14 days.

(d) Removal of props to beams and Arches

- | | |
|------------------------|----------|
| i) Spanning up to 6 m. | 14 days. |
| ii) Spanning over 6 m. | 21 days. |

- All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffit form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

Centering:

- The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behavior of centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.
- The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.
- The centering and form work shall be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to the work, injury to life and damage to property.

Scaffolding:

- All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to act and shall be subject to the approval of the Engineer-in-charge. However, contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc.
- The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.
- The rate is applicable to all conditions of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as:
 - (a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering, strutting, propping bolting, nailing, wedging, easing, striking and removal.
 - (b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm. widths to beams, columns and the like.
 - (c) Temporary opening in the forms for pouring concrete, if required, removing rubbish etc.
 - (d) Dressing with oil to prevent adhesion of concrete with shuttering, and
 - (e) Raking or circular cutting.

Re-Use:

Before-re-use, all forms shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned, and joints gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

Workmanship:

Proportioning: proportioning shall be done by volume, except cement which shall be measured in terms

of bags of 50 Kg. weight. The volume of one such bag being taken as 0.0342 Cu. Meter Boxes of suitable sizes shall be used for measuring sand aggregate. The size of the boxes (internal) shall be 35 cms. x 25 cms. and 40 cms. deep. While measuring the aggregate and sand, the box shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulk age shall be made.

Mixing:

- **For all work.** Concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be continued till materials are uniformly distributed and uniform color of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.
- When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign materials get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dru coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform color. Specified quantity of water shall then be added gradually through a rose-can and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement shall be increased by 10 percent above that specified.
- Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

Consistency:

- The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete shall be determined by regular slumps tests in accordance with I. S. 1199-1959. The slumps of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

Inspection:

- Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relive the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.
- Centering design and its erection shall be got approved from the Engineer-in charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed for ensuring

proper cover; mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

Transporting and laying:

- The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All formwork shall be cleaned and made free from standing water, dust show or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.
- Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 meter when internal vibrators are used and not exceeding 0.30 meter in all other cases.
- Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 meters. When trunking or chutes are used, they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where 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 any particles of coarse aggregate. The surface shall then be thoroughly wetted all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.
- All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns. Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

Curing:

- Immediately after compaction, concrete shall be protected from weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbent material approved soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

Sampling and Testing of concrete:

Samples from fresh concrete shall be taken as per I. S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with I. S. 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following:

Quantity of concrete in the work No. of samples	Quantity of concrete in the works	No. of samples
1-5 Cmt.	16-30 Cmt.	3
6-15 Cmt	31-50	4
51 and above + one additional for each additional 50 M. or part thereof.		

NOTE: At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 kg/Cm² at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not however, be placed in a higher grade on the ground that the test strength is higher than the minimum specified.

Stripping:

- The Engineer-in-charge shall be informed in advanced by the contractor of his intention to strike the form work. While fixing the time for removal of form work due consideration shall be given to local conditions, character of the structure the weather and other condition that influence the setting of concrete and of the materials used in the mix in normal circumstances (generally where temperatures are above 20°C) and where ordinary concrete is used forms may be struck after expiry of periods specified in item No. 9.1 (A) for respective item of form work.
- All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Engineer-in charge. After removable of form work and shuttering the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.
- Immediately after the removal of forms all exposed bolts etc., passing through the cement concrete member and use for shuttering or any other purpose shall be cut inside the cement concrete members to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine caused by form joints, all cavities produced by the removal of forms ties and all other holes and depressions honeycomb spots broken edges or corners and other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportion used in the grade of concrete that is being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which are pointed shall be kept moist for a period of 24 hours. If rock pockets honeycombs in the opinion of the Engineer-in-charge are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement he may declare the

concrete defective and require the removal and replacement of the portions of the structure affected.

Mode of measurement and payment:

- The consolidated cubical contents of concrete work as specified in item shall be measured the concrete laid in excess of section shown on drawings or as directed shall not be measured.
- The rate includes cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as directed curing and all other incidental expenses for producing concrete of specified strength. The rate including the cost of form work.
- The rate shall be for a unit of one cubic meter.

Item No.13

Providing Epoxy coated TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.

Material:

TMT bars conforming to IS 1786 - 1979 with minimum yield strength of 500N/sq.mm. steel reinforcement for R.C.C. work including bending, binding and placing in position complete up to floor two level.

For Epoxy Coating -**IS: 13620 shall be followed.** (Specification for fusion bonded epoxy coated reinforcing bars)

Workmanship:

- The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.
- Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.
- Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be beat cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.
- All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm. in size and by using stay blocks or metal chair spacers, metal hangers, supporting wire or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non - corrodible material. Wooden and metal support shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices. Reinforcement after being

placed in position shall be maintained in a clean condition until completely embedded in concrete. Special care shall be to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawings. All the bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

- Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm. in such manner that they do not slip over each other at the time of fixing and concreting.
- As far as possible, bars of full length shall be used. In case this is not possible overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending movements is maximum.
- Whenever indicated on the drawings or desired by the Engineer-in-charge bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joint by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than normal cross - section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226.
- When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conform to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. sheet electrodes used for sledding shall conform to I.S. 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.

Mode of measurement and payments:

- For the purpose of calculating consumption wastage shall not be permitted beyond 5 percent. Excess consumption over 5% will be charges at panel rate.
- Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones on the same basis of as per M.18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.
- The rate for reinforcement includes cost of steel binding wires its carting from Departmental store to work site. Cutting bending placing binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars.
- The rate shall be for a unit of One Kg.

Item No.14

**Brickwork using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.Cm. in foundation and plinth in cement Mortar 1:6 (1-Cement :6-finesand)
(B)Conventional**

Materials:

Water shall conform to M-1.

Cement shall conform to M-3.

Sand shall conform to M-6, screened, graded & clean.

Brick shall conform to M-15.

Cement mortar shall conform to M-11.

Workmanship:**Proportion:**

- The proportion of the cement mortar shall be 1:6 (1 cement: 6 coarse sand) by volume.

Wetting of bricks:

- The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

Laying:

- Bricks shall be laid in English bond unless directed otherwise. Half of cut bricks shall not be used except when necessary to complete to bond; closers in such case shall be cut to required size and used near the ends of walls.
- A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.
- The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.
- The brick shall be laid with frog upwards. A set of tools comprising of wooden straight edges, mason's spirit level, square half meter rub, and pings, string and plumb shall be kept on the site of work for frequent checking during the progress of work.
- Both the faces of walls of thickness greater than 23 cms. shall be kept in proper place. All the connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.
- All fixtures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

Joints:

- Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.
- The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

Curing:

- Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

Preparation of foundation bed:

If the foundation is to be laid directly on the excavated bed, the bed shall be levelled, cleared of all loose materials, cleaned and wetted before starting masonry. If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top of plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

Mode of measurements & payment:

- The measurements of this item shall be taken for the brick masonry fully completed in foundation up to plinth. The limiting dimensions not exceeding those shown on the plans or as directed shall be final. Battered tapered and curved portions shall be measured net.
- No deduction shall be made from the quantity of brick work, for any extra payment made for embedding in masonry or making holes in respect of following items:
 - (1) Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. Where cross sectional area does not exceed 500 Sq. c.m.
 - (2) Openings not exceeding 1000 Sq. c.m.
 - (3) Wall plates and bed plates, bearing of slabs, chajjas and the like whose thickness does not exceed 10 Cms. and the bearing does not extend to the full thickness of wall.
 - (4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
 - (5) Iron fixtures, pipes up to 300 mm. dia, hold fasts, and doors and windows built into masonry a pipe etc. for concealed wiring.
 - (6) Forming chases of section not exceeding 350 Sq. c.m. in masonry.
- Apertures for fire places shall not be deducted nor shall be paid for separately.
- The rate shall be for a unit of one cubic meter.

Item No.15

Half brick thick honey- comb brick work with common burnt clay building bricks having crushing strength not less than 35Kg/Sq.Cm. (i) In Cement Mortar 1:4 (1- Cement: 4 - coarse sand).

Materials:

Bricks shall conform to M-15.

Water shall conform to M-1.

Cement shall conform to M-3.

Sand shall conform to M-6.

Cement mortar shall conform to M-11

Workmanship:

- Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc. shall conform to item No.14 except that the brick work of half bricks shall be carried out.
- Cement mortar used in masonry work shall be in proportion of 1 part of cement and 3 parts of sand by volume.
- All bricks shall be laid stretcher wise, breaking joints with those in the upper and low course. The wall shall be taken truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for frequent checking.

Mode of measurements and payment:

- The half brick masonry work in foundation and plinth shall be measured under this item, the limiting dimension shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.
- The relevant specifications of item No 14 shall be followed. The length shall be measured nearest to one cm.
- The rate shall be for a unit of one Sq. meter.

Item No.16

Providing & laying 15 mm thick cement plaster in single coat in CM 1:3 (1-cement : 3-sand) on rough & fair side of RCC / brick masonry, ceiling, any other surface for interior & exterior plastering as per architectural design / drawings incl. making 10 x 10 mm or as specified grooves as per pattern given in the architectural drawings incl. drip moulding & finished even and smooth with neat cement slurry incl. racking out joints, cleaning, curing, scaffolding, etc. complete at all floor levels.

Materials:

Water shall be conforming to M-1.

The cement mortar of proportion 1:3 shall conform to M-13.

Workmanship:**Scaffolding:**

Wooden bellies, bamboos, planks, treats and other scaffolding shall be sound. There shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

Preparation of Back-Ground:

- The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing. If it is not hard and by hacking, if it is hard. 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. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.
- The raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out plaster work.
- The work shall be not soaked but only damped evenly before applying the plaster. If the surface become

dry, such area shall be moistened again.

- For external plaster the plastering operation shall be started from top floor and carried down wards. For internal plaster the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the walls of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

Application plaster:

The plaster about 15 x 15 cm. Shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surface of these gauge shall be truly in plane of the finished plaster surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideway movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive troweling or overworking the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished.

Rounding or chamfering, corners, arrises junctions etc. shall be carried out with proper templates to the size required.

Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty 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 the wall and nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices nor at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet top and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up to later on.

Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.

Chicken wire mesh:

- Chicken wire mesh jali shall be clearly drawn to the dimensions as specified in item. The jali shall be sound, free from splits, surface flaws, rough jassed and imperfect edges.
- Jali shall be fixed where over crack is visible at all the junction of necessary and concrete suitable using (nails and /or cement slurry) as per direction of Engineer-in-charge and before plaster work is done.

Mode of measurement & payments:

- The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.

- All the plastering shall be measured in square meters unless otherwise specified. Length, breadth or height shall be measured correct to a centimeter.
- Thickness of the plaster shall be exclusive of the thickness of key i.e. grooves or open joints in brick work, stone etc. or space between laths. Thickness of plaster shall be average thickness with minimum 15mm/10mm at any point on this surface.
- This item includes plastering up to floor two level.
- The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.
- Soffits of stairs shall be measured as plastering on ceilings. Flowing soffits shall be measured separately.
- For jambs, soffits, sills etc. for openings not exceeding 0.5 sq.mt. Each in area for ends of joints, beams, posts, girders, steps etc. not exceeding 0.5 sq. mt. Each in area and for openings exceeding 0.5 sq. mt. And not exceeding 3.00 sq.mt. In each area deductions and additions shall be made in the following's manner:
 - A) No deduction shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq.mt. Each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings. For finishing to plaster around ends of joints beams and posts etc.
 - B) Deduction for openings exceeding 0.5 sq. mt. But not exceeding 3 sq. mt. each shall be made as follows and no deduction shall be made for reveals, jambs, soffits, sills etc. of these openings.
 - i) When both faces of the whole wall are plastered with same plaster, deduction shall be made for one side only.
 - ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and/or pointing as the case may be.
- For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made each plastered face of the wall.
- In case of openings of area above 3.00 sq.mt. each deduction shall be made for openings but jambs, soffits and sills shall be measured.
- The rate shall be for unit of one Sq. Mt.

Item No.17

P/L 20 mm thick sand faced plaster on wall up to any height consisting of 12mm thick backing coat of cement mortar 1:3 (1-cement : 3 sand) & 8mm thick finishing coat of cement mortar 1:1 (1-cement : 1-sand) as per architectural design / drawings incl. making 10 x 10 mm or as specified grooves as per pattern given in the architectural drawings incl. racking out joints, cleaning, drip moulding, curing, scaffolding, etc. complete at all floor levels. used wooden godka.

Materials:

Water shall conform to M-1.

cement mortar shall conform to M-11.

Workmanship:

- The work shall be carried out in the coats. The backing coat (base coat) shall be 12 mm thick in C.M.1:3. The relevant specifications of item No 26/27 shall be followed except that the thickness of back coat shall be 12 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days, depending upon the weather conditions. The surface shall not be allowed to dry during this period.
- The second coat shall be completed to 8 mm thickness in C.M. 1:1 as described above, including raising sand facing by bushing. The samples of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.

Curing:

- The curing be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

Mode of measurements and payment:

- The relevant specifications of item 16 shall be followed except that the sand face plaster on outside for all heights above ground level shall be measured under this item.
- The rate shall be for a unit of one sq. meter.

Item No.18

Filling in foundation and plinth with brick Bats Chhara in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.

Brickbat, chhara filling in soak pit as suggested by EIC.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.19

Carrying out plinth treatment to post construction / existing structure by spraying chemical solution for TERMITE CONTROL TREATMENT including labour and material consistent with I.S.I. specification. Using Chlordene and Chiorpurfiles 20 EC. As per 6131_paret-II Concentration weight one percent is recommended i.e. one liter 20 EC chemical emulsion with 19 liter give 1% concentration inclusive of one-liter chemical emulsion application at the rate of 5 Liter / Sq.m of surface is recommended as per I.S. Etc. complete as directed by EIC.

As described in item description and as suggested by EIC.

Mode of measurements and payment:

- The rate shall be for a unit of one sq. meter.

Item No.20.A, 20.B, 20.C

Providing and laying controlled cement concrete M-250 for RCC work as per detailed drawings including centering, shuttering (Only Fresh Ply), machine mixing, vibrating, scaffolding, curing, centering having double or more height wherever required & finishing

etc. but excluding cost of reinforcement etc. complete at double height Level.

- A) RCC COLUMN AT DOUBLE HEIGHT**
- B) RCC BEAM AT DOUBLE HEIGHT**
- C) RCC SLAB AT DOUBLE HEIGHT**

Same as Item No.12.A, 12.B, 12.C, 12.D except shuttering and scaffolding work as it double height.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.21.A.1, 21.A.2, 21.B.1, 21.B.2, 21.C.1, 21.C.2, 21.D.1, 21.D.2, 21.E.1, 21.E.2, 21.F

Providing and laying controlled cement concrete M-250 for RCC work as per detailed drawings including centering, shuttering (Only Fresh Ply), machine mixing, vibrating, scaffolding, curing, centering having double or more height wherever required & finishing etc. but excluding cost of reinforcement etc.

(A) RCC COLUMN

- I) RCC COLUMN AT GF & FF LEVEL
- II) RCC COLUMN AT Terrace LEVEL

(B) RCC BEAM

- I) RCC BEAM AT GF & FF LEVEL
- II) RCC BEAM AT Terrace LEVEL

(C) RCC SLAB

- I) RCC SLAB AT GF & FF LEVEL
- II) RCC SLAB AT Terrace LEVEL

(D) RCC LINTEL & COPING

- I) RCC LINTEL & COPING AT GF & FF LEVEL
- II) RCC LINTEL & COPING AT Terrace LEVEL

(E) RCC CHHAJJA

- I) RCC CHHAJJA AT GF & FF LEVEL
- II) RCC CHHAJJA AT Terrace LEVEL

(F) RCC STAIRCASE

- I) RCC STAIRCASE AT GF & FF LEVEL

Same as Item No.12.A, 12.B, 12.C, 12.D.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.22

Trimix: Constructing the plinth slab/rcc road with Ordinary cement concrete M- 250 Grade (excluding the cost of concrete & reinforcement) mixed with polyester fiber (12mm) @ rate of 125 gms. per 50 Kg. of cement with Trimix Vacuum dewatering system with power troweling sheet form work with M.S. channels, shrinking of fair hardness, non-oxidizing,

Nonmetallic, heavy duty floor hardener of FOSROC or equivalent at the rate of 4.00 Kg./Sq.M. with 10 mm x 10 mm size groove cutting in concrete as construction joint and 12 mm thick premix expansion joint at every 20 Meter length. Providing and pouring sealant of FOSROC or equivalent with necessary equipment, labors etc. Complete.

As per item description and as per Morth/PWD handbook. As directed by authority.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.23.I & 23.II

Providing Epoxy Coated TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level

I) UP TO GF & FF LEVEL

II) ABOVE AT TERRACE LEVEL

Same as item no.13.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.24.I & 24.II

Brickwork using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq.Cm. cement Mortar 1:6 (1-Cement :6-fine sand) (B) Conventional

I) UP TO GF & FF LEVEL.

II) ABOVE AT Terrace LEVEL

Same as item no.14.

Mode of measurements and payment:

- The rate shall be for a unit of one cubic meter.

Item No.25

Half brick masonry in common burnt clay building bricks having crushing strength not less than 35Kg/Sq.Cm. in Cement mortar 1:3 (1-Cement:3-coarsesand) with 2 Nos of 6mm Mild steel round bars after every three-course embedded in Cement Mortar in foundation and plinth I) UP TO GF & FF LEVEL

Same as item no.15.

Mode of measurements and payment:

- The rate shall be for a unit of one square meter.

Item No.26.I & 26.II, 27.I & 27.II

Providing 10mm thick cement plaster in single coat on brick/concrete walls/ceiling for interior plastering upto two floor level and finished even and smooth in (ii) Cement mortar 1:4 (1 cement: 4 Sand) & finishing with a floating coat of neat cement slurry. at GF

I) UP TO GF & FF LEVEL.

II) FIRST FLOOR & ABOVE AT TERRACE LEVEL

27.I & 27.II

Providing 15mm thick Cement Plaster in single coat on brick/concrete wall for interior plastering upto floor two level finished even and smooth in Cement mortar 1:4 (1-cement :4-sand) at GF

I) UP TO GF & FF LEVEL

II) ABOVE AT TERRACE LEVEL

Same as item no.16.

Mode of measurements and payment:

- The rate shall be for a unit of one square meter.

Item No.28.I & 28.II

Providing 20 mm thick double sand faced cement plaster on walls up to height 10 meters above ground level consisting of 12mm thick backing coat of CM 1:3 and 8mm thick finishing coat of CM 1:1 (1cement: 1 sand) etc. complete.at GF

I) UP TO GF & FF LEVEL.

II) ABOVE AT Terrace LEVEL

Same as item no.17.

Mode of measurements and payment:

- The rate shall be for a unit of one square meter.

Item No.29

Rustic Scratch wall texture created by applying Rustic Scratch material with the thickness of 2mm to 3mm over 20 mm outer plaster.

Providing and applying premium-grade **Rustic Scratch Exterior Wall Texture** to a uniform thickness of **2mm to 3mm**, executed over a cured and primed 20mm thick external cement plaster surface on brick or concrete walls. The texture material must consist of a high-performance, acrylic co-polymer matrix blended with quartz crystals, calcined aggregates, light-fast mineral pigments, and weather-stable additives. The scope of work is fully comprehensive (inclusive of all material, specialized tools, scaffolding, and labor) and encompasses rigorous surface cleaning, application of an anti-fungal acrylic priming coat, uniform troweling of the texture slurry, and precise architectural scratching/grooving using a specialized plastic float to achieve a uniform, rugged, rustic finish as per the approved sample patch and to the complete satisfaction of the Engineer-in-Charge (EIC).

Detailed Specification

1. Scope of Work

The work involves complete surface preparation, staging of high-reach structural scaffolding, application of a protective base primer, manual or mechanical plastering of the texturing matrix, and specialized manual drafting to create structural "scratch" lines, followed by final cleanup.

2. Material Specifications

Component / Parameter	Technical Detail & Material Requirement	Approved Standard / Compliance
Base Material Matrix	Premium exterior-grade Acrylic Co-polymer emulsion featuring cross-linking technology for high elasticity and weather resistance.	IS: 15489 (Exterior emulsion standards)
Aggregate Grading	Selected, hard-washed quartzite granules and calcined aggregates graded specifically between 1.5mm to 2.5mm to facilitate clean structural scratch tracks.	Controlled particle size distribution
Application Thickness	Strictly maintained between 2.0 mm to 3.0 mm wet-film thickness, matched to the maximum aggregate size.	Monitored via physical depth gauges
Undercoat Primer	High-performance, alkali-resistant acrylic exterior wall primer containing anti-microbial additives.	Compatible with the texture base
Performance Indices	<ul style="list-style-type: none"> • Water Resistance: Excellent (hydrophobic finish) • UV Resistance: Non-fading, mineral pigments • Flexibility: Capable of bridging minor hairline plaster cracks 	Verified by manufacturer certificate

3. Execution & Workmanship Standards

- **A. Substrate Preparation & Inspection:**
 - The underlying 20mm thick exterior cement plaster must be fully cured (minimum 14 days), structurally sound, flat, and completely dry.
 - All structural cracks, voids, or honeycomb patches must be pre-filled with an approved polymer-modified mortar and finished flush. The surface must be brushed clean to remove efflorescence, loose dust, laitance, or shuttering oil.
- **B. Priming:** A single uniform coat of exterior acrylic primer shall be applied using a roller or airless spray system. The primer must be allowed to dry completely (minimum 4 to 6 hours depending on ambient humidity) before the texture coat is applied.
- **C. Texture Application Technique:**
 - The Rustic Scratch material must be thoroughly mixed to a workable, lump-free consistency using a mechanical stirrer.

- The material shall be applied uniformly using a stainless-steel trowel, holding the tool at a tight angle to scrape the mix down to the thickness of the largest embedded quartz granule (**2mm to 3mm**).
- **D. Achieving the Scratch Finish:**
 - While the applied texture layer is still wet and workable, a specialized rigid plastic or acrylic finishing float shall be glided flat over the surface with uniform pressure.
 - The dynamic movement of the float rolls the embedded quartz grains across the substrate, creating the characteristic **rustic scratch tracks (vertical, horizontal, or circular patterns)** based on the architectural theme approved by the EIC.
- **E. Joint Management (No-Joint Protocol):** To prevent visible structural joints or lap marks, texture application must proceed continuously from corner to corner or along predefined architectural grooves on a single wall face. **Breaking off work mid-wall is strictly prohibited.** Adequate labor must be deployed on the scaffolding to maintain a continuous "wet edge."

4. Environmental & Weather Restrictions

- The texture must not be applied during active rain, high winds (which cause premature drying and cracking), or when the ambient surface temperature drops below 10°C or exceeds 45°C.
- Freshly applied texture must be protected from direct rain for at least 24 hours until fully cured.

5. Mode of Measurement

- **Unit of Measurement: Square Meter (m²).**
- **Measurement Rules:** The net finished surface area will be measured in square meters along the true plane of the walls. Deductions for structural openings (windows, doors, louvers) will be executed strictly in accordance with **IS: 1200 (Part 13)** guidelines. Jambs and reveals will be measured and added to the quantity.
- **Inclusions:** The comprehensive contract unit rate is **fully inclusive of all material and labor parameters**. This includes the provision of double-stage structural exterior steel scaffolding, surface preparation, scraping, supply and application of the acrylic primer, supply of the premium Rustic Scratch material, specialized texturing trowels and floats, maintenance of wet edges to avoid joints, final curing protection, curing waste disposal, and all skilled labor needed to deliver a uniform architectural pattern across the facade.

Item No.30 & 31

Providing throating or plaster drip and mounding to R.C.C. Chhajja or protection.

Item No.31

Providing Cement Vata (10cm x 10 cm) size quarter round in cement mortar 1:1 including neat cement finishing, watering etc. Complete.

Materials:

Water shall conform to M-1.

Cement mortar shall conform to M-11.

Workmanship:

The work of cement vata of 10 cms x 10 cms size shall be carried out at junctions of parapets and terraces as directed. The vata shall be finished in quarter round shape. The work shall be carried out in the

best workman like manner. The inter portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

Mode of measurements and payment:

The work shall be measured for finished item in running meter.

The rate shall be for a unit of one running meter.

Item No.32

Providing and fixing chicken mesh 30 cm wide double folded fixed firmly to wall with nails on vertical or horizontal junction of RCC and brick wall before plastering including scaffolding and all lead & lift etc complete any floor.

Chicken wire mesh:

- Chicken wire mesh jali shall be clearly drawn to the dimensions as specified in item. The jali shall be sound, free from splits, surface flows, rough jassed and imperfect edges.
- Jail shall be fixed where over crack is visible at all the junction of necessary and concrete suitable using (nails and /or cement slurry) as per direction of Engineer-in-charge and before plaster work in done.

Mode of measurements and payment:

The rate shall be for a unit of one square meter.

Item No.33

Providing 20 mm thick Water Proof cement plaster for sunk in single coat on brick / concrete wall for interior plastering up to floor two level finished even and smooth (ii) Cement mortar 1:3 (1-cement ,3- sand) and mixing waterproofing materials of approved brand and manufacture in cement mortar in proportion recommended by the manufacturer for All Floor.

Materials:

The relevant specification of item No. 17 shall be followed except that the water proofing materials of approved make shall be added to the cement at the rate of specified or as directed by the Engineer-in-charge. The proportion of water proofing materials to be mixed with 50 Kg. bags shall be as recommended by the manufactures of the water proofing materials.

Mode Of Measurement & Payment:

The measurement shall be taken on the Sq. Meter basis as per I.S. 1200-XII- 1976 or as revised from time to time so far as applicable.

The contract rate shall be for a unit of one Sq. Meter.

Item No.34

Providing and laying cement concrete 1:5:10 (1-Cement:5-finesand:10-graded brickbat aggregates 40mm nominal size) and curing complete including waterproofing material excluding cost of form work - for toilet floor at all levels.

Brickbat with water proofing for toilet floor as described and directed by EIC.

Mode Of Measurement & Payment:

The contract rate shall be for a unit of one Sq. Meter.

Item No.35

Providing & Laying CINDER FILLING in architectural gap and sunk slab including compacting manually with rammer and finishing true line & level at all floor level etc. complete as directed by E.I.C.

Cinder for toilet floor and architectural gap as described and directed by EIC. The Cinder filling shall be carried out at sunk slab due to architectural treatment. The space where cinder shall be laid is cleared of all debris, brick bats, mortar dropping etc. and then filled with cinder in layer not exceeding 20cm. Each layer shall be adequately watered, rammed, and consolidated before the succeeding layer is laid. The cinder shall be rammed with iron rammers where feasible and with the butt ends of crow-bars, where cannot be used. When filling reaches finished level, the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

Mode Of Measurement & Payment:

The payment shall be made for filling in sunk slab. No deduction shall be made for shrinkage or voids, if consolidated as instructed above. Rate shall include cost of material, labour for filling, compacting, ramming and watering for the satisfactory completion of works.

The contract rate shall be for a unit of one Sq. Meter.

Item No.36

Providing and laying integrated cement based water proofing treatment of required thickness over the roof, chaina mosaic fitting and finally finishing the surface with white cement slurry and slopping out terrace slabs with following specification laid to required slope not flatter than 1:8 (the thickness of water proofing treatment near rainwater outlet or the lowest point of the finished slope shall not be less than 45mm, including treating the vertical surface of the parapet wall up to 20cms . height above finished level of terracing including finishing the top with joint less water proofing plaster, curing, testing etc. complete. (No extra shall be paid for increase in thickness for proper slope).

(A) Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with properly water proofing compound conforming to IS -2645 incl. cleaning the surface before treatment

(B) Providing and laying 80 mm thick cement concrete 1:5:10 (1-Cement:5-finesand:10-graded brickbat aggregates 40mm nominal size) and curing complete excluding cost of form working

(C) After Two Days of proper curing applying a second floor of cement slurry.

(D) Finishing the surface with china mosaic pieces laid on 10mm thick joint less cement plaster of mix 1:3(1 cement :3 coarse sand) admixed with proprietary water proofing compound conforming to IS :2645 and finally finishing the surface with trowel with neat cement slurry

(E) The whole terrace so finished shall be flooded with water for a minimum period of two weeks for curing for final taste. All above operation to be done in order and as directed and specified by the Engineer in Charge. (The plan area shall be measured and paid, vatta shall not be paid separately).

Material:

As described in item description and as directed by EIC.

Workmanship:

- The existing R.C.C. surface of slab shall be cleaned thoroughly.
 - Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with proprietary water proofing compound conforming to IS 2645 over the R.C.C. slab.
 - Laying cement concrete using broken bricks/brick bats 40 mm nominal size with cement mortar 1:4 (1 Cement: 4 coarse sand) admixed with proprietary water proofing compound conforming IS 2645. over 15mm thick layer of C.M 1:3 (1 Cement: 3 coarse sand) admixed with proprietary water proofing compound conforming to IS 2645 to required slope and treating similarly the adjoining walls up to 200mm height including rounding of junctions of walls and slabs.
 - After two days of proper curing, applying a second coat of cement slurry admixed with proprietary water proofing compound conforming to IS 2645.
 - Finishing the surface with china mosaic pieces laid on 10mm thick joint less cement plaster of mix 1:3 (1 cement :3 coarse sand) admixed with proprietary water proofing compound conforming to IS :2645 and finally finishing the surface with trowel with neat cement slurry.
 - The whole terrace so finished shall be flooded with water for a minimum period of two weeks of curing and for final test. All above operations to be done in order and as directed and specified by the engineer in charge.
- **Mode Of Measurement & Payment:**
 - The contract rate shall be for a unit of one Sq. Meter.

Item No.37

Providing & laying GVT Vitrified tiles flooring over 20 mm (average) base of cement mortar 1:6 (1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material and jointed with color cement slurry including Making 3mm spacer at joint of tiles and fill the spacer with epoxy jointing material ,finished with flush pointing & cleaning the surface etc complete selection as directed by Architect/E.IC (Min. Size -1.20Mt. X 0.60 Mt. or Bigger 8' x 4' as selected by EIC) Make: AGL, Nitco, Kajariya or as selected by authority.

Materials:

Water shall conform to M-1.

Cement mortar shall conform to M-11.

Tiles shall conform to M-58 & as per approved brand list or as approved by EIC.

i] Water shall confirm to M – 1 of specification booklet of tender.

ii] Cement mortar shall be confirmed to M – 11 of specification booklet of tender.

iii] Fully polished Vitrified floor tiles shall be of shade approved by Engineer - In – Charge.

The tiles shall be hard even / sound. regular in shape and uniformly coloured. It shall be without any soft vines and cracks of flow. The size of the tiles shall be as per drawings or otherwise specified by Engineer - In – Charge scratch hardness minimum 7 on Mohr's scale with a density of 2.2 to 2.3.

Workmanship:**Bedding:**

- The sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the monsoon to place wooden planks across and squat on it.

- The tiles shall be laid on cement mortar bedding of 20 mm. thick in C.M. 1:6. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The proportion of the cement mortar shall be as specified in the item.
- Each Vitrified tiles cut to the required size and shape as shown in the working drawing supplied by Engineer - In – Charge. Each tile shall be in mirror polished. All angles and edges of tiles shall be True Square and free from chipping and giving a plain surface. The shade quality of Vitrified tiles shall be got approved by Engineer - In – Charge.
- It shall laid on top pressed tapped gently to bring it in with the adjoining tiles flooring. The top surface of mortar shall be corrected by adding fresh motor of hollow and depressions. The mortar shall than be allowed to harden bit over the surface cement slurry of honey like consistence shall be applied. The joints shall be as thin as possible. Joints shall be filled up by white cement (If required pigment shall be mixed with white cement, to match the shade of tiles). The top surface shall be protected from scratches damages etc. by means of a thin layer & good quality POP & all joints shall be protected with adhesive tape or as directed by Engineer – In– Charge.

Fixing tiles:

- The tiles before laying shall be soaked in water for at least two hours. Neat gray cement grout at 33 kg/Cement/Sq. mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be. no hollows in bed or joints. The joints between the tiles shall be as 3 mm space filling with epoxy as possible in straight line or as per pattern.
- The tiles shall not have staggered joints. The joints shall be true to center line both ways as per mentioned in item description filling with epoxy. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with 3 mm epoxy c with wire brush or trowel to a depth of 5 mm. and loose material removed. Epoxy shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

Cleaning:

The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

Mode Of Measurement & Payment:

- The rate includes the cost of all material and labour involved in all operations described above. The flooring shall be measured on Sq.mt. basis. Rates also include rubbing, sizing and cleaning of tiles etc. completed.
- The contract rate shall be for a unit of one Sq. Meter of visible surfaces.
- Note: The flooring work shall be done as per right angle & as per architectural drawings & as suggestion by architect/E.I.C.

Item No.38

Providing and laying polished Kota stone slab flooring over 20mm (Average) thick base of cement mortar 1:6 (1-cement : 6-coarse sand) or L.M. 1.1.5 (1-Lime putty :1.5 - coarse sand) laid over and jointed with grey cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. (A) 25mm thick (upto 10 ton). Material should be as per brand list as selected by authority.

Materials:

Water shall confirm to M – 1 of specification booklet of tender.

Cement mortar of proportion 1:6 (1-cement, 6- coarse sand) shall conform to attached Specification of Materials.

White or colour cement shall conform to M- 4 or M-5 of attached specification of materials.

Workmanship:

The work is to be executed as directed by the Engineer in Charge & as per current relevant standards / codes etc. and details specified OR finalized by the Engineer in charge.

Mode Of Measurement & Payment:

The contract rate shall be for a unit of one Sq. Meter of visible surfaces.

Item No.39

Providing and laying polished kota stone slab 25mm thick in risers of steps, skirting Dedo and pillars laid on 10mm thick cement mortar 1:3 (1-Cement: 3 coarse sand) and jointed with gray cement slurry mixed with pigment to match the shade of slab including rubbing and polishing etc. complete. Material should be as per brand list as selected by authority.

Materials:

- Water shall confirm to M – 1 of specification booklet of tender.
- Cement mortar of proportion 1:3 (1-cement, 3- coarse sand) shall conform to attached Specification of Materials.
- White or colour cement shall conform to M- 4 or M-5 of attached specification of materials.

Workmanship:

The work is to be executed as directed by the Engineer in Charge & as per current relevant standards / codes etc. and details specified OR finalized by the Engineer in charge.

Mode Of Measurement & Payment:

The contract rate shall be for a unit of one Sq. Meter of visible surfaces.

Item No.40

Providing and laying Vitrified tiles (GVT)8 to 10 mm thick , Min. 24" x 24" or bigger (i.e. 2' x 4' or 8' x 4') as selected by EIC in flooring treads of steps and landing laid on a bed of 12mm thick cement mortar 1:3 (1-cement : 3-coarse sand) finishing with flush pointing in white cement. etc complete selection as directed by Architect/E.I.C. Make: AGL, Nitco, Kajariya or as selected by authority.

Materials:

Water shall conform to M-1.

Cement mortar shall conform to M-11.

White glazed tiles shall conform to M-35.

Workmanship:

- Bedding the sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over surface tamped and corrected to desired level and followed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.
- The white glazed tiles shall be laid on cement mortar bedding of 12 mm. thick in C.M. 1:3. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding the base shall be cleared and well wetted. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 12 mm. thickness. The proportion of the cement mortar shall be as specified in the item.

Fixing tiles:

- The tiles before laying shall be soaked in water for at least two hours. Neat grey cement grout at 33 kg/cement/sq. Mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.
- The tiles shall not have staggered joints. The joints shall be true to center line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement grout with wire brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

Cleaning:

- The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

Mode of measurements & payments:

The work done shall be measured in sq. mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dados or plastered face of wall as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made not extra paid for any opening in the floor of area up to 0.1 sq. mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

The rate shall be for a unit of one sq. meter.

Item No.41

Providing & laying GVT Vitrified tiles in Toilet flooring, side wall skirting, risers of steps and DADO on 10mm thick cement plaster 1: 3 (1 cement: 3 coarse sands) & jointed with white cement slurry. and jointed with color cement slurry including Making 3mm spacer at joint of tiles and fill the spacer with epoxy jointing material or spacer Baar, finished with flush pointing & cleaning the surface etc complete selection as directed by Architect/E.IC IC (Min. Size -1.20Mt. X 0.60 Mt. or Bigger 8' x 4' as selected by EIC) Make: AGL, Nitco, Kajariya or as selected by authority.

Materials:

- The ceramic vitrified tiles-8mm thickness shall conform to M-58 of attached specification of materials & IS: 457-1962 & shall be of best quality, approved make & shade.
- Cement mortar of proportion 1:3 (1-cement, 3- coarse sand) shall conform to M-9 of attached Specification of Materials.
- White or colour cement shall conform to M- 4 or M-5 of attached specification of materials.

Workmanship:

Preparation of surface: - In case of brick / a block masonry wall the joints shall be raked out to a depth of at least 15mm. while the masonry is being laid. In case of concrete wall surface shall be chiseled and roughed with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

- **Laying:**
- The wall surface shall be covered within 10mm thick plaster of cement mortar 1:3 mix and allowed to harden. The plaster shall be roughened with wire brushes both ways. The back of tiles shall be floated with grey cement slurry and edges with white cement slurry. The tiles shall be gently tapped in position one after the other keeping the joints as thin as possible. Top of skirting of dado shall be truly horizontal and the joints vertical or as per required pattern.
- Risers of steps, skirting and dado shall rest on top of treads of flooring. Where full size tiles cannot be fixed they shall be cut to the required size and the edges to smoothened.
- The joints shall be cleaned and flush pointed with white cement (If required pigment shall be mixed with white cement, to match the shade of tiles). The surface shall be kept wet for seven days. After curing the surface shall be washed clean.
- Colour & size shall be of the Vitrified tiles should be provided as per instruction of Engineer – In- Charge.

Mode of Measurement & Payment:

The contract rate shall be for a unit of one Sq. Meter of visible surfaces.

Item No.42

Providing & fixing 18 mm thick first quality Black Polished Granite stone approved by Client/Architect for Doors - windows Frame, Lintel, jambs & sill in cement mortar (1:4) including cutting, fixing in cement paste with hairline joint, filling the joints with white cement / pigments / joint filler, rounding of edges, edge polishing & finishing as directed by the Engineer. (fixing the granite in one piece). Material should be as per brand list as selected by authority.

Materials:

- 18mm thick granite with finish shall be used as per sample approved by authority/ interior designer / arch.
- Matching pigment shall be used of approved material by authority/ interior designer / arch.
- All type of material shall be used as per approved make list and confirming to relevant IS codes and approved by authority/ interior designer / arch.

Workmanship:

Dressing of slabs: stone shall be cut to require size and fine chisel dressed to give a smooth and even surface on all sides to full depth. A straight edge laid along the sides of the stone shall be fully in contact with it chisel dressing shall also be done on top surface to remove any waviness. The sides and top surface of marble slabs shall be machined rubbed or table rubbed with coarse sand before using. All angles and edges or slabs shall be true, square and free from chipping. The thickness of stone shall be 18mm the allowable tolerance shall be 2mm, allowable. The tolerance shall +5 mm in length and breadth.

Bedding:

Granite slab shall be laid on bedding of cement mortar 1:4 (1 cement: 4 coarse sand) of including 20mm to 30mm thick as given in description of item.

Laying:

The surface of sub-grade shall be cleared, wetted and mopped. Mortar of specified mix and thickness shall then be spread on an area sufficient to receive one slab. The slab be washed clean before laying. It Granite laid on top pressed and tapped gently to bring it in level with other slabs. It shall then be lifted and a side. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depression. The mortar shall then be allowed to harden it over this surface cement slurry or honey like consistency at 4.4 kg. Of cement per sq. Meter. The edges of slabs already paved shall be buttered with gray cement. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slab. The joints shall be as fine as possible. Surplus cement on the surface of the slab shall be removed. The slab fixed in the floor adjoining the walls shall enter not less than 10mm. Under the plaster skirting or dedo. The junction between the walls and floors shall be finished neatly. The finished surface shall be true to level and slopes as directed. The whole work is to be completed as per design; sample material & any other requirement shall be as per instruction of authority/ interior designer / arch.

Mode of measurements & payments:

The work done shall be measured in square meter for visible area of work done. The length and width of the flooring shall be measured between the faces of skirting or dedo or plastered face of wall as the case maybe. The paving under dedo or skirting shall not be measured. The rate shall be for a unit of one square meter.

Item No.43

P/F 18 mm avg. thick double polished (both side) jet black granite slab for urinal partition incl. making groove in wall and fixing properly in line & level incl. all cost of materials & labours etc. complete at all levels.

Description should be same as above item no.41, except both side polish should be done as directed by authority.

Mode of measurements & payments:

The rate shall be for a unit of one square meter.

Item No.44

Providing and fixing 35 mm thick Flush door shutters excl. door frame (fitted on granite frame) , including fixing 1 mm thick exterior lamination over it on both sides, peripheral 2 x 3 cm mounding patti with colour, with Stainless Steel hinges size - 6" x 1.25", dead lock with 4 key , SS handle size 30 cm Long, SS Tower Bolt (Stoper) size 20cm long, as per detail including one coat of primer and two coats of oil painting as and where required, pattern and design is to be approved by the Architect/EIC.

Materials:

Flush door shall conform to M-52.

Plywood shall conform to M-61.

Anodized aluminum butt hinges shall conform to M-25.

Workmanship:

- The relevant specifications of shall be followed except that the shutters be non-decorative type and block board core with face veneer or plywood with 35 mm. thickness. & 1 mm of selected mica on both sides.
- Readymade shutters shall be of correct size and shall fit into the door or other opening without excessive scraping of edges. Adding of battens etc., to make up to the size shall be allowed.
- Item includes all necessary fitting / fixing, fixtures- as per approved hardware system with double action floor spring, handle with lock, door stop, hinges, locks and all others accessories complete as per drawing and description.
- All doors should be properly levelled without any sagging and with smooth opening and closing. There should be no variation or deviation of any kinds.
- The whole work is to be complete as per design; including necessary support of plywood in ceiling etc. To be provided without any extra cost. Sample material & any other requirement shall be as per instruction of authority/ interior designer / arch.
- Sample mock shall be approved from authority/ interior designer / arch.

Mode of measurements & payments:

The rate shall be for a unit of one square meter.

Item No.45

PARTLY GLAZED DOUBLE LEAF DOOR (LAMINATE FINISH):- Providing & Fixing Partly Glazed Double leaf Door, required of size as per detail drawing (for each door.) considering block board flush door sheet of 35 mm thickness covered both side by 9 mm ply & finished with 1 mm thick laminate on both sides of shutters and having 12 mm clear toughen glass slits as per given pattern & size with crystal edges in both shutters, fixed with Burma border Patti at joints , Finishing with all necessary S.S hardwires like DOOR S.S Handles 5PHO 2218SS -FPHO 2218, conceal Door lock Mortise Body 85x60M S.S , DOOR UK key CYLI,60MM 1CK S.S 5 KEY M/HL 125 ROSE SS, cylinders, stoppers, tower bolt, MS nails, SS-304 screws, miscellaneous hardware items etc. As per details given in drawing and as per instructions of Architect/ consultant/ Engineer In charge.

PARTLY GLAZED DOUBLE LEAF DOOR (LAMINATE FINISH):- Providing & Fixing Partly Glazed Double leaf Door, (finished size of door is 50 mm) of size 900 mm x 2400 mm (for each door.) considering block board flush door sheet of 35 mm thickness covered both side by 9 mm ply & finished with 1 mm thick laminate on both sides of shutters and having 12 mm clear toughen glass slits (two nos.) as per given pattern & size with crystal edges in both shutters , fixed with Burma border Patti at joints, rest on floor spring of 100 kg to 120 kg (heavy duty or equivalent.) & Top-Bottom fitting for door-pivot. All exposed framing made by Burma border bidding finish with laminate. Finishing with all necessary hardware like SS brush finish handles, conceal locks, stoppers, tower bolt, MS nails, SS-304 screws, miscellaneous hardware items etc. As per details given in drawing and as per instructions of Architect/consultant/Engineer In charge. (Note: For partly glazed door two various patterns are there. Contractor has to follow as per given instruction of architect/consultant or Engineer in charge.). All material should be use as per brand list or as selected by authority.

Mode of measurements & payment

The rate shall be for a unit of One Sq.mt.

Item No.46,47,48 & 49

Providing and fixing standard extruded of aluminum section of size 63.50 x 38.10 x 1.95 mm (of Jindal Section no:4605, @ Wt 1.094Kg / Rmt with colour anodized aluminum frame with 5 mm thick transparent bronze colour tinted float glass with colour anodized aluminum frame for ventilation with 5 mm thick frosted glass as details etc complete (work

for all the floors). As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Item No.47

Providing and fixing extruded aluminum window having extruded aluminum Colour Powder Coated section frame main outer size 127mm x 38.10mm x 1.35mm ,@ Wt.1.384 Kg/mt, horizontal Four track member size 122.20mm x 31.75mm x 1.10mm @ Wt. 1.205 Kg/mt, vertical member of size 122.20mm x 31.75mm x 1.50mm ,@ Wt. 1.398 Kg/mt with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm @ wt. of 0.456Kg/mt, vertical member of size 40mm x 18mm x 1.29mm @ wt. of 0.456Kg/mt,@ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Item No.48

Providing and fixing window having extruded aluminum Colour Powder Coated section frame main outer size 95mm x 24mm x 1.17mm @ wt.of 0.738 Kg/mt, horizontal Three track member size 92mm x 31.75mm x 1.30mm @ Wt.1.07 Kg/mt, vertical member of size 92mm x 31.75mm x 1.50mm ,@ Wt. 1.06 Kg/mt with sliding shutters of horizontal member size 40 mmx18mm x1.29mm @ wt.of 0.456 Kg/mt, vertical member of size 40mm x 18mm x 1.29 mm @ wt.of 0.456Kg/mt with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc. . As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Item No.49

Providing and fixing window having extruded aluminum Color Powder Coated section frame including mosquito net wire mesh shutter with powder coated aluminum fittings size as per architectural drawings etc complete as directed by architect /EIC.

Materials:

These shall be obtained from approved and established manufacturers and shall be of aluminium alloy conforming to IS:733 and sections shall generally conform to IS: 1948.

These shall be fabricated as per the detailed drawing and description.

GENERAL:

- The unit assemblies shall be as per drawing or as directed by the Architects.
- The unit assemblies shall be anodized finished. Anodizing shall be minimum 20 to 25 microns thick, of matt non-directional and non-specular. Anodized surface shall be suitably protected during transportation, storage and erection.
- Sub units shall be joined together by concealed screws, Jamb member shall be self mullioning type obtaining use of separate mullions, thus increasing clear height of each unit.
- Joints shall either be mitred or coped. All joints shall be neat, hair line, and sealed with epoxy to make them water proof.
- Openable shutters shall have a single row continuous neoprene or PVC weather strip to prevent air infiltration. Weather strips shall not be interrupted by any fittings.

- All windows shall be glazed from inside with PVC rubber or approved "Shalimar" putty. Glazing beads shall snap fit and shall be fitted without use of screws. No screws other than those on some of the hardware shall be visible.
- Glazing shall be approved and specially selected quality glass of thickness as specified in the Bills of Quantities.
- The rate shall include supplying and fixing with fittings and fixtures including approved locking arrangements.
- Before handing over, the aluminum work shall be washed with mild solution of non-alkali soap and water.
- The glazing units, doors, windows and ventilators shall not be built into the walls but shall be fixed in the prepared opening with lugs in masonry or with screws and jute expansion plugs in holes carefully drilled in RCC work. Mastic compound shall be provided all around the frame of the glazing unit at the junction of the frame and opening to make the junction watertight.
- Composite glazing units shall be supplied loose with necessary coupling transoms or mullions with machine screws and mastic compound and shall be coupled with box mullions. The mullions shall be embedded in mastic to make the joint watertight.

Mode of measurements & payment

The rate shall be for a unit of One Sq.mt. of net area fixed at site.

Item No.50

Providing & fixing 35 MM thick door shutter excl. door frame (fitted on granite frame) consisting of solid core single or double leaf flush door shutter of 30 MM thickness, lipped with 15 mm (5MM x 3) thick x 30 mm width on stiles & top rails and 10 mm (5 mm x2) other stiles and bottom rails. The inner panel laminated with 2 mm thick termite proof, water proof & fire resistant moulded PVC sheet with 2,4,6 raised panel design in different plain and/ or pre laminated colour on one side after routing the moulded design on flush door & 2 MM plain and/ or pre laminated PVC sheet on other side using rubber adhesive on flush door and solvent cement adhesive on the PVC lapping incl. prov. & fixing stainless steel matt fixtures, fasteners and lock as per the detailed drawing etc. complete at all level (Excl. cost of granite frame). As per architectural drawings etc complete as directed by architect /EIC.

Item description followed by item No.43. like 35 MM thick door shutter excl. door frame (fitted on granite frame) consisting of solid core single or double leaf flush door shutter of 30 MM thickness, lipped with 15 mm (5MM x 3) thick x 30 mm width on stiles & top rails and 10 mm (5 mm x2) other stiles and bottom rails. The inner panel laminated with 2 mm thick termite proof, water proof & fire resistant moulded PVC sheet with 2,4,6 raised panel design in different plain and/ or pre laminated colour on one side after routing the moulded design on flush door & 2 MM plain and/ or pre laminated PVC sheet on other side using rubber adhesive on flush door and solvent cement adhesive on the PVC lapping incl. prov. & fixing stainless steel matt fixtures, fasteners and lock as per the detailed drawing and directed by authority etc. complete at all level.

Mode of measurements & payment

The rate shall be for a unit of One Sq.mt. of net area fixed at site.

Item No.51

Providing & Fixing 100 mm vertical/Horizontal blind of NL or vyoma or equitant make of choice shade & pattern rate shall be including necessary NOTCH guard treatment on both sides, the overlaps shall be uniform & adequate. As per architectural drawings etc complete as directed by architect /EIC.

Materials:

- Vertical/Horizontal blinds shall be used as per approved make and sample by authority/ interior designer / arch.
- All type of material shall be used as per approved make list and confirming to relevant IS codes and approved by authority/ interior designer / arch.

Workmanship:

- Fixing of blinds as per approved sample by authority/ interior designer / arch.
- Work is to be complete as per design; sample material & any other requirement shall be as per instruction of authority/ interior designer / arch.
- **Mode of measurements & payment**
- The size of the blind will be measured from end-to-end bracket (left to right bracket) height will be measured from top of the pelmet to sill bottom LVL and clear opening size only there will be not extra payment towered overlapping.
- Area shall be measured in square meter.

Item No.52

Providing and fixing eco-friendly light weight calcium silicate false ceiling tiles having Tegular edge & 15 mm Thick Densified edges on the Tile Periphery for Extra Strength the Light weight calcium silicate ceiling tiles shall have, light reflection 85% non-combustible as per B.S. 476-part IV, 100% humidity resistance and also having thermal conductivity 0.043° w/m KC. for the best thermal Insulation. The Light weight calcium Silicate tile shall be of approved texture Fine fissured/Spintone/Cosmos having NRC value of 0.5 & Globe having NRC value of 0.75 NRC or equivalent of size 595 X 595 mm to be laid on true horizontal level suspended inter locking metal grid of hot dipped galvanized steel sections (galvanizing @120 grams per sqm including both side). consisting of main 'T' runner suitably spaced at joints to get required length and size of 24X38mm made from 0.30 mm thick (minimum) sheet, 1200mm center to center, and cross 'T' of size 24X28mm made out of 0.33mm (Minimum) sheet spaced 1200mm along spaced between main 'T' at 600mm center to center to form a grid of 1200X600mm and secondary cross 'T' of length 600mm and size 24x28mm made of 0.30 mm thick (Minimum) sheet to be interlocked at middle of the 1200X600mm panel to form grid of size 600X600mm resting on periphery walls/partitions on a perimeter wall angle precoated steel of size (24X24X3000mm made of 0.40mm thick (minimum) sheet with the help of raw plugs at 450mm center to center with 25mm long dry wall screws @ 230mm interval and laying 15mm thick Densified edges light weight calcium silicate ceiling tiles of approved texture (Fine Fissured /Cosmos/ Spintone) in the grid including, cutting /making opening for services like diffusers, grills, light fittings, fixtures, smoke detectors etc., wherever required. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Materials:

Material should be as per description and as per approved make/Brand list and as selected by authority.

Workmanship:

GRID CEILING: Providing and fixing eco-friendly light weight calcium silicate false ceiling tiles having Tegular edge & 15 mm Thick Densified edges on the Tile Periphery for Extra Strength the Light weight

calcium silicate ceiling tiles shall have, light reflection 85% non-combustible as per B.S. 476-part IV, 100% humidity resistance and also having thermal conductivity 0.043° w/m KC. for the best thermal Insulation. The Light weight calcium Silicate tile shall be of approved texture Fine fissured/ Spintone/Cosmos having NRC value of 0.5 & Globe having NRC value of 0.75 NRC or equivalent of size 595 X 595 mm to be laid on true horizontal level suspended inter locking metal grid of hot dipped galvanized steel sections (galvanizing @120 grams per sqm including both side) consisting of main 'T' runner suitably spaced at joints to get required length and size of 24X38mm made from 0.30 mm thick (minimum) sheet, 1200mm center to center, and cross 'T' of size 24X28mm made out of 0.33mm (Minimum) sheet spaced 1200mm along spaced between main 'T' at 600mm center to center to form a grid of 1200X600mm and secondary cross 'T' of length 600mm and size 24x28mm made of 0.30 mm thick (Minimum) sheet to be interlocked at middle of the 1200X600mm panel to form grid of size 600X600mm resting on periphery walls/partitions on a perimeter wall angle pre-coated steel of size (24X24X3000mm made of 0.40mm thick (minimum) sheet with the help of rawl plugs at 450mm center to center with 25mm long dry wall screws @ 230mm interval and laying 15mm thick Densified edges light weight calcium silicate ceiling tiles of approved texture (Fine Fissured/Cosmos/Spintone) 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 25X35X1.6mm fixed to ceiling with 12.5mm dia and 50mm long dash fasteners, 4mm G.I. adjustable rods with galvanized steel level clips of size 85X30X0.8mm, spaced at 1200mm center to center long main 'T' bottom exposed with 24mm of all T-sections shall be pre-painted with polyester baked paint, for all heights, as per specifications, drawings and as directed by engineer-in-charge.

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 tiles shall have NRC. Value of 0.50 (Minimum) for Fine fissured/Spintone/Cosmos and 0.75 NRC for Globe, light reflection 85% non-combustible as per B.S. 476-part IV, 100% humidity resistance and also having thermal conductivity. 0.043° w/m KC.for the best thermal Insulation.

Mode of measurements & payment

The rate shall be for a unit of one square meter.

Item No.53

Providing and fixing single layer waterproof Gypsum board moisture resistant 12.5 mm thick of the make Newgood Group Co. Ltd. or equivalent & Newgood Group Co. Ltd. company sections using waterproof board of size 1220 mm x 1830 mm x 8.0 mm suspended by G.I suspender of size 25 mm x 3 mm with intermediate channel of size 18 mm x 40 mm x 0.80 mm at 1220 mm center to center ceiling section of size 40 mm x 35 mm x 0.55 mm at 457 mm center to center and perimeter channel A of size 20 mm x 27 mm x 30 mm x 0.50 mm at edges & drops including paper tap sand soffit cleat, anchor fastener, scotch bolt connecting cleat joining compound top coat on ceiling including making necessary opening for light fitting, diffuser etc. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Materials:

Metal Surface (Gypsum Brand) suspended ceiling regular (Single layer) using 12mm thick gypsum board.

Workmanship:

Suspended ceiling which include G.I. periphery channels of size 0.55 mm thick heaving one flange of 20mm and other flange of 30mm and a web of 27mm along with perimeter of ceiling screw fixed to the wall/ partition with help of nylon sleeves and screw at 610mm centre, then suspending G.I. intermediate channels to size 40mm x 0.8mm thick with two flange of 80mm each from the slab at 1.220 centre to soffits

with G.I. cleat and steel expansion fasteners ceiling section of 0.55 mm thickness having knurled web of 40mm and two flanges of 35mm each with lips of 10.5 mm are then fixed to the intermediate channel at 457mm centres.

12mm thick gypsum calcium silicate tapered edge board is than screw fixing is done mechanically either with screw driver of drilling machine with suitable attachment. The boarding is to be don keeping a gap of 2mm from all sides of the boards and making a 3mm tapered edge on the two sides of the boards.

Jointing and finishing method: finally, the boards are to be jointed and finished so as to have a flush cock which includes filling and finishing the square edges of the boards with lime and PVA based materials with fibre tape.

Necessary gape for light diffuser fans and cut out shall have to be made.

Mode of Measurements and Payment:

Measurement shall be taken for finished visible work and rate shall be for a unit of one square meter Basis. The rate includes the cost of materials and labour etc. complete

Item No.54 & 55

External wall painting (two coats of priming coat + two coats of paint) with APEX exterior paint of Asian paints or as per brand list equivalent of required shade or equivalent including a priming coat of primer of approved brand and manufacture on wall & any other surfaces to give an even shade after thoroughly brushing the surface & making the surface free from mortar droppings and other foreign matter and sand papered smooth incl. filling the all small holes, cracks, open joints, undulations and similar other minor defects of every kind with ready-made putty of approved brand and manufacture and rubbed smooth with sand paper incl. nece. scaffoldings etc. complete at all floor levels. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Item No.55

Wall painting with (two coat) plastic emulsion paint of approved brand and manufacture on undecorated wall / Ceiling surfaces to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth including two coat birla putty & two coat Primer of approved brand. (work for all the floors). Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Materials:

- Birla or equivalent quality white putty as per approved make/brand list and as selected by engineer in charge shall be used for finishing coat on 15mm plastered surface as directed.
- Plastic emulsion paint of approved brand and manufacturer of required shade on wall surface.
- The dry distemper and primer shall be of approved brand and manufacture. The dry distemper shall be of required colour and shade and the same conform to I.S. 427-1965. Whiting shall conform to I.S. 63-1964.

Application White Putty for finishing coat.

Birla or equivalent approved make white putty shall be applied in true line and plumb on 15mm sand face plastered surface as directed by engineer in charge. The smooth finish shall be in proper manner so that the depressions or un evenness shall not be found on the finished surface.

Preparation of surface:

- The undecorated surface to be distempered shall be thoroughly brushed free from dust, dirt, grease, mortar, droppings and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry at least 2 months before application of distemper.
- All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with dry distemper of the colour to be used. The surface shall then be rubbed down again with a fine grades and paper and made smooth. The surface affected by moulds, moss, fung, algee, litchens, efflorescence etc. shall be treated in accordance with I.S. 2395 (part-I) 1966 before applying distemper. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulations and then sand papering the same after it is dry.

Priming Coat:

- Application of primer shall be done as under: The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly possible leaving no brush marks. It shall be allowed to dry for atleast 48 hours before oil bound distemper or paint is applied. No coat of white washing with lime shall be used as a priming coat for distemper.

Application shall be done as under:

- The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.
- Distemper is not recommended to be applied within six months of the completion of wall plaster.

Proportion of distemper:

- The distemper shall be diluted with water or any other prescribed thinner in manner recommended by manufacturers only. Sufficient quantity of distemper required for one day's work shall be prepared.

Application of distemper coat:

- For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surfaces shall be lightly sand papered to make them smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper dry of the preceding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.
- Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed on the same day.
- 15 cm. double bristle distemper brush shall be used. After the day's work, brushes shall be thoroughly washed in hot water with soap solution and hang down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

Protective Measures:

The surfaces of doors windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be protected from being aplashed upon. Such surfaces shall be cleaned of distemper aplashes, if any.

Application of Plastic emulsion paint for finishing coat.

- Wall painting (two coats) with distempering with dry distemper of approved brand and manufacturer of required shade on wall surface to give an even shade.

Workmanship:

- Preparation of Surface - The surface shall be thoroughly cleaned of all dust, dirt, mortar droppings and other foreign matter before painting is to be applied.
- The surface spoiled by smoke soot shall be scraped with steel wire brushes or steel scrapers or shall be rubbed with over burnt surkhi or brickbats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.
- Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubbed with wire brushes.
- All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portion shall be wetted and allowed to dry. They shall then be given one coat of paint. Each coat shall be allowed to dry before the next coat is applied. The number of coats as specified in item shall be applied.
- All unnecessary nails shall be removed, the holes, cracks, patches etc. shall be made good with materials similar in composition to the surface to be prepared.
- Splashing and dropping if any on the flooring, doors and windows, ventilators etc. shall be removed and the surface cleaned.

Scaffolding:

- Where scaffolding is necessary it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be painted. A properly secured strong and well tied suspended platform (Zoola) may be used for painting. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the floors and walls. For painting of ceilings, proper stage scaffolding shall be erected where necessary.

Mode of measurements and payment:

- Priming coat of distemper primer, scraping of surface spoiled by smoke soot, removal of oil and grease spots, treatment for infection of efflorescence, mould, moss, fungi, algae and lichens and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.
- All the work shall be measured net in the decimal system as in places subject to the following limits unless otherwise stated hereinafter:
 - (a) Dimensions shall be measured to the nearest 0.01 m.
 - (b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be measured in sq. metre. No deductions shall be made for ends of joints, beams, posts etc., and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around the ends of joints, beams, posts etc.
- Deductions or openings exceeding 0.5 m. but not exceeding 3 sq. m. each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc of these openings:
 - (a) When both the faces of walls are provided with the same finish deductions shall be made for one face only.
 - (b) When each face of wall is provided with different finish, deduction shall be made for that of frame for door, windows etc., on which width of reveal is less than that of the other side but no deductions shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.
 - (c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that of untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.
- In case of openings of area exceeding 3 sq. m. each, deduction shall be made for openings, but jambs, sill and soffits shall be measured.
- No deduction shall be made for attachments such as casing, conduits, pipes, electric wiring and the like.

- Item includes removing nails, making good holes, cracks, patches with materials similar in composition to the distemper.
- The rate includes cost of all materials, labour, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handling, unloading, storing etc.
- The rate shall be for a unit of one sq. meter.

Item No.56

Applying priming coat over new steel and other metal surface after and including preparing the surface by thoroughly cleaning, oil, grease, dirt and other foreign matter and scoured with brushes fine steel wood, scrapers and sand paper with ready mixed priming paint brushing red lead. Painting two coats (including 1 Priming coat) on new steel and other metal surface with enamel paints brushing, interior to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter. (work for all the floors).

Materials:

The item shall be executed as per the relevant specifications of general technical specification for building work booklet.

- It should be carried out as Applying priming coat over new steel and other metal surface after and including preparing the surface by thoroughly cleaning, oil, grease, dirt and other foreign matter and scoured with brushes fine steel wood, scrapers and sand paper with ready mixed priming paint brushing red lead. Painting two coats (including 1 Priming coat) on new steel and other metal surface with enamel paints brushing, interior to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter. (work for all the floors)
- Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall be used.

Mode of measurements and payment:

The rate shall be for a unit of one sq. meter.

Item No.57

Providing and fixing S.S. (8% nickel, SS304) PIPE RELLING of 0.90m height as pattern shown in drawings at STAIRCASE with anchoring 0.075m in RCC or masonry including 50mm dia. SS pipe 18 gauge @ 1.40 kg./m as hand rail, 40x40mm SS pipe 18 gauge @ 1.40 kg./m as vertical support and 16mm dia. SS pipe 18 gauge @ 0.45 kg./m as intermediate horizontal member including welding, grinding, fixing in position with necessary fixtures and fastenings (25mm bracket, base SS cap 50mm dia. hole, base SS cap 40x40mm hole, SS pipe cap 16mm hole & 16mm long) and polishing etc. completed. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

- The rate shall be on Running meter basis of railing. The rate shall include providing and fixing all pipe railing work with necessary jointing welding labour for fixing the in position, etc. complete
- Whole work should be carried out as per requirement and as directed by Engineer-in-charge. All steel pipes shall be used SS304 grade.
- It should be carried out as follows.

Providing and fixing S.S. (8% nickel, SS304) PIPE RELLING of 0.90m height as pattern shown in drawings at STAIRCASE with anchoring 0.075m in RCC or masonry including 50mm dia. SS pipe 18 gauge @ 1.40 kg./m as hand rail, and 16mm dia. SS pipe 18 gauge @ 0.45 kg./m as intermediate horizontal member including welding, grinding, fixing in position with necessary fixtures and fastenings (base SS cap 50mm

dia. hole, SS pipe cap 16mm hole & 16mm) and polishing etc. complete as per detailed drawings & directed by E.I.C.

Mode of measurements and payment:

The Item shall be measured and paid as finished work on Running Meter basis.

Item No.58

Providing and fixing M.S. grills of required pattern to wooden frames of windows etc. with M.S. flats at required spacings and frame around, square or round bars with round headed bolts and nuts or by screws (A) Plain Grill

Materials:

The structural steel shall conform to M-19 & C-64/A.

Workmanship:

- The M.S. Grill shall be prepared as per the drawing or as directed for fixing to wooden/RCC frames of windows etc.
- The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be reverted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc. before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts or screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to minimum of 2 Nos. on each side of the frame or as indicated in the drawing or as directed.
- The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of the frame strips.

Mode of measurements and payment:

- No payment shall be made for weight of screws, bolts nut etc. only weight of grill shall be paid.
- The rate shall be for a unit of one kg.

Item No.59

Providing and fixing in position collapsible steel shutters with vertical channels 20mm x 10mm x 2mm braced with flat iron diagonals 20mm x 5mm size with top & bottom rail soft iron 40 mm x 40mm x 6mm with 38mm diameter steel pulleys complete with bolts, nuts, locking arrangements, stopper handles including applying a priming coat of red lead paint. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Materials:

Vertical Channels:

- These shall be hot rolled medium channels of at least 18 x 9 x 3 mm and shall be of weldable quality mild steel conforming to IS: 1977-1975*. 5.2

Crossings or Lacings:

- These shall be flats of mild steel of at least 18 X 5 mm size conforming to IS : 1977-1975*. 5.3 Top and Bottom Runner - Tees or 'E's used for bottom runner shall have minimum web of 40 X 12 mm and flange of 40 x 6 mm, and the flats used for top runner shall be of minimum size 40 x 12 mm. All these shall conform to IS: 1977-1975*. 5.4 Roller Wheels - These shall be of grey iron castings conforming to grade FG 150 of IS: 210-1978.

Spacer or Sockets:

- These shall be of cast aluminum conforming to IS: 733-1975. 5.6 Rivets - These shall not be less than 6 mm diameter, snap headed, and shall conform to IS: 2155-1962.

Fabrication, Workmanship and Finish:

- Collapsible gates shall be fabricated from rolled steel channels, T or E sections and flats. These shall be provided with roller wheels at bottom to roll on 'T' or 'E' bottom runners or with wheels at top to roll on flat top runner. The channels shall have a maximum spacing of 100 mm when the gate is in closed position. The vertical channels shall be first riveted in pairs with toes face to face and with the spacers in position. The crossings shall be introduced at appropriate positions and rivetted. One set of crossings shall extend from 450 to 600 mm in height and the clear space between two sets of crossings shall be within 150 mm. The edges shall then be trimmed, locking eyes and handles welded or rivetted and the roller wheels fitted in the respective channels.
- The number and size of roller wheels shall be dependent on the width of the gate and shall be as given in Table 1. The roller wheels shall be capable of taking the weight of the gate. For gates of width more than 1.5 m and up to 2'0 m, the wheels may be fitted with ball bearings; and for gates of width above 2'0 m, the wheels shall be fitted with ball bearings. Single row ball bearings, self-lubricating type shall be used. The bottom and top runners shall be fabricated separately with necessary holding fixtures for burying in the ground or fixing in the lintel or to the walls, as the case may be. Suitable holding fixtures shall be provided for fixing the end channels at the face of the openings. Welding is not required in fabricating the gate except as specified under. All the components shall, therefore, be capable of being dismantled by cutting away the rivets. Maintenance or replacement of worn-out parts shall not, therefore, pose any problem. The fabricated parts shall be finished with a coat of red oxide primer, conforming to IS: 102-1962.

Mode of measurements and payment:

- No payment shall be made for weight of screws, bolts nut etc. only weight of grill shall be paid.
- The rate shall be for a unit of one Quintal.

Item No.60

LOUVERS: Supplying and Installation of Aluminum powder coated louvers etc complete as per drawing& selection as directed by Architect/Engineer in charge.

As per detail drawing and as directed by EIC/Architecture.

Mode of measurements and payment:

- The rate shall be for a unit of one Sq.Mtr.

Item No.61

Providing a I.S.I mark 7 levers three keys brass pad lock of NAVTAL (Godrej) make 75mm dia on completion of project.

Materials:

Agency should provide I.S.I. mark 7 lever three keys brass pad locks of Navtal (Godrej) make 75mm dia.

Workmanship:

- On completion of the project agency has to lock each unit and require to paint mark on block / unit number on lock and key.
- Agency has to makes bunch of keys per unit properly tied with chain.

Mode of measurements and payment:

The rate shall be for one number of completed item.

Item No.62

Constructing of Cooking platform (sandwich type) 80cm high resting on thick sandwiched polish kota stone in C.M 1:3 with providing and fixing 25 mm thick rough kota stone at bottom and 25mm thick Polish kota stone/ Granite stone (single piece) top and polished kota stone/ granite stone (single piece) 25mm thick on top with 15mm high machine cut polished kota stone /granite round moulded facia patty including polishing etc. complete as per drawing and specification without stainless steel sink including necessary cutting for sink & making hole for gas pipe and fixing P.V.C bend of 25mm dia.

- The Item shall be executed as per the relevant specification of General Technical Specifications for Building works Booklet Item No. M – 52 / P-23 Thickness of granite shall be 18 mm thick in Suggested colour and with mirror polish.
- The cooking platform of size as directed shall be construction in 60 cm width and 80 cm. high.
- Stone shall be of required size with hand dressed edges and for sandwich facing sides and edges must be polished and wall dressed. Two stone shall be sandwich with cement slurry. Stone size and shade shall be approved by the Engineer – in – charge.
- The facia patti of 20 mm thick granite stone with all four sides Machine cut machine finish shall be provided and fixed in the front of cooking platform as per the drawing and as directed.
- The granite stone slab shall be fully molded round on all front edge and both side mirror polished as directed by the Engineer in charge.

Mode of measurements and payment:

- The rate includes cost all material labour form work and centering required for satisfactory completion of this item.
- The rate shall be for a unit one running meter of visible length of platform provided for complete work.

Item No.63

Providing and fixing 5 mm thick PVC sheets as signage and display of health signs/information of required size having retro reflective letters/design as per requirement, fixing the same through approved adhesive etc. complete work shall be carried out as per instruction of Engineer-in-charge (Approved make PVC foamed sheet only) (25 x 6 cms.)

Material:

- Material is used PVC Sheet of unbreakable and shatter proof light weight matt surface and advertising grade sheet of approved make and vinyl is used of LG or max or equivalent as per approved make list.

Application:

- Keep micro clean of PVC sheet with sprinkling water on it and then, pesting of self-adhesive vinyl sheet over with uniform press.

Mode of measurements and payment:

- The rate shall be for a unit of one no. The rate includes the cost of labour, materials etc. complete.

Item No.64

Providing & Fixing Engraved letters, figures, logo etc. on 1 mm thick S. S. 304 grade plate (inching plate) and fix on any surface, wall and at any height. Plates will be fix with Brass Pins and nuts in proper line & level. (stops, comas, hyphens and the like not to be measured and not paid for separately (ii) Indian letters-

Material:

- Material is used S.S. 304 of Approved make. Front gauge is 19 and Side wall are of 20 gauge.

Application:

- Cutting of 304 grade stainless steel on laser as per given details size, after that bending and shouldering done by hand made, fitting fixing are as per given, and bolt, screw etc. as per given details. Etc. complete.

Mode of measurements and payment:

- The rate shall be for a unit of one Sq.Mtr basis. The rate includes the cost of labour, materials etc. complete.

Item No.65

Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658: 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC: SP 63-2018 etc. Complete. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

Material:

- The size of rubber moulded coloured paver block shall be 275mmx195mm or 272mmx190mm or 250mmx 250mm of shape approved by the Engineer, manufactured in automatic press machine.
- Shape - Uniform unit shape
- Tolerance in size ± 1 mm in length and width all sides
- Colour: Colour to be of approved shade with minimum colour layer on top to be 12mm to 15mm. The top surface should be a smooth shining surface.
- Compressive strength - Minimum 400 kg/cm² as specified
- Testing norms - 5 blocks out of 10000 Nos. of paving blocks

Paver Blocks:

- The block shall be a M-30 concrete grade. The min. strength of paver block should not less than 300 Kg/cm². The block shall be confirming with IS 15658:2006 or its latest revision. The blocks must be manufactured on Vibropress type machine only. For the paver block manufacturing, the feeding of material into the machine by automatic batching plant. The blocks will be made using wear resistant materials in the face mix and must be cured in controlled environment to ensure efflorescence free material. The block shall be supplied in uniform size and shape as approved by Engineer in charge. The block should bearing ISI marked high finished shot blasted texture. The paver should have uniform chamfers to facilitate easy drainage of surface run off. The pavers should have uniform interlocking space of 2 mm to 3 mm to ensure compacted sand filling after vibration on the paver surface.
- The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.

The minimum requirement as per IS is given below,

Sr. No.	Parameters	Min. Requirement
1	Percentage Water Absorption	Average not over 6%
2	Compressive strength	Average not less than 400 Kg/cm ²

3	Tensile Splitting Strength (as per EN 1338)	Average not less than 3.6Mpa
4	Average wear in Thickness- Abrasion	Less than 2mm
5	Tolerance in size (length + breadth)	± 1.mm
6	Thickness of wearing layer	Not less than 5mm
7	Tolerance in Thickness of block	± 2mm

- The manufacturer must have in house testing laboratory to carry out all testing including Compressive strength testing, Water absorption, abrasion resistance etc.
- The laying of cement concrete paver block shall be commenced with fine sand/grit as directed by Engineer in charge.
- A layer of 35 mm sand/grit is used for levelling. The joints shall be as narrow as possible and normally the joint shall be filled with sand in proper line and level.
- All necessary materials, tools, tackles are required to be arranged by the Contractor.
- The work shall be done as per given pattern and instruction of Engineer in charge.

Bedding Sand Course:

- The bedding sand shall consist of a clean well graded sand/grit passing through 4.75 mm sieve and suitable for concrete. The bedding should be from either a single source or blended to achieve the following grading.

In Sieve Size	% Passed
9.52 mm	100
4.75 mm	95-100
2.36	80-100
1.18	60-100
600 Microns	25-60
300 Microns	10-30
150 Microns	5-15
75 Microns	0-10

- Contractor shall be responsible to ensure that single-sized, gap graded sands or sands containing an excessive number of fines or plastic fines are not used. The sand particles should preferably be sharp not rounded as sharp sand possess higher strength and resist the migration of sand from under the block to less frequently areas even though sharp sands are relatively more difficult to compact than rounded sands, the use of sharp sands is preferred for the more heavily trafficked driveways. The sand use for bedding shall be free of any deleterious soluble salts or other contaminants likely to cause efflorescence.
- The sand shall be of uniform moisture content and within 4%-8% when spread and shall be protected against rain when stock piled prior to spreading. Saturated sand shall not be used. The bedding sand shall be spread loose in a uniform layer as per drawing. The compacted uniform thickness shall be of 45 mm and within +/- 5 mm. Thickness variation shall not be used to correct irregularities in the base course surface.
- The spread sand shall be carefully maintained in a loose dry condition and protected against pre-compaction both prior to and following screening. Any pre-compacted sand or screened sand left overnight shall be loosened before further laying of paving blocks take place.
- Sand shall be slightly screened in a loose condition to the predetermined depth only slightly ahead of the laying of paving unit. Any depressions in the screened sand exceeding 5 mm shall be loosened, raked and rescreened before laying of paving blocks.

Laying of Interlocking Paver Blocks:

- Paver blocks shall be laid in uniform laying pattern throughout the pavement. Once the laying pattern has been established, it shall continue without interruption over the entire pavement surface. Cutting of blocks, the use of infill concrete or discontinuities in laying pattern is not be permitted in other than approved locations.

- Paver blocks shall be placed on the uncompacted screened sand bed to the nominated laying pattern, care being taken to maintain the specified bond throughout the job. The first row shall be located next to an edge restraint. Specially manufactured edge paving blocks are permitted or edge blocks may be cut using a power saw, a mechanical or hydraulic guillotine, bolster or other approved cutting machine.
- Paver blocks shall be placed to achieve gaps nominally 2 to 3 mm wide between adjacent paving joints. No joint shall be less 1.5 mm not more than 4 mm. Frequent use of string lines shall be used to check alignment. In this regard the "laying face" shall be checked at least every two meters as the face proceeds. Should the face become out of alignment, it must be corrected prior to initial compaction and before further laying job is proceeded with.
- In each row, all full blocks shall be laid first. Closure blocks shall be cut and fitted subsequently. Such closure blocks shall consist of not less than 25% of a full block.
- To infill spaces between 25 mm and 50 mm wide concrete having screened sand, coarse aggregate mix shall be used. Within such mix the nominal aggregate size shall not exceed one third the smallest dimension of the infill space. For smaller spaces dry packed mortar shall be used.
- Except where it is necessary to correct any minor variations occurring in the laying bond, the paver blocks shall not be hammered into position. Where adjustment of paver blocks necessary care shall be taken to avoid premature compaction of the sand bedding.

Mode of measurements and payment:

The contract rate shall be for a unit of one square meter.

Item No.66

Providing and fixing pre-cast concrete kerb stone of gray cement based concrete block 30cm length,30cm height and 15cm thick of M250 grade concrete as per approved design and including excavation for fixing in proper line and level, filling the joint with C:M 1:3 (1cement:3fine sand) etc complete.

Materials:

- The kerb shall be a M-25 concrete grade. The min. strength of kerb should not less than 250 Kg/cm². The blocks must be manufactured on vacuum wet press type machine with hydraulic pressing of concrete mixture only. The faces of the kerb shall not exhibit any defects such as cracking or flaking. The blocks must be cured in controlled environment. The block shall be supplied in uniform size and shape as approved by Engineer in charge. The size of kerb shall be 60cm length,30cm height and 15cm thick or as directed by engineer in charge.
- The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.

Laying

- Trenches shall first be made along the edge of the wearing course of the road to receive the kerb stones of cement concrete of specified grade. The bed of the trenches shall be compacted manually with steel rammers to a firm and even surface and then the stones shall be set in cement mortar of specified proportion.
- The joints of kerb and channel stones shall be staggered and shall be not more than 10 mm. Wherever specified all joints shall be filled with mortar 1:3 (1 cement : 3 coarse sand) and pointed with mortar 1:3 (1 cement: 3 fine sand) which shall be cured for 7 days. The necessary drainage openings of specified sizes shall be made through the kerb as per drawings or as directed by the Engineer-in-Charge for connecting to storm water drains. Finishing Berms and road edges shall be restored and all surplus earth including rubbish etc. disposed off as directed by the Engineer-in-charge. Nothing extra shall be paid for this.
- This item includes all necessary excavation and filling of joints pointed with mortar 1:3 (1 cement: 3 fine sand) in line and level. The debris or excavated stuff shall be dispose off as directed by engineer incharge.

Mode of measurements and payment:

It shall be measured in running meter along the edge of the road correct to a cm.

Item No.67

Providing and fixing in expansion joint 100 mm thick expansion joint board of best quality and approved make including cutting to required size and shape at all levels etc. complete as directed.

As described & directed by Authority and as per requirement.

Mode of measurements and payment:

It shall be measured in running Sq. meter

Item No.68

Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed up to 50Mt.lead.

Scope:

- This item shall consist of excavation, removal and satisfactory disposal of all materials necessary widening of Road, Re-sectioning & Profile correction of Road., Side Shoulder & Road by using cutting stuff received from cutting, in accordance with the requirement of these specification including all lead and lift and conformity with the lines, grades and cross sections shown in the drawings or directed by the engineer- in – charge. This work shall include the hauling and stacking of or hauling to sites of embankment for land scapping Island, Road work & side shoulder construction etc. of suitable cut materials as required and also the disposal of unsuitable cut materials in specified manner, including all lead and lifts including trimming and finishing of the road to specified dimensions or as directed by the engineer in charge including rolling and watering etc. complete.

Classification Of Excavated Materials:

All materials involved in excavation shall be classified by the engineer in charge in the following groups:

- i) All sorts of soil and soft murrum.
- ii) Hard murrum.
- iii) Soft rock not required blasting.
- iv) Hard rock. (not required blasting)
- v) Hard rock. (required blasting)
- vi) Hard rock (blasting prohibited)

Authority For Classification:

- The classification of excavation shall be decided by the Engineer in charge and his decision shall be final and binding to the contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer in charge.

Construction Operations:**Site Clearance:**

- The land width on which the earth work is to be done, shall be cleared from all trees, bushes, shrubs, rubbish and other objectionable materials. Useful material shall be arranged in convenient stacks and un-useful material shall be burnt or otherwise disposed of by contractor at his own cost. MoRTH specification clause No.201 shall be also followed.

Setting Out:

- After the site has been cleared, the limits of excavation and the alignment of the road shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer in charge. The contractor provides all labour and materials such as strings, time pegs, stones etc. required in connection with the setting out of works and establishment of Temporary & permanent Bench mark, centre line stone & other marks. The contractor shall be responsible for the maintenance of the bench mark and other marks, and stacks as long as in the opinion of the Engineer in charge. Before start of the work, toe line of embankment shall be marked on ground.

Compacting Original Ground:

- The original ground, where construction of embankment for land scapping Island, Road work, side shoulders and water way to be done, with excavated stuff shall be consolidated by rolling as directed by Engineer in charge and in accordance with MORTH specification Clause No.305.3.4.

Excavation:

- All excavation shall be carried out in a manner approved by the Engineer in charge and in conformity with the directions laid herein under and in manner approved by the Engineer in charge. The work shall be so done that the suitable materials available from excavation are satisfactory utilized as decided upon beforehand.
- While planning or executing excavations, the contractor shall take all adequate precaution against soil erosion, water pollution etc. as per MoRTH Clause No.306 & take appropriate drainage measures to keep the site free from water in accordance with the MORTH Clause No.311.
- The excavation shall conform to the lines, side slopes, and levels shown on the drawings or directed by the Engineer in charge. The contractor shall not excavate outside the limit of excavation subject to the permitted tolerance, any excess depth/width excavated beyond the specified levels/ dimensions on the drawing shall be made at the cost of contractor with suitable material of characteristics similar to that removed and compacted to the requirements of MORTH clause No.305.
- Care shall be taken to see that excavation is arranged in a safety way so that there will be no risk to the work or workmen. If slides occur in cutting during the process of the construction, they shall be removed at the cost of contractor as ordered by the Engineer in charge. While planning or executing excavations, the contractor shall take all adequate precautions against soil erosion, water pollution etc. as per MORTH specification clause no.306.
- All debris and loose materials on the slopes of cutting shall be removed. No back filling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in instruction of the Engineer in charge & the resulting cavities filled with suitable materials and thoroughly compacted in an approved manner.
- For rock excavation, specifications under MORTH clause No. 301.3.5 shall be followed.

Disposal & Utilizing of Excavated Stuff:

- All the excavated material shall be property of the corporation. The material obtained from the excavation of roadways, widening work, SWD, foundation for structures etc. shall be used for the work of embankment, for land scapping Island, Road work, embankment for side shoulder of roads & embankment work as directed by the Engineer in charge including leveling & spreading with all lead and lift and no extra payment shall be made for the same.
- Unsuitable and surplus materials not intended for use shall be removed from site of the work to outside estate limit or within estate limit by suitable means. No extra payment shall be made for the same.
- The useful excavated materials shall be used in embankment and it shall be directly deposited at the required location in specified layer. No handling or conveyance charges shall be paid. If no DGIDCIEA land is available, but the excavated useful stuff is to be stacked temporarily before use under the same agreement, the contractor shall make his own arrangements for the stacking of this material temporarily on private land or land of plot holders, by paying rent etc. without claiming any compensation. Surplus material not required for use on embankment or unsuitable materials may be used of his own cost to

uniformity widen embankment to flatten slopes and fill low places in the road land or plot land, if so permitted by the Engineer in charge. Material not required for any use whatsoever may be disposed off by the contractor at his own cost in a manner approved by the Engineer in charge.

- The excavation shall be finished neatly, smoothly and evenly to the correct lines, curves, grades sections and side slopes as shown on the plans or directed by the Engineer. Any damage to the existing works or work in hand caused as a result of his operations or negligence shall be made good by the contractor at his own cost. Road side gutters shall be excavated to the specified section.

Spreading The Excavated Stuff in Layers:

- The excavated stuff shall be spread uniformly over the entire width of embankment for land scrapping Island, Road work, side shoulders in layers not exceeding 250 mm in loose thickness. Successive layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down in the detailed specifications of MORTH Clods or hard lumps of cutting stuff shall be broken as directed by the Engineer in charge.

Dewatering:

- If water is met with the excavation due to springs, seepage, rain etc. shall be removed by suitable diversions, pumping or bailing out and the excavation part kept dry whenever so required or directed. Care shall be taken to discharge the drained water into suitable outlets as not to cause damage to the works, demarcated plots, crops any other property. Due to any negligence on the part of the contractor, if any such damage is caused, it shall be the sole responsibility of the contractor to repair/ restore to the original condition at his own cost or compensate for the damage. MORTH Specification Clause No. 304.3.3 shall also apply.

Public Safety:

- Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights at night to avoid accidents. The contractor shall take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures. For safety precautions, guidance may be taken from IS: 3764.

Preservation Of Property:

- The contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing road side trees, structures, drains, sewers, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which in the opinion of the Engineer in charge shall be continued in use without any change. Safeguards taken by the contractor in this respect, shall be got approved by him from the Engineer in charge. However, if any of these objects is damaged by reason of the contractor's negligence, it shall be replaced or restored to the original condition at his expense. If the contractor fails to do so, within the required times as directed by the Engineer in charge or if, in the opinion of the Engineer, the actions initiated by the contractor to replace/ restore the damage objects are not satisfactory, the Engineer shall arrange the replacement/ restoration directly through any other agency at the risk and cost of the contractor after issuing a prior notice to the effect.

Reparation of Cut Formation:

- The cut formation, which serves as a sub-grade, shall be prepared to receive the sub - base / base course as directed by Engineer.
- Any unsuitable material encountered in the sub grade level shall be removed as directed by Engineer in charge & replace with suitable materials compacted in accordance with the MORTH clause no.305.
- In rock formations, the surface irregularities shall be corrected and the level brought up to the specified elevation with granular base material as directed by the Engineer in charge, laid and compacted in accordance with the respective specifications of these materials. After satisfying the density requirement, the cut formation shall be prepared and to receive the sub-base / base course in accordance with MORTH Clause No.310 & 311 to receive the sub-base/ base course.

Finishing Operations:

- Finishing operations shall include the work of properly shaping and dressing all excavated surface/embankment works, and shall conform to MORTH specification Clause No.301.7 and 305.3.9.
- The finished cut surface shall satisfy the surface tolerance described in MORTH Clause 902.

Quality Control of Work:

- Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with these specifications and general specification for quality control on works and materials attached herewith. All testing charges shall be borne by the contractor.

Arrangement For Traffic:

- MORTH specification Clause –112 shall be applicable.

Mode of measurements and payment:

- The contract rate shall be for a unit of one cubic meter for the strata mentioned in the wording of the item of excavation acceptable completed and limited to the dimensions shown on the plans and construction of embankment/ side shoulders with cutting stuff, acceptably completed and limited to the dimensions only. Excavation shall be measured in its original position by taking cross sections before the work starts and after it is entirely completed, or levels shall be taken before and after construction. The quantity shall be worked out by the average end area method. Where it is not feasible to compute volumes by this method, because of erratic location of isolated deposits, the volumes shall be computed of the strata changes, the contractor shall bring this to the notice of the Engineer-in-charge who will then verify and if necessary, take levels for the changed strata for purposes of measurements.
- Levels and sections of the ground shall be taken in the presence of the contractor or his authorized agent before the excavation is started so as to serve as the basis of measurement. The contractor or his representative shall sign the field book in token of his acceptance of the levels. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with the specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint shall be taken. Merely not signing of the field book shall not be deemed as disagreement.
- The contract unit rate for this item shall be payment in full for carrying out the required operations including full compensation for setting out, transporting the excavated materials & disposing the same on site of the embankment/ work of side shoulder etc. as directed within all lead and lift. trimming bottoms and slopes of excavation, dewatering, keeping the work free of water as per clause 311, all materials, labours, tools, equipment, safety measures all testing charges, making arrangement for traffic and incidentals necessary to complete the work to the specifications above and all leads and lifts. No extra payment shall be made for the cutting stuff used in embankment/ shoulders.
- **The contract unit rate shall be for a unit of one Cubic meter of finished work at the site of work.**

Item No.69

Construction of granular sub-base by providing & laying of compacted thickness of 200 mm Grading 5th Granular sub base (GSB) in layers of (150 mm with geocell + 50 mm) of graded granular material consisting of machine cut black trap stone aggregate as per grading - V given in table 400-1 of the specification MORT&H and compactor to the required density with vibratory roller in all seasons as per MORT&H , maintaining the required slope & grade during the operation as approved by the engineer in charge & watering to the proper

moisture content and sprinkled with the help of truck mounted water tank fitted with suitable arrangement. (fully saturated having CBR value minimum 30).

Scope:

- This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

Materials

- Granular sub-base material shall be natural sand, ~~moorum~~, gravel, crushed stone, or combination thereof. Materials like crushed slag, crushed concrete, ~~crushed brick and kankar~~ may be allowed with the approval of the Engineer. The material shall be free from organic or other deleterious constituents and conform with the requirements in Table 400-1.

TABLE 400-1 SPECIFICATION FOR GRANULAR SUB-BASE MATERIAL

Grading Sieve Size (mm)	Percentage by weight passing
53	100
37.5	95 – 100
19.0	70 – 100
9.5	50 – 90
4.75	35 – 85
2.36	25 – 65
0.425	10 -40
0.075	4 -25
Liquid Limit (%)	≤ 25
Plasticity Index (%)	≤ 6
Soaked CBR (%)*	≥ 30

At a depth greater than 480mm below top of base course the strength requirement can be relaxed to a soaked CBR of 15 %. This material shall be termed a lower sub-base material.

TABLE

GRADING FOR CLOSE-GRADED GRANULAR SUB-BASE MATERIALS

IS Sieve	Per cent by weight passing the IS sieve		
Designation	Grading I	Grading II	Grading III
75.00 mm	100	-	-
53.00 mm	80-100	100	-
26.50 mm	55-90	70-100	100
9.50 mm	35-65	50-80	65-95

4.75 mm	25-55	40-65	50-80
2.36 mm	20-40	30-50	40-65
0.425 mm	10-25	15-25	20-35
0.075 mm	3-10	3-10	3-10
CBR Value (Minimum)	30	25	20

TABLE
GRADING FOR COARSE GRADED GRANULAR SUB-BASE MATERIALS

IS Sieve	Per cent by weight passing the IS sieve		
Designation	Grading I	Grading II	Grading III
75.00 mm	100	-	-
53.00 mm		100	
26.50 mm	55-75	50-80	100
9.50 mm			
4.75 mm	10-30	15-35	25-45
2.36 mm			
0.425 mm			
0.075 mm	<10	<10	<10
CBR Value (Minimum)	30	25	20

Strength of sub-base

- It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.
- When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the “quality” of materials, as may be necessary.

Construction Operations:

- **Preparation of subgrade:** Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.
- The existing pavement, where it is to be over layed by a granular base and embankment of less than 500mm total thickness shall be scarified in accordance with Sub-Clause 501.3.2. Where the existing pavement contains multiple bituminous layers the scarification shall be to the underside of the lowest bituminous layer. General areas within the Works where multiple bituminous layers exist will be advised by the Engineer. The Contractor will verify that all bituminous layers have been removed using appropriate methods approved by the Engineer. The bituminous surfacing material removed from the existing pavement may be used in other parts of the works provided it complies with the relevant specification clauses.
- After scarification and removal to the satisfaction of the Engineer of the bitumen surface from the existing pavement to be overlaid, the existing pavement shall be lightly sprinkled with water if necessary and rolled with three passes of an 80-100kN smooth wheeled roller. The existing pavement shall then be proof rolled with a 18 tonne single drum vibrating roller in the presence of the Engineer who shall determine the suitability of the existing pavement for overlay.

- After proof rolling, the surface of the existing pavement shall be lightly tined as directed by the Engineer where the overlay includes a sub-base layer but the compacted depth of the sub-base layer is less than 75mm. In other cases, tining is not necessary.”
- **Spreading and compacting:** Where a lower sub-base material is used the minimum compacted layer thickness shall be 75mm. The sub-base material of grading specified in the Contract shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer.
- Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations, as in small-sized jobs. The equipment used for mix-in-place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.
- The moisture content of the loose material shall be checked in accordance with IS : 2720 (Part 2) and suitably by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 percent above to 2 percent below the optimum moisture content corresponding to IS : 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.
- Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer upto 225 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight with plain drum or pad foot-drum or heavy pneumatic tyred roller of minimum 200 to 300 kN weight having a minimum tyre pressure of 0.7 MN/m² or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall and super elevation and shall commence at the edges and progress towards the centre for portions having cross fall on both sides.
- Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. During rolling, the grade and crossfall (camber) shall be checked and any high spots or depressions, which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour.
- Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS : 2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902.

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

Arrangements for Traffic

During the period of construction, arrangement of traffic shall be maintained in accordance with Clause 112.

Measurements for Payment

- Granular sub-base shall be measured as finished work in position in cubic meters under the following items:
 - i. Upper sub-base
 - ii. Lower sub-base (greater than 480mm below top of base course).
The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

Rate

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- (i) Making arrangements for traffic to Clause 112 except for construction of diversions;
- (ii) Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts;
- (iii) All labour, tools, equipment and incidentals to complete the work to the Specifications;
- (iv) Carrying out the work in part widths of road where directed; and
- (v) Carrying out the required tests for quality control.

The rate for preparation of existing pavement in areas of overlay shall include all items necessary to prepare the surface for overlay including scarifying and removal of bituminous surfacing, watering and re-compaction of the surface, proof rolling and re-scarifying before placement of sub-base where necessary. Payment for preparation of existing pavement in areas of overlay shall be made only for areas of existing pavement retained for overlay and treated in the specified manner.

Mode of measurements & payment:

The rate shall be for a unit of one M3 Basis.

Item No.70

Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the materials with water at OMC in mechanical mix plant carriage of mixed materials by tipper to site, laying in uniform layers (Layer should not be more than 200 mm) with paver in sub base/base course on well-prepared surface and camber with Sensor paver consolidation by vibratory road roller to achieve the desired density by using machine crushed chips as per required gradation mixing with required optimum quantity of water incl material, labour, plant and machinery and equipment etc. complete by plant mix method. (Using mechanical paver).

SCOPE OF WORK:

- Wet mix base course macadam (WMM) Embankment: Providing and laying wet mix base course macadam of compacted thickness of 250mm in two layer using machine crushed chips as per required gradation mixing with required optimum quantity of water conveying the mix to site and spreading to grade and camber with Sensor paver consolidation by vibratory road roller incl. material, labour, plant and machinery and equipment etc. completed as directed by engineer in charge.
- "Providing and laying wet mix base course macadam with graded aggregates conforming to grading of MORT&H- 5th revision , graded aggregate and granular material premixed with water to a dense mass laid in uniform required layer by sensor paver finisher on a prepared subgrade / sub base / base in proper grade and camber and compacted with vibratory roller as per MORT&H (materials to be used only crushed in mechanical crushers) as per required gradation mixing with required optimum quantity of water conveying the mix to site and spreading to grade and camber with Sensor paver consolidation by Tandem vibratory roller of minimum static weight of 80 to 100 KN to achieved the desired density incl. all materials, labours, plant and machineries and equipments etc. complete as directed by engineer in charge."

Scope:

- This work shall consist of lying and compacting clean, machine crushed stone graded aggregate and granular materials, premixed with water to a dense mass on a prepared sub-base/base in accordance with the requirement of these specifications. The material shall be laid in single layer of 100mm for base constructing the base to lines grades and cross sections shown on the approved drawing or as directed by the Engineer-in-charge.

Material - Sources:

- The machine crushed black stone coarse aggregates & granular materials of approved quality shall be obtained from outside sources / area other than G.I.D.C. land. The contractor will have to make their own arrangement at his own cost to obtain the M.C. stone dust, soft murrum & required materials of approved quality from existing or new sources / Quarries.
- The M.C. stone aggregate, stone dust, soft murrum and required materials shall be obtained only from sources / Quarries approved by the Executive Engineer. The M.C. stone aggregate, stone dust, soft murrum and required materials shall be of approved quality and shall have to be brought on site from all leads and lifts. The sample of aggregate shall be got approved from Engineer-in-charge, prior to collection.

General requirements:

- The M.C. stone aggregate, stone dust and required materials shall be obtained from hard, tough, sound, durable, stone of close texture as is locally available and reasonably free from decay and weathering.
- Pieces of the stone shall be angular and roughly cubical in shape and round. Elongated or flaky aggregates shall be rejected. No round or oblong pebbles or angular chips large r smaller than specified size shall be allowed. All unsound, weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layers of boulders shall be rejected.
- The screening material to be used for the work shall be machined stone aggregate of specific size. The M.C. stone aggregate shall be hard, durable, & free from excess flat, elongated, soft and disintegrated particles, dirt and other deleterious materials.
- The binding material to be used for the work shall be soft murrum having PI value less than 6. The soft murrum shall be free from logs/ stumps, roots, rubbish or any other matter likely to deteriorate or to affect the stability of base.
- Inferior quality of M.C. stone aggregate, stone dust soft murrum and required materials and excess quantity over the actual requirement at any place shall be rejected and shall have to be removed from site of work by the contractor at his own cost.
- Approval of the samples of materials given by the Executive Engineer shall not absolve the contractor from the responsibility of replacing defective and materials brought on site. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.

Physical requirements:

- The samples of required materials/ machine crushed black stone aggregate collected from approved sources/quarries shall be got tested at Govt. recognized laboratory as may be directed to the contractor at his own cost. The test results of M.C. Stone aggregates shall conform to the physical requirement laid down in table below.
- Physical requirement of M.C. stone aggregates for wet Mix Macadam

T A B L E

Test	Test Method	Requirements Maximum
Los Angeles Abrasion Value Test	IS:2386(Part-4)	40%
Or *Aggregate Impact Test	IS:2386(Part-4) or **IS:5640	30%

Combined Flakiness and Elongation Index (total)	IS:2386(Part-I)	35%
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* Aggregate may satisfy requirements of either of the two tests.

** To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles.

The value of flakiness index and elongation index so found are added up.

If the water absorption value of the coarse aggregate is greater than 2 % the soundness test shall be carried out on the material delivered to site as per IS-2386 (Part-V).

Grading requirements:

The Machine crushed stone coarse aggregate shall conform to the grading given in table below:

TABLE 400 – 13 (5th revision MORTH)

IS Sieve	Percentage by Weight Passing
53.00 mm	100
45.00 mm	95 - 100
26.50 mm	---
22.40 mm	60 - 80
11.20 mm	40 - 60
4.75 mm	25 - 40
2.36 mm	15 - 30
600 mic.	8 - 22
75 mic.	0 - 5

- Wherever any doubt exists as to where the above requirements are satisfied, whole or any part of the collection of aggregate shall be got screened by the contractor at his own cost, is so ordered by the Engineer-in-charge.
- "Materials finer than 425 Micron shall have plastic index (P.I.) not exceeding 6.
- The final gradation approved within this limit shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa."

Construction Operation:

Preparation of base:

- The surface of the sub-base/ base to receive wet mix macadam course shall be prepared to the specified lines and cross fall (camber) & make free from dust & other extraneous materials. Any roots or soft yielding place shall be corrected in an approved manner and rolled until firm surface is obtained, if necessary, by sprinkling water. Any sub base/ base surface irregularities where predominant, shall be made good by providing appropriate type of profile corrective course (levelling course) to M.O.R.T. & H. clause No. 501.

Setting out:

- After completion of the sub-base/base the alignment of the road shall be properly set out true to lines curves, slopes, grades and sections as shown in the plan or as directed by the Engineer-in-charge. The

contractors shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing temporary & permanent bench marks, centre line stone & other marks and giving profiles, alignments and other marks, as long as they are required for the marks and long as opinion of the Engineer-in-charge.

Preparation of mix:

- Wet mix macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/positive mixing arrangement like pug mill or pan type mixer of concrete batching plant, as approved by the Engineer-in-charge.
- Optimum moisture for mixing shall be determined in accordance with I.S. 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.7 mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mix material should be uniformly wet and no segregation should be permitted.

Spreading of mix:

- The work of spreading the mix shall be synchronized with the work of rolling and consolidation of mix.
- The mix shall not be spread without permission of the Engineer-in-charge.
- "Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub-base/ base in required quantities to achieve the compacted thickness. In no case should these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly compacted stretch be permitted."
- The mix shall be spread by the paver finisher with electronic sensor device for automatic leveling & profile control having at least 7.00m screed. As approved by Engineer-in-charge.
- "The paver finisher shall be self-propelled having the features mentioned in the special condition for bitumen surface work with use of M.O.R.T. & H. D.M.P. and P.F. attached herewith."
- The surface of the aggregates shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregate as spread should be uniform gradation with no pockets of fine materials.
- The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawing or as desired.

Compaction:

- "The work of rolling and consolidating the mix shall be synchronized with the work of spreading the mix.
- After the mix has been laid to the required thickness, grade & cross fall / camber the same shall be uniformly compacted, to the full depth with help of vibratory roller. If the thickness of single compacted layer does not exceed 100 mm. a smooth wheel roller of 80 to 100 KN weight shall be used. For a compacted single layer up-to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN or equivalent capacity roller. The speed of the roller shall exceed 5 km/hr.
- "In portion having unidirectional cross fall / super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. There after roller should progress parallel to the centre of road, uniformly overlapping each preceding track by at least 1 meter away from any preceding stop."
- In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface had been rolled.
- Any displacement occurring as a result of reversing of the direction of roller or from any other cause shall be corrected at once as specified / or removed and made good.

- "Along forms, kerbs, walls or other places not assessable to the roller. The mixture shall be thoroughly compacted with the mechanical tampers or a plate compactor as approved. Skin patching of an area without scarifying the surface to permit proper bounding of the added material shall not be permitted."
- Rolling should not be done when the sub-grade is soft or yielding or when it causes a wave like motion in the sub-base course or sub-grade. If irregularities develop during rolling which exceed 12mm when tested with a 3-meter straight edge, the surface should be loosen and premixed material added or removed as required before rolling again so as to achieve uniform surface conforming to the desired grade and cross fall. In case the use of un mix material be permitted to make up the depressions.
- Rolling shall be continued till the density achieve is at least 98% of the maximum dry density for material as determined by the method outlined in IS 2720 (Part-8) or as directed by Engineer in Charge.
- "After completion the surface of any finished layer shall be well closed, free from movement under compaction equipment or any compaction planes, ridges, cracks & loose material. All loose segregated or otherwise defective area shall be made good to the full thickness of the layer and re-compacted."

Setting and drying:

- After the final compaction of W.M.M. course, the road shall be allowed to dry for 24 hrs.

Arrangement of traffic:

- No traffic shall be allowed on the finished wet mix macadam surface till it has dried and the wearing coarse laid.
- During the period of executing the work, flow of traffic shall be maintained in accordance with M.O.R.T. & H. specification clause no.112 or as directed by Engineer-in-charge.

Surface finish and quality control on work:

- "The relevant provision of general specification for quality control for works and materials attached with the technical bid with pre-qualification application and under M.O.R.T.& H. specification close number 900 shall be apply."
- "All tests shall be got carried out in Govt. or as approved laboratories and cost thereof shall be entirely borne by the contractor. The general specification for Quality control on works and materials attached herewith shall be also followed."

Finishing operations & site clearance:

- The work shall be carried out as directed by the Engineer-in-charge. Relevant M.O.R.T.& H. clause made also be applicable.
- Rectification of surface irregularity:
- "Where the surface irregularity of the wet mix macadam course exceeds the permissible or where the course is otherwise defective due to sub grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, re-shaped with added premix material or removed and replaced with fresh premixed materials as applicable and re compacted in accordance with MORT & H clause No. 406.3. The area treated in aforesaid manner shall not be less than 5 mtr. long and 2 mtr. wide in no case shall expressions be filled up with the unmixed and un graded materials or fines."

Mode of measurement and payment:

- "The work of providing, laying, spreading & compacting, specified graded M.C. stone aggregate of specific size in single compacted layer for construction of 100 MM thick base to W.M.M. specification shall be measured as compacted and finished work in position in cubic meters. The finished and compacted thickness to be paid on volume basis shall be computed in the following manner. Levels shall be taken before and after instruction at a grid of points 10 or 30 M center to center longitudinally in straight but 5 meters at curves. Normally on two lane roads, the levels shall be taken at four positions transversely at 0.75 and 2.75 meters from either edge of the carriage way or as directed by the Engineer-in-charge and on single lane roads these shall be taken at two positions transversely being at 1.25 M from either edge of the carriage way or as directed by the Engineer-in-charge. The measurements may be taken at closer intervals also if so

desired by the Engineer-in-charge. The average thickness of the layer of coarse aggregate in any area shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that area, provided that thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer-in-charge in writing."

- The contractor shall sign day-to-day levelling work and also original cross section, longitudinal section in token of his acceptance etc. The working sections both longitudinal and cross of the sub-grade shall be taken by the Engineer-in-charge before the work is started. The contractor or his authorized representative shall attend day to day levelling work and sign with date the field book daily in token of this acceptance. If there is any dis-agreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started no cognizance of any complaint taken, merely not signing of the level book shall not be deemed as dis-agreement. The contractor shall maintain the finished work to proper formation and grade till this item is finally measured and accepted by department. The measurement shall be taken on compacted work. The contract unit rate for the work of providing, Laying, & compacting of specified graded M.C. stone aggregates of specific size having 250 mm compacted thickness (of each layer), shall be payment in full for carrying out the required operations including full compensation for:
 - i) Cost of arrangement of land as a source of supply of all materials of required quality for construction.
 - ii) Furnishing of all material to be incorporated in the work including all royalty, fee, rent & all lead & lift.
 - iii) Setting out
 - iv) Compacting ground surrounding embankment prepared sub-base, base except where removal & replacement of unsuitable material or loosening and re compacting is involved.
 - v) Cost of watering.
 - vi) Spreading in layers, compacting to specifications requirement.
 - vii) Shaping & dressing etc.
 - viii) All materials, labours, tools, equipments and incidental necessary to complete the work to the specifications.
 - ix) Carrying out required tests for quality control on work and & materials.
 - x) Making arrangement for traffic as per M.O.R.T & H. clause no 112.

The contract unit rate shall be for a unit of one cubic meter of finished compacted work in position at site of work.

Mode of measurements & payment:

- The rate shall be for a unit of one M3 Basis

Item No.71

Construction of dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing.

Construction of dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be determined during trial length construction,

concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver with electronic sensor, compacting with 8-10 tonnes vibratory roller, finishing and curing. Work should be carried out as per IS and Mix design and as directed by EIC.

Mode of measurements & payment:

- The rate shall be for a unit of one M3 Basis

Item No.72

Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with approve grade cement @ 400 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing.

Followed item No.22 & Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with approve grade cement @ 400 kg per cum, coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site, laid with a fixed form or slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing. Work should be carried out as per IS and Mix design and as directed by EIC.

Mode of measurements & payment:

The rate shall be for a unit of one M3 Basis

Item No.73

LAMINATE FINISH TABLE: Providing & fixing laminate finish table having given size with height of 750 mm (as per attached detail drawing) Table having 40 mm Thick .at top made by 19 mm thick sandwich ply. Top is cantilever then its base supports. Base supports made by 19 mm thick sandwich ply. A Table having drawers and a shutter in a pedestal and a key board tray at single end. Drawers & Keyboard tray rest on telescopic channels. Shutters & drawers having thickness of 25 mm which are made by 19 mm + 6 mm ply to create conceal grooves as handle. Drawers & keyboard, sides, Bottom is covered with 19 mm ply & back of pedestal are made up of 12 mm thick Marine Ply Wood. Having 3" high Footrest of 19 mm ply. At Front facade (covered with grooves as per given patterns.) All internal and external surfaces covered by 1mm thick laminate. all complete with given nos of key board tray, drawers on telescopic channels, locks, stoppers, SS Screws, MS nails, Auto hinges, Cable Manager etc as per shown in detail drawings & as per instructions of architect/consultant / in charge engineer. Contractor has to provide all necessary cut outs for Electrical works & no extra payment shall be made for it. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make.

Mode of measurements & payment:

The rate shall be for a unit of Sq.Mtr Basis

Item No.74

CORIAN TOP VINEER FINISH CONFERENCE TABLE : Providing & fixing corian top veneer finish conference table 750 mm height , see size as per detail drawing ,Corean Top based on 19 mm thick Marin plywood finished by rubbing ,buffing & pasting (Core an top covers 300 mm bottom of table at longitunal side & 300 mm bottom of table at shorter side including edges) table have base of 19 mm thick plywood for footrest & supporting vertical supports made by of 12mm+9 mm thick sandwiched Ply for grooving as indicated in drawing. (as per details given in sectional drawing) Base of the table covered by Burma teak bidding Patti finished with veneer. All external & internal surfaces covered by 4mm thick veneer, complete with PU spray polish All complete as per shown in detail drawings & as per instructions of architect / in charge engineer. Contractor has to provide all necessary cut outs for Electrical works & no extra payment shall be made for it. Material should be as per brand list as selected by authority. As per details given in drawing and as per instructions of Architect /consultant/ Engineer In charge.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make.

Mode of measurements & payment:

The rate shall be for a unit of Sq.Mtr Basis

Item No.75

DINNING TABLE: - Providing & fixing DINNING TABLE, having size as per detail drawing, granite top surface with proper finished, polished all side moulding, chamfering & teakwood frame, support with 12mm ply inside with polishing, necessary hardware etc All complete as per shown in detail drawings, photos or selected by authority. & Material should be as per brand list as selected by authority.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

The rate shall be for a unit of Sq.Mtr Basis

Item No.76

Providing & fixing plywood frame of 150mm x 38mm thick, fitting & fixing as per drawing 1.0 mm laminate of approved colour & shade as approved by EIC.

Material:

- 12mm thick ply IS 710 shall be used for partition work as per approved make and sample approve by authority/Archi.
- Wood used inside frames shall conform to Material specification of respective item.
- Laminate used as per approved make.
- All type of material shall be used as per approved make list and confirming to relevant IS codes and approved by authority/Archi.

Workmanship:

- Work complete as per above specification.
- The whole work is to be complete as per design; sample material & any other requirement shall be as per instruction of authority/Archi.
- All the ply paneling should be fitted to ensure accurate positioning & level of the ceiling, flooring, and wall system as per the site/EIC requirements.

Mode of measurements & payment:

The work done shall be measured in square meter for area of work done. The rate shall be for a unit of one square meter.

Item No.77

Providing & fitting toughed 12mm clear float glass of modi or equilent makes as per approved design shall be provide from f. f. up to 2.4 mt height fixed with wooden molding on both sides finished with melamine polish/glass film as approved by EIC.

Material:

- 12mm thick toughened glass partition shall be used as per approved make and sample by Authority/Archi.
- Aluminum section shall be used as per approved make list and confirming to relevant IS codes and approved by Authority/Archi.
- All type of material shall be used as per approved make list and confirming to relevant IS codes and approved by Authority/Archi.

Workmanship:

- Work complete as per above specification.
- Use aluminum c channel at top and bottom as per detailed drawing.
- EPDM quality rubber for aluminum section / filling transparent neutral cure glazed & metal silicon sealant of approved make on the periphery of the glass & wood etc each glass panel secured to the ply box at top and C- Channel at floor.
- All the partition should be fitted to ensure accurate positioning & level of the ceiling, flooring, and wall system as per the site/EIC requirements.

Mode of measurements & payment:

- The work done shall be measured in square meter for area of work done. The rate shall be for a unit of one square meter.
- Partition height will be measured from finish floor to false ceiling level only.

Item No.78

Providing & fitting toughed 12 mm clear float fully glass Door of modi or equilent makes with floor spring heavy duty, 30 cm long handle both side, locks and other necessary fittings as per approved design shall be provide from f.f. up to 2.4 mt height fixed with wooden molding on both sides finished with melamine polish/glass film as approved by EIC.

Materials:

- 12 mm thick toughened glass shall be used as per sample approved by Authority/Archi.
- Hardware shall be used as per approved sample.

Workmanship:

- 12mm thick customized clear toughened glass, edge polished prepared with stainless steel patch fitting with locking arrangement / fixing Each glass panel secured to the floor by stainless steel patch fitting.

- Item includes all necessary fitting / fixing, fixtures- as per approved hardware system with double action floor spring, handle with lock, door stop complete as per drawing.
- All doors should be properly levelled without any sagging and with smooth opening and closing. There should be no variation or deviation of any kinds.
- The whole work is to be complete as per design; including necessary support of plywood in ceiling etc. To be provided without any extra cost. Sample material & any other requirement shall be as per instruction of Authority/Archi.
- Sample mock shall be approved from Authority/Archi.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- Clear opening area shall be measured & paid in square meter.

Item No.79

FABRIC FINISH VISITOR CHAIR - Providing & Supplying of Fabric finish visitor Chairs, having single touch adjustable seat of appropriate size, Frame construction should be of nylon & black in color having dimension of 1200mm Ht., 475mm width & 431 mm Depth & Back cushion Ht. should be 535 mm. It should have Nylon base Arms; Armrest is T fixed. having ht. of 260mm, It should have minimum 5 years warranty. Complete as per instructions given by the Architect & Engineer In charge & as per shown in the View. Samples should be approved by the Architect & Engineer In charge. Please see the Attached Make List for Approved Makes Make: Hoff - Model No. Eone, or wipro, Godrej. MEDIUM BACK WITH FABRIC FINISH VISITOR CHAIR WITH FIBER LEG REVOLVING.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Nos. Basis

Item No.80

HIGH BACK WITH COMPOSITE LATHER CHAIR - Providing & Supplying of High Back Chairs, having single touch adjustable seat of size 525mm x 500mm, having adjustable tilt angle & tension with lock to find optional position, water fall seat cushion slopes slightly downward to help reduce stress on your legs. Frame construction should be of aluminum & black in color having dimension of 1200mm Ht., 700mm width & 750 mm Depth & Back cushion Ht. should be 719 mm. It should have Nylon base Arms, Armrest is 2D. it should have provision of Gas Lift system, WITH CROME LEG AND FANCY ARM REST WARRANTY 1 YEAR Complete as per instructions given by the Architect & Engineer In charge & as per shown in the View. Shape, design, material, colour, etc. will be selected by Architect/Engineer In charge. Make: Hoff - Model No. Spon (H), or Wipro, Godrej. WITH CROME LEG AND FANCY ARM REST WARRANTY 1 YEAR

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.

- The rate shall be for a unit of Nos. Basis

Item No.81

WOODEN DINNING CHAIR: - Providing & supplying Wooden chair, having solid teak wood chair etc All complete as per shown in drawings, photos & as per instructions of architect / engineer in charge.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Nos. Basis

Item No.82

2-SEATER SOFA: The Inside frame shall be made of seasoned wood with proper anti-termite treatment. The seat and back shall be made of foam and finished in leatherite upholstery. leatherite colour and type shall be as per approval. The seat and back shall be made of PU foam of density 45 ± 2 Kg/m³ . hardness - 20 ± 2 on Hampden machine at 25% compression with wood inserts for ensuring long life and optimum comfort to the users. The complete seat and back cushion shall be upholstered with satin repellant "Velveteen fabric". Under structure proved S.S. frames made from 50mm x 25mm S.S. with stander Buffing. All complete as per shown in drawings, photos & as per instructions of architect / engineer in charge.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Nos. Basis

Item No.83

LAMINATE FINISH SIDE CREDENZA UP to 0.75MT HT: Providing & fixing Laminate Finish Low ht back credenza having Ht of 750mm. having 18 mm quartz stone top with ply. base, based on vertical supports made by 19mm Thick. comm Ply Wood with all shutters & horizontal single self (made by 19 mm thick Marin ply) as per given in detail drawings. Backside of low ht storage is covered with 12 mm thick plywood. Shutters made with 19mm ply with wooden handles. Credenza have suggested nos of drawers of suggested ht and suggested self & shutters. All exposed and internal Joints complete with teak wood bidding patti finished with melamine polish. All exposed and internal surfaces covered with 1 mm thick approved shade laminates as instructed by Architect/ consultant/ Engineer in charge. Sizes and patterns may be varies as suggested by architect. All fixtures and fastening must be approved by architect/EOI as per given standard make. Complete with all-necessary mouldings, hardware like MS nails, ss-304 screws, magnet, Stoppers, L - hinges, 19 mm multilocks, table chain, conceal handles etc.

As described in item description & Drawing and directed by Authority/Archi. Material should be as per approved make as selected by authority.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Sq.Mtr Basis

Item No.84

**Providing and fixing in position cowl vent to pipes. 75mm dia.
&**

Item No.85

Providing and fixing in position cowl vent to pipes. 100mm dia.

Item should be include as Providing & Fixing 75- & 100-mm dia. PVC -U SWR COWL VENT of (FINOLEX / SUPREME) brand of working pressure 4 kg/sq.cm including jointing with adhesive solvent cement including fixing the same in true line and level etc complete as directed by EIC.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Nos. Basis

Item No.86

**Providing and fixing Gun metal check or non-return fullway wheel valve.
(A) 15mm dia.**

Item No.87

**Providing and fixing Gun metal check or non-return fullway wheel valve.
(C) 25mm dia.**

Item No.88

**Providing and fixing Gun metal check or non-return fullway wheel valve.
(D) 32mm dia.**

Item No.89

**Providing and fixing Gun metal check or non-return fullway wheel valve.
(E) 40mm dia.**

Item No.90

Providing and fixing ball cock of approved. quality as directed. (B) Abonite (ii) 50mm dia.

The relevant specification of material specification booklet should be followed. Material should be approved make.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Nos. Basis

Item No.91

Providing laying and jointing in true line and level 15mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer in Charge. Pipe shall be fixed on the

wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. Material should be as per brand list as selected by authority.

Item No.92

Providing laying and jointing in true line and level 25mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. Material should be as per brand list as selected by authority.

Item No.93

Providing laying and jointing in true line and level 32mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. Material should be as per brand list as selected by authority.

Item No.94

Providing laying and jointing in true line and level 40mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. Material should be as per brand list as selected by authority.

Item No.95

Providing laying and jointing in true line and level 50mm dia. U.P.V.C. Pipe (SCH- 40) for cold water including fittings as approved by Engineer in Charge. Pipe shall be fixed on the wall with the help of clamp at every two-meter C/C or shall be concealed as directed including necessary fittings etc. including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials. Material should be as per brand list as selected by authority.

Material:

ASTM D 1784 – Rigid Poly Vinyl Chloride (PVC) Compounds.

ASTM D 1785 – Unplasticized Poly Vinyl Chloride (UPVC) Plastic Pipes, SCH 40 & SCH 80.

ASTM D 2466 - Socket type Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, SCH 40. ASTM D 2467 - Socket type Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, SCH 80. ASTM D 2564 - Solvent Cements for Plastic Pipes & Fittings

ASTM F 1498 - Taper Pipe threads 60° for Thermoplastics Pipe & Fittings

ASTM D 2774 - Underground Installation of Thermoplastic Pipes.

ISO 7/1 - Pipe threads where pressure joints are made on threads - Part 1 : Designation, Dimension & Tolerances.

Material brand should be as per make list or as approved by authority.

Application:**CUT PIPE**

- Cut pipe square. As joints are sealed at the base of the fitting socket. An angled cut may result in joint failure.
- Acceptable tools include miter saw, mechanical cut o saw or wheel cutter. Wheel type cutters must employ a blade designed for plastics.

REMOVE BURR & BEVEL

- Remove all burr from inside and outside of pipe with a knife-edge, file or deburring tool Chamfer (bevel) the end of the pipe 100-150.

CLEAN

- Remove surface dirt, grease or moisture with a clean dry cloth.

DRY FIT

- With light pressure, pipe should go one third to one half of the way into the fitting socket Pipes and Fittings that are too tight or too loose should not be used.

APPLICATOR

- Use an applicator that is one half the pipe diameter. • Too large an applicator will force excessive cement in to the inside of small diameter fittings. Too small and applicator will not apply su-cient cement to large diameter systems.

CEMENT

- Apply a full even layer of cement to the outside of a pipe and medium layer of cement to the inside of a fitting.

JOIN PIPE & FITTING

- Assemble pipe and fitting socket till it contacts socket bottom. Give pipe a quarter turn. Hold pipe and fitting together until th pipe dose not back out.
- Remove excessive cement from the exterior. A properly made joint will show a continue bead of cement around the perimeter.
- Observe all safety precautions.
- Systems should be installed in a good and workmanlike manner consistent with normal industry standards and in conformance with all local plumbing, fire and building code requirements. Failure to follow proper installation practices, procedures or techniques can result in system failure, property damage or personal injury.
- Pipes and fittings should be used for their intended purpose as defined by local plumbing and building codes and the applicable ASTM standards.
- Follow manufacturer's instructions for all related products.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Rmt. Basis

Item No.96

Providing, laying and jointing in true line and level 110 diameter U.P.V.C (Type B) conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 of approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 110 mm diameter x 149 mm length x 145 mm heigh at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints and jointed with adhesive solvent cement including cost of all materials. Material should be as per brand list as selected by authority.

SCOPE OF WORK

This section includes the supply of materials, equipment, labour and services necessary for the construction of water supply distribution network. These standard covers supply, underground installation and hydrostatic testing procedures for unplasticized polyvinyl chloride (UPVC) pressure pipe and fittings that comply with IS: 4985-1981, IS:7634-1975 PART-III or the latest revision. It may be necessary to supplement this standard with provisions for special requirements not included herein. Such special requirements should be incorporated into the department specifications.

STANDARDS (PVC Pipes Dimensions and laying)

IS: 4985-1981-Dimensions of PVC pipes

IS: 7634-1975 (Part-III)-Code of practice for Laying of PVC plastics pipes work for potable water supplies
ANSI/AWWA C900-Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4Inch. Through 12 Inch., for Water Distribution.

ANSI/AWWA C905-Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14 In. Through 36 Inch.

MATERIALS:

PIPES AND FITTINGS.

Pipes and fittings shall comply with the relevant Indian Standards or as per piping material specification.

GENERAL PHYSICAL PROPERTIES OF UPVC PIPES	
Specific Gravity	1.41-1.43
Tensile Strength	457 Kg/cm ² - 562 Kg/cm ²
Elongation	80% minimum
Modulus of Elasticity	33,750 Kg/cm ²
Modulus of Rigidity	11,250 Kg/cm ²
Compressive Strength	598 Kg/cm ²
5 Kg. Vicat Softening Point	82 C
Heat Distortion Temperature at 18.5 Kg/cm ²	75 C
Coefficient of Linear Expansion	5.0- 6.0 X 10 ⁻⁵ per C
Specific Heat	0.25 cal/gm/C
Thermal Conductivity	4.0X 10 ⁻⁴ cal/sec/cm ² /C/cm
Volume Resistivity	10- 15 ohm/ cm
Flammability	Self-Extinguishing
Maximum bending stress	21 kg/cm ²
Impact strength - 20°C	1 to 2 ft-lb / inch of notch
Impact strength - 0°C	0.5 to 1.0 ft-lb / inch of notch
Compressive strength	600 to 700 kgf/cm ²

PVC PIPES

Providing, lowering, laying, jointing with unplasticized rigid PVC pipes suitable for potable water as per IS 4985/1988 or latest revision of tested quality, resistance to pressure as mentioned in the item, in trenches in proper line levels and slopes including all fittings, hydraulic testing with equipment having pressure gauge.

(A) MATERIAL

Pipes

UPVC pipes shall be conforming to IS 4985:1988 or latest version having working pressure 6kg/cm². The PVC pipes to be made with material suitable for potable water.

Tolerance

Tolerance on OD (+) 0.4mm

Wall Thickness

For 110mm dia pipe 2.50 to 3.0 mm

WORKMANSHIP

- Excavation for laying of pipe to be done of required width, depth and level/ slope in sorts of soil, strata as directed. After completing excavation 150mm thick PCC 1:3:6 to be laid having width (pipe dia +300mm.) Over the PCC sand layer 50mm to be laid before laying of PVC pipes.
- PVC pipes to be cut with hacksaw to get square cut end. Fine tooth blades to be used to get good surface of cut end. The end surface to be cleaned by filings/ emery paper.
- Primers to be used before applying solvent cement recommended by solvent cement manufacturer to get continuous bond between mating surface. The coupling to be used at joints, joints to be cleaned with cotton rags to remove any moisture from the matting surface.
- After applying solvent cement, the pipes to be joined to be inserted in the coupling as quickly as possible. The pipes to be turned 90° to ensure complete and even distribution of the solvent cement. The solvent to be applied to external surface of pipe and internal surface of coupling. After jointing work is completed the surface to be cleaned to remove excess solvent cement. The pipes to be joined with solvent cement, after making the joints the pipes should not be disturbed, till solvent cement is completely set. Following is the approximate times for setting of solvent cement.

INITIAL SET TIME

PIPE SIZE OD

Temperature range during initial set time °C	Upto 75m OD	Above 75mm OD
15 to 40	30 min	1 hr.
5 to 15	2 hrs.	4 hrs.
1 to 5	6 hrs.	12 hrs.

TYPICAL JOINT CURE SCHEDULE

PIPE SIZE OD

Ambient temperature °C	Upto 75m OD	Above 75mm OD
15 to 40	12 hrs.	24 hrs.
5 to 15	24 hrs.	48 hrs.
1 to 5	96 hrs.	8 days

- After completion of jointing work PVC pipes to be laid in trenches over sand layer laid on PCC in required gradient / slope. After laying of PVC pipes sand to be filled in the side and at top of the pipes before filling the earth with minimum 300mm cover of sand.
- The completing of back filling the trenches to be done after sand filling and same to be watered and rammed to get the compaction of sand/earth.
- The surplus earth to be spread as directed.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Rmt. Basis

Item No.97

Providing and fixing PVC SWR Nahni trap IS 14735 for drain - 100 mm diameter with jali of the following nominal diameter of self-cleansing design with C.I sread down or hinged grating including the cost of cutting and making good the walls.

Materials:

The cast iron (spun) Nahni trap shall be conforms to M.45. The C.I. hinged of screwed down cover shall be of best quality.

Workmanship:

- The Nahni trap with 100 mm dia inlet and 50 mm dia outlet shall be fixed as per drawing or as directed.
- The Nahni trap shall be jointed with C.I. pipe 75 mm dia, with lead joints. The lead joints shall be done in conformation with IS 782 1976.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item including lead jointing and testing.
- The rate shall be for a unit of Nos. Basis

Item No.98

Providing erecting and fixing double coated ISI water tank of required capacity each with all necessary fittings and connection etc. complete on terrace. Material should be as per brand list as selected by authority.

General

- This work shall consist of Providing and fixing P V C water tank of specified capacity with necessary G I fittings including 25 mm dia G.I. over flow pipe, ball valve, of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

PVC Water tank

- PVC Water tank of specified capacity and of I.S.I. mark of approved in liters of approved make and quality equivalent to syntax product
- Net capacity shall be net volume of water stored between the lowest level of overflow and lowest specified level.

Nipple

- Galvanize pipe nipple shall be of approved make and of best quality Relevant specification given in Booklet of Building specification shall be applied for the execution of this item

Ball valve

- Ball valve shall confirm specification no 23.00.5 (A) on page 172 of specification booklet for building works
- Ball valve shall be of approved make and of best quality. Relevant specification given in Booklet of Building specification shall be applied for the execution of this item

Connections

- Connections shall be of approved make and of best quality. Relevant specification given in Booklet of Building specification shall be applied for the execution of this item

Workmanship

- Tank shall be approved quality and as per IS standard make. Material used in manufacturing tank shall be confirmed to relevant IS code. The material of tank and lead and fittings which may come in contact of water should be such that it does not impart any taste, colour or odor. It does not have any toxic effect and it does not contaminate the water. Thereby making it unbootable.
- The tank shall be fixed properly in a level position and making all required necessary correction like inlet outlet flushing overflow and air vent. Tank shall be satisfying the standards of public health.

Mode of Measurement & Payment:

- The payment will be made on capacity in litter's basis of the finished work.
- All necessary labour materials Equipment tools and plant, conveyance including loading and unloading etc shall be provided by the Contractor as directed by the Engineer in charge
- The item shall be measured for its capacity in litters limiting dimensions to those specified on plan or as directed.
- The rate shall be for a unit of one Litter.

Item No.99

Providing and fixing concealed center point to wall ceiling & floor CPVC (SDR 13.5) PIPE having National Sanitation Foundation (NSF) seal for potable water of following dia. nominal bore tube fittings and clamps including making good the wall, ceiling and floor etc. complete. [A] 15 mm. Material should be as per brand list as selected by authority.

Item specification should be followed by item No.90.

Mode of measurements & payment:

- The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.
- The rate shall be for a unit of Rmt. Basis

Item No.100

Providing and fixing S.W. gully trap with C.I. grating brick masonry chamber and water tight C.I. cover with frame of 300mm x 300mm size (inside) with standard weight. (i) Square mouth traps. (A) 100mm x 100mm size P type.

Materials:

- Water shall conform to Material specification of respective items.
- cement mortar of proportion 1:5 shall conform to Material specification of respective items.
- burnt brick shall conform to Material specification of respective items.
- The S.W. gully trap of 100 mm x 100mm size shall conform to Material specification of respective items.

Workmanship:

- Excavation for gully trap shall be done true to dimensions and levels as indicated on plans or as directed. The excavation work shall generally be done as per relevant specifications of item of earthwork.

Fixing:

- The gully trap shall be fixed over cement concrete 1:5:10 (1 cement: 5 sand; 10 graded brick bats aggregate 40mm nominal size) foundation 650mm square and 100mm thick. The depth of top of bed concrete upto ground level shall be 675 mm. The jointing of gully outlet to the branch drain shall be one similar to jointing of S.W. pipe as described in item no.16.05.

Bricks masonry chamber:

- After fixing and testing gully and branch drain, brick masonry 300 x 300 mm inside width bricks in CM 1:5 (1 cement: 5 sand) shall be built with 100 mm bricks work round the gully trap from the top of bed concrete upto ground level. The space between the chamber walls and the trap shall be filled with cement concrete 1:5:10 The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3(1cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded of so as to slope towards the grating.

C.I. cover:

- C.I. cover with frame 300 mm x 300 mm (inside) size shall then be fixed on the top; of the brick masonry with CC 1:2:4 (1 cement: 2 coarse sand; 4 graded stone aggregate 20 mm nominal size) 40 mm thick and rendered smooth. The finished top of the cover shall be left about 40 mm above the adjoining ground level so as to exclude the surface water from entering the gully trap.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.101

Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete. 150mm.

Item No.102

Providing laying (to level or slopes) and jointing reinforced concrete Light duty non-pressure pipes I.S. class NP2 of the following internal diameter with collars and butt ends prepared for collar joints including testing of joints complete.250mm.

Materials:

- The reinforced concrete light duty non-pressure pipes of specified diameter shall conform to I.S. 458-1971.

Workmanship:

- The relevant specifications of excavation item shall be followed for work of trenches except that the excavation in trenches shall be for reinforced concrete pipes of specified diameter.

Laying:

- The pipes shall be lowered into the trenches carefully. Mechanical applications may be used. Where necessary pipe shall be laid in straight lines or with easy curves and true to line and gradient as specified. The laying of pipe shall proceed upgrade of a slope. In the pipe spigot and socket joints; the socket ends shall face upstream. In case of pipes with joints to be made with loose collars, the collars shall be slipped on before the next pipe is laid.
- In case where the foundation conditions are unusual such as the proximity of trees or holes, under existing proposed around in 150 mm. thick cement concrete 1:5:10 (1 cement : 5 fine sand : 10 graded stone aggregate 40 mm. nominal size) or compacted sand or gravel.
- In case where the natural foundation is inadequate the pipes shall be laid either in concrete cradle, supported on proper foundations or on any other suitably designed structure. If concrete bedding is used, the depth of concrete below bottom of the pipe shall be at least $1/4^{\text{th}}$ of the internal diameter of the pipe subject to a minimum of 100 mm. and a maximum 300 mm. The concrete shall be extended up the sides of the pipe at least to a distance of $1/4^{\text{th}}$ of the outside diameter for pipes 300 mm. and over in diameter.
- The pipes shall be laid in the concrete bedding before the concrete has set. Pipes laid in trenches in earth shall be bedded evenly and firmly and as far as up to the haunches of the pipe as to safely transit the load expected from the back fill through the pipe to the bed. This shall be done either by excavating the bottom of the trenches to fit the curve of the pipe or by compacting the earth under a round curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

Jointing:

- The joints shall be done by slipping the collar over and clear of the end of the pipe. The recess of the end of the pipe shall be filled with jute braiding in hot bitumen. The new pipe shall then be brought forward until the bitumen ring in recess of first pipe is set into the recess of the second pipe. The process shall be repeated for

two or three pipes which shall then jacked up so as to thoroughly compress the bitumen. The quantity of jute and bitumen shall be just enough to fill the recess when pressed hard by jacking, care being taken that no offset of the jute braiding shall be visible either outside of inside of pipe. The collar shall then be set up over the joints covering equally both the pipe and leaving an even caulking space all around. Cement and sand mortar 1:1½ shall then be well punched or pressed home with a caulking tool with in this caulking space. Care shall be taken that the underside of the joints is properly filled with mortar.

Curing:

- Every joint shall be kept wet for about 10 days for maturing. The section of the pipe line laid and jointed shall be covered immediately to protect from weather effects. Minimum bore of 100 mm. is considered adequate.
- The joints shall be left exposed for observation.

Testing of Joints:

The testing of joints shall be done as per relevant specifications of item except that the testing of reinforced concrete pipes shall be done.

Mode of measurements & payment:

- The relevant specifications of item shall be followed except that the rate includes for lying to level or slope in trenches etc. (measured separately), making the joints as indicated and testing to stand the water test.
- The measurements shall be net without any allowance for cutting and waste. The length of bends, junctions another connection (measured along the center line) shall be included in the total length of the Pipes, the connections being numbered afterwards and paid for extra over pipes.
- The size of bends, junctions, etc. shall suit the size of pipe. The bore (internal diameter of pipe) shall be the criterion for payment.
- Nothing extra shall be paid separately for the use of mechanical appliances, where necessary, as described above.
- The rate shall be for a unit of one running meter.

Item No.103

Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:3 (1-Cement : 3-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1-Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) With 230mm thick walls of brick masonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (2) B type depth 1.50 Meter for 150mm diameter sewer.

- All material used for construction shall confirm relevant specification of respective item of Material specification booklet.
- Work should be carried out as per drawing, site requirement and as directed by EIC/Archi.
- Constructing Manhole with R.C.C. top slab in 1:2:4 mix (1-cement :2-coarse sand : 4-graded stone aggregate 20mm nominal size) foundation concrete 1:3:6 mix (1-cement : 3- coarse sand :6-Brick bats 40 + 50mm size) inside plastering 15mm thick with Cement Mortar 1:3 (1-Cement : 3-coarse sand) finished with a floating coat of neat cement and making channels in cement concrete 1:2:4 mix (1-Cement :2-Coarse sand :4-stone aggregate 20mm nominal size) finished smooth complete including curing and festing (i) Inside size 900mm x 1200mm and 1.5M. deep including C.I. cover with frame size 560mm diameter total weight of cover and frame to be not less than 128 kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) With

230mm thick walls of brick masonry using brick having crushing strength not less than 35Kg. / Sq.cm. in Cement Mortar 1:5 (1- Cement: 5-Coarse sand) (2) B type depth 1.50 Meter for 150mm diameter sewer.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.104

(II) Extra rate for constructing B.B. masonry for every additional depth of 0.1M. GR Part thereof over item No.24.27 (I) for depth from 1.50M. to 2.25M.

Item specification followed by above item except extra height.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.105

Providing and fixing cast iron steps of size 500mm x 150mm x 22.5mm and painting with two coats of Anti-corrosive paint etc. complete.

Materials:

- The C.I. steps of size 500 x 150 x 22.5 mm. size shall conform I.S. 5455-1969. Paint shall conform to relevant specification of material booklet.

Workmanship:

- The C.I. steps of size 500 x 150 x 22.5 mm. size shall be fixed in manhole as and where directed. The steps shall be staggered in vertical runs 380 mm. apart horizontally. The top step shall be 450 mm. below the manhole cover and lowest not more than 300 mm. above the benching. The steps shall be embedded in wall of man hole with C.C. 1:3:6 up to 200 mm. depth and the surface finished with cement plaster 15 mm. thick in C.M. 1:5. The steps shall be painted with two coats of anti-corrosive paint.

Mode of measurements & payment:

- The rate includes all labour materials tools and plants etc. required for satisfactory completion of this item.
- The rate shall be for a unit of one number.

Item No.106

Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm² in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg.) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete. (i) Inside dimensions 455mmx 610mm and 450mm deep for single pipe line.

Item specification followed by above item No.102.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.107

Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber. (i) for 455mm x 610mm size.

Item specification followed by above item No.105, except extra height.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.108

Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/Cm² in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg.) (R.C.C. top slab with 1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete. (ii) Inside dimensions 500mm x 700 mm and 450mm deep for pipe line with one or two inlets.

Item specification followed by above item No.102.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.109

Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber. (ii) for 500mm x 700mm size.

Item specification followed by above item No.107, except extra height.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.110

Constructing brick masonry chamber for underground C.I. Inspection chamber and bends with bricks having crushing strength not less than 35Kg/ Cm² in C.M. 1:5 C.I. cover with frame (Light duty) 455mm x 610mm internal dimensions total weight of cover with frame to be not less than 38Kg. (Wt. of cover 23 Kg.) and Wt. of frame 15Kg.) (R.C.C. top slab with

1:2:4 mix (1-cement :2- coarse sand :4-graded stone aggregate 20mm size) foundation concrete 1:5:10 inside plaster 15mm thick with cement mortar 1:3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete. (iii) Inside dimensions 600mm x 850 mm and 450mm deep for pipe lines with three or more inlets.

Item specification followed by above item No.102.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.111

Extra over items 24.44 for every additional depth of 0.1M. of part thereof beyond 450mm depth for Brick masonry chamber. (iii) for 600mm x 850mm size.

Item specification followed by above item No.109, except extra height.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of one number basis.

Item No.112

Providing laying and jointing U PVC SCH40 for cold water 20 mm dia (3/4)" including its accessories.

Item specification followed by above item No.90.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rmt basis.

Item No.113

Providing laying and jointing PVC SWR pipes IS 13592 for Drain - 75 mm dia it's accessories.

Item specification followed by above item No.95.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rmt basis.

Item No.114

Providing and fixing PVC SWR P- Trap IS 14735 for Drain -110x110 it's accessories.

Item specification followed by above item No.96.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.115

Providing and fixing Gun metal check or non-return full way wheel valve. (A) 50mm dia.

Item specification followed by above item No.85.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.116

Providing laying and jointing PVC SWR pipes IS 13592 for Drain - 50 mm dia it's accessories.

Item specification followed by above item No.95.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rmt basis.

Item No.117

Providing and fixing to the inlet mouth of rain water pipe cast iron grating 15 cm diameter and weighing not less than 440 grams.

As described & as directed by EIC.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.118

Providing and fixing wash down water closet European type WC pan (Wall Hung) of Jaquar or Kohler or American standard like JAQUAR CNS-WHT-961SPP- SIZE 365x545x360MM and P trap distance 23.5 cms with integral P trap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement: 1 find sand) etc, complete.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.119

Providing and fixing Health Faucet hand shower of Jaquar or Kohler or American standard heavy duty with SS braided hose 1.2 MT long pipe to water closet like JAQUAR ALD-CHR-573.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.120

Providing and fixing Metropole Flush Valve of Jaquar or Kohler or American standard Regular 32mm Size (Concealed Body) with Exposed Shut Off Provision & Round Flange like FLV-CHR-1095N.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.121

Providing and fixing Toilet roll holder -like Jaquar -ACN -1151N etc, completed.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.122

Providing and fixing Urinal of Jaquar or Kohler or American standard approved quality including connection with trap and with integral longitudinal flush pipe. (A) Squatting plate pattern white earthenware size of urinal 385x325x635 mm like jaquar make code no URS-WHT-13253N including (1) Providing and fixing SS finish waste coupling of 32 mm dia size half thread with 80mm height like jaquar -ALD - 709 for wash basin with rubber plug etc completed.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.123

Providing and fixing of Jaquar or Kohler or American standard SS finish flush valve of auto closing system like jaquar PRS-073 of approved quality and connection with waste pipe trap etc. completed.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.124

Providing and fixing of Jaquar or Kohler or American standard SS finish bottle trap with internal partition of 32mm size with 250mm &190mm long wall flange connection pipes and wall flange like jaquar ALD-769 of approved quality with necessary fitting for wash basin etc. completed.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.125

Providing and fixing of Jaquar or Kohler or American standard Wash Basin vitreous China table top wash basin size 560mm x 450 mm in white colour. Like JAQUAR CNS-WHT-903 SIZE OF 425x340x175MM with single hole for pillar tape with CP or MS brackets painted white including cutting holes and making good the same including (1) Providing and fixing of Jaquar or Kohler or American standard SS waste coupling of 32 mm dia size half thread with 80mm height like jaquar -ALD - CHR-705 for wash basin with rubber plug etc. completed.

Make: Jaquar, Kohler or American standards only as selected by authority.

- All material shall follow respective specification of Material specification hand book and relevant code.
- Work shall be carried out as shown in drawing and directed by Archi/EIC. Fitting should be done as per standards norms and as directed by authority.
- Material brand shall be approved from authority.
- Fitting shall be done as per drawing of respective item and as directed by EIC.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.126

Providing and fixing on platform stainless steel Sink glossy ASIS 304 grade x 1mm thick with overall size 610x460mm & bowl size 560x410x200mm including fixing the sink in platform & making good the same including the cost of PVC waste pipe of 32mm dia. and PVC waste coupling etc complete as directed by EIC.

- All material shall follow respective specification of Material specification hand book and relevant code.
- Work shall be carried out as shown in drawing and directed by Archi/EIC. Fitting should be done as per standards norms and as directed by authority.
- Material brand shall be approved from authority.
- Fitting shall be done as per drawing of respective item and as directed by EIC.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.127

Providing and fixing of Jaquar or Kohler or American standard SS Pillar cock with extension body like JAQUAR FUS-CHR-29021N etc complete as directed by EIC.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.128

Providing and fixing of Jaquar or Kohler or American standard Two-way BIB cock with wall flange of genuine company brand, in with model no like FUS-CHR29041, water tap brand or approved ISI brand quality, fixing in pipeline and testing the same... etc., complete., as directed by EIC.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.129

Providing and fixing of Jaquar or Kohler or American standard SS finish Angular Stop cock for wash basin like Jaquar FUS-29053.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.130

Providing and fixing of Jaquar or Kohler or American standard SS finish bib tap like Jaquar Florentine Bib Cock (Silver) FUS-CHR-29037.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.131

Providing and fixing of Jaquar or Kohler or American standard Overhead Shower ø105mm Round Shape Single Flow with Air Effect (ABS Body & Face Plate Chrome Plated) with Rubit Cleaning System like JAQUAR OHS-1709 & Shower Arm Casted 160mm Long Light Body Round Shape for Wall Mounted Showers with Flange like JAQUAR SHA-477 & Wall Mixer 3-in-1 System with Provision for both Hand Shower and Overhead Shower Complete with

115mm Long Bend Pipe, Connecting Legs & Wall Flange (without Hand & Overhead Shower) like JAQUAR QQP-7281PM, Towel Rack 600mm Long without Hangers, Stainless Steel like JAQUAR ACN-1181FS approved ISI brand quality, fixing in pipeline and testing the same etc., complete., as directed by EIC.

Make: Jaquar, Kohler or American standards only as selected by authority.

Item No.132

Providing, supplying and fixing Waste Pipe.

Item No.133

Providing, supplying and fixing cement Bluster as approved by EIC.

- All material shall follow respective specification of Material specification hand book and relevant code.
- Work shall be carried out as shown in drawing and directed by Archi/EIC. Fitting should be done as per standards norms and as directed by authority.
- Material brand shall be approved from authority.
- Fitting shall be done as per drawing of respective item and as directed by EIC.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Nos. basis.

Item No.134

Providing, supplying and fixing GRC Material.

Materials:

- Material shall be from Brand List and approved by authority.
- Material shall be used for elevation purpose as shown in elevation photos in drawing volume.
- Fixing shall be done as per instruction of authority/Archi. Or as per relevant specification of item drawing & instructions from vendor.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Sq. Meter. basis.

ITEMWISE DETAIL SPECIFICATIONS

ELECTRO-MECHANICAL WORK

DETAILED SPECIFICATION OF THE ITEMS OF WORK TO BE CARRIED OUT.

Item No.135

Point wiring for Light / Bell with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length , in below type of pipe erected with 6A Modular type switch / bell push & accessories and earth continuity of following type, erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected, with necessary Lamp holder/ceiling rose / H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.136

Point wiring for Tissino / Modular secondary light point with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires, in below type of pipe to be erected complete with earth continuity and necessary connection with primary light with accessories erected on Metal / PVC / wooden box covered with 3 mm thick PC(Polycarbonate) / Acrylic sheet for open / concealed wiring. with necessary Lamp holder / ceiling rose / H.D.Connector as directed. Note:- Maximum up to 6 mtrs length, excess will be considered as Mains for Secondary Point. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.137

Point wiring for FAN with 2-1.5 sq.mm & earth wire of 1.5 sq.mm (Green) both are of .ISI marked 1.1 KV Grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected with 6A Modular type switch and hum free EME step type electronic fan regulator mounted and accessories with earth continuity of following type erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured/metallic/white front plate modules erected on / in wall / ceiling as per pipe erected. with necessary ceiling rose / H.D.Connector as directed. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.138

Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete

with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories [II] For 16A Plug and 16 amp switch with 2-2.5 sq.mm Cu. Wire from mcb db board. (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.139

Point wiring for Individual Plug with & earth wire of 1.5 sq.mm (Green) both are of ISI marked 1.1 KV grade FRLS PVC insulated multi strand copper wires up to 10 mtr length, in below type of pipe erected complete with Modular type switch & 5 pin Plug erected on PVC / Metallic/Wooden box covered with appropriate front plate modules erected on / in wall / ceiling as per pipe erected with following type of accessories. [I] For 6A Plug and 6 a switch with 2-1.5 sq.mm Cu. Wire from nearby switchboard/mcb db board (f) with medium class Rigid PVC pipe and accessories erected concealed in wall/ceiling complete

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.140

Point wiring for on board Looped Plug with 6A Modular type switch & 5 pin socket erected on PVC / Metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate modules erected on / in wall / ceiling with following type accessories Cat. III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of pt. basis.

Item No.141

Providing & erecting Switch board for Computer or electric apparatus consisting of following modular type accessories mounted with PVC / Metallic concealed/open box with single mounting base frame covered with textured/metallic /white front plate,modules erected with necessary connections as directed 1 no. 6A/16A universal plug-switch combined. 3 nos. 6A Switch 3 nos. 6A 5 pin Plug For Modular Type Accessories Cat. III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.142

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (8) Computer RJ-45 socket Cat.III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.143

Supplying & erecting approved make LAN cable of following size in existing pipe as per direction [C] CAT – 6

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.144

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (3) Two Pin/RJ-11 Telephone Socket [A] For One Gang Cat.III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.145

Supplying & erecting approved make Telephone Cable electrolytic copper conductor PE insulation twisted in two pairs, & wrapped with FRLS PVC tape & sheathed with FRLS PVC or HFFR outer Jacket suitable for telephone wiring & confirming to C-DOT erected in existing pipe. of following size of onductors & nos. of pairs. With necessary connections. [A]Conductor Size 0.5 mm (a)Unarmoured (2) Two Pairs

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.146

Providing & erecting main Distribution (MDF) indoor type, back mounted frame as per DoT standard approved with krone strips (a) Suitable for 10 pair

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.147

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (4) TV Co-axial Socket outlet Cat.III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.148

Providing & Erecting approved make following size of TV Co-axial flexible cable comprising inner conductor of solid bare copper insulated with Foam PE & Secondary conductor made of poly - Aluminium film bonded Al. Braids @ suitable coverage overall sheathed with black PVC insulation.

(b) RG-6

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.149

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. (f) One wire 10.00 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.150

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. (g) One wire 16.00 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.151

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. (h) One wire 25.00 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.152

providing and erecting Mains with ISI marked, 1.5KV grade electrolyte multi stranded, annealed copper conductor with heat resistant PVC insulated conforms to IS 694, IEC - 227 erected in existing pipe of following size (Specifically for control panel, relays, power switchgears, motor starters & control wiring) with required size of copper lugs, nuts and bolts if required. (i) One wire 35.00 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.153

Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size. (A) With medium class Rigid PVC pipe and accessories (a) 2 wire 1.5 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.154

Providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected concealed in /flushed on wall/ceiling, with 1.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size. (A) With medium class Rigid PVC pipe and accessories (b) 2 wire 2.5 sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.155

providing and erecting Mains with 1.1 KV grade FRLS PVC insulated ISI marked stranded Copper conductor wire in following type of pipe to be erected in / on wall / ceiling with 2.5 sq. mm copper conductor FRLS PVC insulated stranded wire of green colour for earth continuity of following size (A) with medium class Rigid PVC pipe and accessories (i) 4 wire 10 sq. mm (use earth wire of 4 sq. mm)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.156

Providing and erecting ISI mark Medium class RIGID PVC PIPES of following size complete to be erected on/in wall or ceiling erected with necessary PVC fittings & Junction boxes fixed with adhesive solution & Clamps with following dia of pipes, in approved manner as directed (b) 25 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.157

Providing & erecting PVC Corrugated Flexible Conduit with required nos. of coupling, PVC ushes, Check-nuts etc. complete of following sizes.(2) 25 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.158

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for (B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI) (b) sheet steel double door (ii)6 way

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.159

Providing and erecting Sheet Steel powder coated MCB distribution board - flush / surface mounted fitted with busbar, neutral link, earth bar and DIN rail, Conforms to IS 8623-1 & 3, IEC 61439-1 & 3 without MCB to house appropriate nos. of MCBs.(The DBs should be used of same company of MCB to be used) suitable for (B) three phase incoming and single phase horizontal type outgoing Per phase isolation type (PPI) (b) sheet steel double door (iii)8 way

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.160

providing and erecting Miniature circuit breaker single pole 6A to 25A suitable to operate on 240 V A.C. system and having breaking capacity 10 KA to be erected in existing box. confirming to IS 8828/1996 with ISI Mark Cat.III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.161

Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity (A) 6 to 32 Amp. Cat-III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.162

Providing & erecting 415 V MCB Four Pole for Motor & Inductive Load (C Curve) having 10KA breaking capacity & confirms to IS :8828 in existing box having following capacity (b)40 Amp. Cat.III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.163

providing and erecting Approved make RCCBs conforming to IS: 12640 and having sensitivity of 30 mA and Short Circuit withstand capacity of 10 KA and suitable for operation on single phase 240 V,50Hz. having characteristic of quick action & tripping with all advance feature & do not incorporate any electronic component. for following Max. rating erected as directed (ii) 40Amps. DP Cat. III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.164

Supplying & erecting approved make Four Pole 415V change over switch interior for panel mounting with operating mechanism A.C.23 duty confirming to IS for (B)63 A

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.165

Supplying and erecting triple pole & neutral 440V / 500V panel mounting Copper Busbars with four equal Nos. of electrolyte bus having current density not more than 1.6 Amp. / sq.mm (Rated current / cross section area) duly wrapped with colour insulating tape for phase sequence of following current carrying capacity, erected with necessary bus bar supports /insulators, main cable socket to each bar, erected in existing cubical panel with necessary connections.(A) Suitable for 100 Amp. Capacity

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rn. Mtr. basis.

Item No.166

Providing and erecting Approved make Four pole moulded case circuit breaker having breaking capacity ICU of 25 KA. at 415 V, having normal current rating up to 25 A to 100A. with Fixed

thermal & magnetic release suitable to work on A.C. supply 50 c/s. with all internal connections, spreader tinned copper & complete erected in existing 16 G.M.S. housing.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.167

Providing & erecting weather proof, dust & vermin proof, floor mounted front operated indoor type cubical panel board necessary IP- 42 and above protection as per approval from engineer incharge made from 14 SWG thick CRC M.S. sheet for outer body & doors, 16 SWG thick CRC M.S. sheet for internal partitions with necessary accessories, supporting angles/ flats channel including cutting, bending, drilling, welding, riveting with internal partitions & cable alley as per requirements & instruction of engineer-in-charge with erection of supplied switch gears, BUSBARS, suitable size of inter connecting PVC copper wire / copper-aluminium strips, rubber grommets, rib, bakelite control fuses/MCB for measuring instruments, earth bus & earth bolts, foundation flange - bolts-base Plates, sufficient nos. of hinged doors, handles with locking arrangement and rubber gasket, heavy duty end terminal connection, danger notice board, necessary ventilation, earthing strip complete. The Panel shall be painted with epoxy powder coating (The rates excludes the cost of switchgears, bus bars, inter connecting mains & Copper Aluminium strips, meters, Fuses etc. The dimension shall be measured excluding base beams) The panel shall be supplied with following approved manufacturers with following size. (B) The standard companies switch gear shall be used and only manufacturers at CPRI approved factory. (i) with 350mm depth board

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Sq. Mtr. basis.

Item No.168

Providing, erecting, fabricating the M.S. structure as per requirement on site incorporating proper size of M.S. angles, square, round, flats, bars, channels, sections complete with cutting, welding, grinding & finishing duly painted with one coat of red oxide with erection on site as per direction of engineer in charge with necessary grouting, cementing, plastering & finishing complete.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Kg. basis.

Item No.169

Providing and erecting multifunctional meter suitable for application of Power monitoring and showing measurement of following Voltage, Frequency, Apparent energy, Apparent power, Active and reactive energy, Active and reactive power, Average voltage Vavg, Peak demand power PM, QM, SM, Demand power P, Q, S, Apparent power S, S1, S2, S3, Unbalance current, Power factor and displacement PF (signed, four quadrant), Calculated neutral current, Active, reactive, apparent energy (signed, four quadrant), Active power P, P1, P2, P3, Voltage U21, U32, U13, V1, V2, V3, Phase currents, Average current Iag, Peak demand currents, Reactive power Q, Q1, Q2, Q3, Demand current I1, I2, I3, [Us] rated supply voltage 40...300 V AC 45...65 Hz, 40...300 V DC, Network frequency 50 Hz, Type of network 3P, Display type 7 segments LED,

Display colour Red, Messages display capacity 3 fields of 4 characters, Display digits 12 digit(s) - 14.2 mm in height

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.170

Supplying and erecting approved make suitable panel indicator LED type lamp, lens cover, complete erected with necessary connections.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.171

Providing & erecting L.T. Current Transformer with bar primary 50/5 to 1000/5 ratio 15 VA burden erected in existing CRCA box duly secured with insulating materials connected to the meter.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.172

Supplying and erecting, commissioning and testing of Diesel Generating set confirming to IS: 4722:1968 & BS:5514 having continuous rating, 3 phase, 415 volts, 50 cycles A.C. supply comprising of a totally enclosed air/water cooled diesel engine with multi-cylinders developing suitable BHP not less than following capacity at 1500 RPM with 10% overload for one hour in 24 hours with standard accessories like fly wheel, lubricating oil cooler, "A" class governor, heavy duty fuel wheel and lubricating oil filter, oil bath air filler, lubricating oil pressure gauge, end exhaust manifold, standard set of tools with adjustable spanners, screw drivers, cylinder head to cover, joint cylinder head to exhaust, element lube oil filter, 12 / 24 volts electric starting equipment complete with standard heavy duty battery, dynamo, cut-outs, ammeter, necessary wiring, pressure gauge, starter etc and heavy duty Residential type exhaust silencer and vertical hot air duct logged with asbestos rope, save oil trays, exhaust piping of required length, standard wall/floor mounted fuel with level indicator and piping and drip proof alternator, self excited, self regulated, screen protected, with excitation system, capable of delivering the rated system output at 415 volts, 3 phase, 0.8 PF, 50 Hz, 4 wire, running at 1500 RPM, conforming to IS-4722- 1968 with voltage regulation +/- 5% of rated voltage from no load to full load. Both the engine and alternator fitted on a common fabricated steel base plate with antivibration mounting engine and alternator both connected to each other by flexible flange coupling and with floor/wall mounted control panel box comprising of voltmeter ammeter, selector switches, ACB / MCCB / MCB of adequate capacity, indicator lamps duly wired with HRC fuses. The alternator & control panel shall be connected with provided suitable capacity armoured cable and complete with Acoustic enclosure (canopy) made out of 16 SWG CRCA Sheet, sound absorbing material Rockwool of 64 density & 100 mm thick conforming to IS:8183 / PU Foam of 40 Density - at least 40 mm. The resin bonded rockwool covered from inside the canopy by perforated sheet with 3/4 mm holes, sound level not more than 75 dB at a distance of 1 mtr, as per PVCT norms. Erection, commissioning and satisfactory testing as per requirement with first filling of fuel, oil, etc. with guarantee / Warrantee of complete system for Two years. & with obtaining all necessary certificate from Electrical Inspector. The Capacity and Ratings of DG sets are as below. (A) Continuous Rating of 40 KVA ,BHP not less than 52 BHP

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.173

Providing & erecting approved make AMF control panel suitable for following size of 3 phase, 415 V., 50 cycles, A.C. diesel generating set complete of scope as detailed below:

- 1) Power module: A pair of electromechanically interlocked contactors (for mains & generator) Overload relay for generator contactor Neutral contactor for mains and generator Power socket for connections.
- 2) Control and metering module: Line voltage monitor. Generator voltage monitor Ammeter 3 items attempt start facility. Air circuit breakers/MCB/MCCB of suitable rating for auto/manual operation. Auto/manual switch. Emergency stop push buttons. Manual start push button. frequency meter. Engine hour meter. Two earthing studs.
- 3) Protection module: The engine shutdown in the unlikely event of Low lube oil pressure High cylinder head temperature. V belt failure.
- 4) Indicators with alarm Load on generator.
- 5) Indicators Load on mains Engine fails to start . Emergency stop battery charger.

The AMF Panel of following capacity

(A) AMF Control Panel for 50/62.5 KVA 3 phase DG Set

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.174

Providing and erecting Approved make Earth fault Relay suitable to mount with inter connection suitable to following size of moulded case circuit breaker having CT ratio & MCCB rating as following along with shunt trip 220V AC. with all internal connections & complete erected in existing M.S.housing..
(1) 15 A -100 A , CT Ratio 1/100

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.175

Providing and erecting metallic vitrified danger notice board as per language suggested by engineer incharge for MEDIUM VOLTAGE installation to be erected as per IS-2551.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.176

Providing following type of Modular Type Accessories mounted with PVC / metallic/Wooden box, single mounting base frame covered with textured / metallic/white front plate , modules erected with necessary connections as per site situation directed by Engineer In charge. (7) Blank Plate Single

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.177

Providing and erecting XLPE(IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables.
(C) 3 core 6 Sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Work shall be carried out as per the description of the item and as per instruction of engineer in charge. The sample shall be got approved before execution.

This section shall cover supply, installation, connection, termination, testing and commissioning of medium voltage cables. The cables shall be installed either underground or on cable tray, or on cable support, or in purpose made built up trench or any other method as indicated in the relevant drawings. As per instruction of Engineer In charge. In this work the cable shall be required for providing power connection to the street light pole.

The copper flexible cable shall be provided for connection from the pole box to the luminaries and it shall be of ISI marked only and approved list of make.

CODES AND STANDARDS

The design, manufacture, testing and supply of the brand new cables under this specification shall comply with the latest revisions including amendments of the following standards.

IS: 1554-I : PVC insulated heavy-duty cables for working Voltages up to 1100 Volts.

IS: 3961-II : Recommended current ratings for cables.

IS: 8130 : Conductors for insulated cables.

IS: 583 : PVC insulation and sheath of electric cables.

IS: 10810 : Test procedures for cables.

IS: 10418 : Specification for drums for electric cables.

IS: 7098 - I: Specification for cross linked polyethylene

Insulated PVC sheathed cables for working voltages up to and including 1100 volts.

IS: 3975 : Mild steel wire, strips, and tapes for armoring of cables.

GENERAL

MV cables shall be supplied, inspected, laid, tested and commissioned in accordance with drawings, specifications, relevant Indian standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written in the drum.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

MATERIAL

The MV cables shall be XLPE insulated Aluminum / Copper conductor armored cable conforming to IS: (IS: 7098 (I) - 88) laid in trenches, ducts and underground as shown in drawings.

TECHNICAL REQUIREMENTS

Power cables shall be 1100 volts grade, multi core constructed as per IS: (IS: 7098 (i) - 88) as follows.

Stranded aluminum / copper conductor

Extruded PVC insulation cores laid up

Extruded PVC inner sheath

Galvanized steel wire armored

Extruded PVC outer sheath

Conductor shall be hard drawn aluminum / copper wires grade H2 as per IS: 8130

Insulation shall be of XLPE type - A as per IS: 7098-1-88 and its latest version.

The cables shall be suitable for laying in racks, ducts, trenches, conduits and underground-buried installation with uncontrolled back fill and chances of flooding of water.

Cables shall be designed to withstand all mechanical, electrical and thermal stresses under steady state and transit operating conditions.

The cable should withstand the system fault current with insulation screen / armour insulated at one end.

Bidder shall furnish calculations in support of capability of cables for 3 phase faults. Armour shall be designed to withstand the earth fault currents. The current carrying capacity of armour shall not be less than the earth fault current values of the system.

Progressive automatic in line sequential marking of the length of cables in meters at every one meter shall be provided on the outer sheath of all cables and also the marking of property of NAA, GIDC, Hazira.

Cables shall be supplied in non-returnable wooden drums as per IS: 10418. Both ends of the cables shall be properly sealed with PVC / rubber caps so as to eliminate ingress of water during transportation, storage and erection.

INSPECTION

All cables shall be inspected upon receipt at site and checked for any damage during transit.

While selecting cable routes, corrosive soils, ground surroundings sewage effluent etc. shall be avoided, where this is not feasible, special precautions as decided by the Engineer In charge particularly for HV cable installations, shall be taken. Street lighting and service line to each pole should have separate route.

LAYING METHODS

Cables shall be laid direct in Doubled walled corrugated pipes.

Joint in the cable throughout its length of lying shall be avoided as far as possible and if unavoidable, prior approval of site Engineer shall be taken. If allowed, proper straight through epoxy joint shall be made without any additional cost. A loop of one Mtr. Of each length of cable shall be left near each street light pole. Also a loop of one meter shall be provided on both end of the cable. This additional length shall be used for fresh termination in future. Cable for this loop shall be paid for supply and laying. During the preliminary stages of laying cables, consideration should be given to proper location of the joint position so that when the cables are actually laid, the joints are made in the most suitable places. As far as possible, water-logged locations, carriage ways, pavements, proximity to telephone cables, gas or water mains, inaccessible places, ducts, pipes, racks etc., shall be avoided for joint position.

LAYING DIRECT IN GROUND

General

This method shall be adopted where the cable route is through open boundary, along roads lanes etc., and where no frequent excavations are encountered and where re excavation is easy possible without affecting other services.

TRENCHING:

Width of trench:

The width of trench shall first determine on the following basis.

The minimum width of trench for laying single cable shall be 35 Cms.

Where more than one cable is to be laid in the same trench, in horizontal formation, the width of trench shall be increased such that the inter-axial spacing between the cables, except where otherwise specified shall be at least 20 Cms. There shall be a clearance of at least 15 Cms between axis of the end cables and the sides of the trench.

Depth of Trench:

The depth of trench shall be determined on the following basis.

Where cables are laid in single tier formation, the total depth of trench shall not be less than 90 Cms. for cables up to 1.1 KV and 120 Cms. for cables above 1.1 KV

When more than one tier of cables is unavoidable and vertical formation of laying is adopted, depth of trench in above shall be increased by 30 Cms for each additional tier to be formed.

Excavation of trenches:

The trenches shall be excavated in reasonably straight lines. Wherever there is a change in direction, suitable curvature shall be provided complying with the requirements of the manufacturer.

Adequate precautions should be taken not to damage any existing cable(s), pipes or other such installation in the proposed route during excavation. Wherever bricks, tiles or protective covers or bare cables are encountered, further excavation shall not be carried out without the approval of the Engineer In charge.

If there is any danger of a trench collapsing or endangering adjacent structures, the sides should be well shored up with timbering and / or sheeting as the excavation proceeds. Where necessary, these may even be left in places when back filling the trench

Excavation through lawns shall be done in consultation with the staff of the department

The bottom of the trench shall be a leveled and free from stone, brickbat etc. The trench shall then be provided with a layer of clean, dry sand cushion of not less than 8 Cms in depth

Laying of cable in trench:

At the time of issue of cable for laying, the cores shall be tested for continuity and insulation resistance

When the cable has been properly straightened, the cores are tested for continuity and insulation resistance and the cable is then measured. The ends of all lead sheathed cables shall be sealed with solder immediately. In case of XLPE cables moisture seal tape shall be used for this purpose.

Cable laid in pipe in a single tier formation shall have a covering of clean, dry sand of not less than 15 cms above the base cushion of sand before the protective cover is laid.

In the case of vertical multi-tier-formation after the first cable has been laid, a sand cushion of 30 Cms shall be provided over initial bed before the second tier is laid. If additional tiers are formed, each of the subsequent tiers also shall have a sand cushion of 30cms as stated above. The top most cable shall have final sand covering not less than 15 Cms i.e., 7.5 CMS below & 7.5 CMS above the cable before the protective cover is laid.

At the time of original installation, approximately 5 Mtrs. of surplus cable shall be left on each end of the cable and on each side of underground joints (Straight through / Tee / Termination) and at entries and places as may be decided by the Engineer in charge. The surplus cable shall be left in the form of a loop. Where there are long runs of cable length, loose cable may be left at suitable intervals as specified by the Engineer In charge.

Unless otherwise, specified, the cables shall be protected by second class bricks of not less than 23 Cms. x 10 Cms. x 7.5 Cms. (Nominal size) protection covers placed on top of the sand, (Bricks to be laid breadth wise) or the full length of the cable to the satisfaction of the Engineer In charge. Where more than one cable is to be laid in the same trench, this protective covering shall cover all the cables and projects at least 5 Cms. over the sides of the end cables or as per drawing.

BACK FILLING

The trenches shall be then back filled with excavated earth free from stones or other sharp-edged debris and shall be rammed and watered, if necessary, in successive layers not exceeding 30 Cms. Unless otherwise specified, a crown of earth not less than 50 mm in the center and tapering towards the sides of the trench shall be left to allow for subsidence. The crown of earth however should not exceed 10 Cms. so as not to be a hazard to vehicular traffic. The temporary re-installment of roadways should be inspected at regular intervals, particularly during the wet weather, and any settlement should be made good by further filling as may be required.

After the subsidence has ceased, trenches cut through roadways or other paved areas shall be restored to the same density and material as the surrounding area and repaved to the satisfaction of the Engineer In charge.

Where road turns or lawns have been cut or kernal stones displaced, the same shall be repaired and made good except surfacing. Asphaltting to the satisfaction of the Engineer and all surplus earth or rock removed to places as specified.

ROUTE MARKER

Route marker shall be provided along straight runs of the cable at locations approved by the Engineer In charge and generally at intervals not exceeding 30 Mtr. Markers shall also be provided to identify change in the direction of the cable route and also for location of every underground joint.

Route markers duly marked with "GIDC" shall be made out of 230 mm x 120 mm x 5 mm Iron Clad, bolted on to 35mm x 35mm x 6mm angle iron 60cm, long, flushed with ground in cement foundation as directed by the Engineer in-charge. Such plate marker shall be mounted parallel to a 0.5 Mtr. or so away from the edge of the trench.

The working cable and other details such as voltage grading size etc. as furnished by the Engineer in charge shall be inscribed on the marker.

At every cable straight through joint, marker shall be provided with tag plates both upstream and downstream of the joint.

LAYING IN PIPES / CLOSED DUCTS

In locations such as road crossing, entry to pump house on poles, in paved areas etc. cables shall be laid in pipes or closed ducts.

Stoneware pipes, G.I., C.I. or spun reinforced concrete pipes shall be used for such purposes. In the case of new construction, pipes as required, shall be laid along with the civil works and jointed as per the instructions of the Engineer In charge. The size of the pipe shall be as per schedule B for more than one cable. These pipes shall be laid directly in ground without any special bed except for SW pipe which shall be laid over 10 cm thick cement concrete 1:5:10(1 cement: 5 coarse sands: 10 graded stone aggregate of 40 mm nominal size) bed. No sand cushioning or tiles need be used in such situations. Unless otherwise specified, the top surface of pipes shall be at a minimum depth of 1.0 m from the ground level when laid under roads, pavements etc. Where steel pipes are employed for protection of single core cables feeding AC load, the pipe should be large enough to contain both cables in case of single-phase system and all cables in the case of poly phase system.

Pipes for cable entries shall slope downwards and suitably sealed to prevent entry of water. Further, the mouth of the pipes at the road-crossing end shall be suitably sealed to avoid entry of water.

All chases and passage necessary for the laying of service cable connections to street poles shall be cut as required, and made good to the original finish and to the satisfaction of the Engineer In charge.

Cable grips / draw wires and winches etc. may be employed for drawing cables through pipes closed ducts etc.

TESTING

Prior to laying cables and prior to energizing the cables, following tests shall be carried out

Insulation resistance test between phases, phase to neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Sheathing continuity test.

Earth resistance test of all the phases and neutral.

All cables before laying shall be tested with a 500 volts megger for 1.1 KV grade or with a 2,500 / 5,000 volts megger for cables of higher voltages.

All cables shall be subjected to above-mentioned tests during laying, before covering the cables by protective covers and back filling and also before the jointing operations.

All tests shall be carried out in accordance with relevant Indian standard code of practice and Indian Electricity Rules. The Contractor shall provide necessary instruments, equipment, and Labor for conducting the above test and shall bear all expenses in connection with such tests. All tests shall be carried

out in the presence of the representative of the Corporation and results shall be recorded in prescribed forms.

Item No.178

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand / Solid Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables(B) 4 core 6 Sq. mm, **Item Description refer Item No.177**

Mode of measurements and payment:

The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.

- The rate shall be for a unit of Mtr. basis.

Item No.179

Providing and erecting XLPE (IS:7098)(I)-88 ISI armoured cable multistrand Aluminium conductor for 1.1 KV. to be laid on wall with necessary clamps or in existing trench / pipe of following size of cables (A) 4 core 16 Sq. mm, **Item Description refer Item No.177**

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.180

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (B) 2 to 4 core 6 Sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.181

Providing and, fixing heavy duty flange type brass cable gland with rubber ring for PVC insulated armoured cable complete with out going tails, insulating tape etc for following size of cables. (D) 2 to 4 core 16 Sq. mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.182

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (A) 1.5/ 2.5/4/6 Sq.mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.183

Solder less crimping type Aluminium lugs conforming to IS suitable for cable of following size evenly crimped with high pressure tool & connected to switchgear terminals with brass/cadmium plated nut bolts in an approved manner. (C) 16/25 Sq.mm.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.184

Supplying & erecting earth pit of minimum bore dia.150mm size approved make Earthing Electrode consisting Pipe-in-Pipe Technology as per IS 3043-1987 made of corrosion free hot dipped G.I.Pipes having Outer pipe dia of 50mm having 80-200 Micron galvanising, Inner pipe dia of 25 mm having 200-250 Micron galvanising, connection terminal dia of 12mm with constant ohmic value surrounded by highly conductive compound with high charge dissipation suitable for following type of applications with chamber and heavy duty cover. (A)(approved make OEM has to submit test certificate including value of earth resistance of installation duly stamped and signed by agency and officer Incharge has to ensure the value of earthing resistance mentioned in test Certificate) & having back filling compound of (B) Inner chemical (CCM Compound)- Resistivity:- 0.2 ohm / meter testing as per IEC 62561-2017, Voltage drop:- < 1 volt at no load & dry form, Sulphur content:- <2%(C) Back fill Compound :- Earthing compound should be capable to retain moisture for long time Necessary test report must be submitted by Agency. (c) For Electrical Installation covering Transformer Neutrals, Lightning arrester Earthing, A.C.Plant & Sensitive Computer System(like Automation, SCADA) i.e independent Earthing in normal soil. Length of Pipe : 3.00 mtrs Back filling Compound :2 nos Bags of 25 Kg.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

General:

All the non-current carrying metal parts of the electrical installation and mechanical equipment's shall be earthed properly. The metal conductor, trenching cables armor and sheath; electrical panels boards; lighting fixtures; and connected by means of specified earthing system. An earth continuity conductor shall be installed with all the feeders and circuits and shall be connected from the earth bar of the panel boards; earth pin of the socket outlets and to any metallic wall plates used.

◆ Scope of work:

The scope of work shall be covers supply; laying; Earthing GI installation; connecting; testing and commissioning of:

1. Earthing station.
2. Earthing G.I./Aluminum/copper strips from earthing station to equipotential bar / Section pillar.

3. Earthing G.I/Aluminum/copper strips from earthing station to equipotential bar to lay feeder / Section pillar.
4. Bonding of Non- current carrying part and metallic parts of the electrical installation.
5. Earthing station to be provided shall comprise of earth Electrode of copper plate in earth pits, earth bus/grid of GI flats 25 mm x 6 mm and bare GI wires as earth continuity conductor.

◆ CODE AND STANDARDS.

The entire earth system shall conform to the following standards and rules as applicable.

1. IS 3043 – 1966 Code of practice for earthing.
2. Indian Electricity Act 1990.
3. Indian Electricity Rules 1956.

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Codes of practice in absence of Indian standard.

◆ GENERAL REQUIREMENT:

1. GI flat 25 mm x 6 mm strips of specified size shall directly earth Neutral of the Transformer / section pillar.
2. Enclosures and frame work of all current carrying equipment and accessories, structural steel/ columns shall be adequately earthed to a single earthing system, unless separate earthing systems are specifically stipulated. All electrical equipment shall be earthed at two distinct points.

◆ EARTH ELECTRODES IN EARTH PITS.

Plate Electrodes of copper shall be 600 X 600 X 3.15mm thick.

◆ EARTH BUS AND EARTH CONTINUITY CONDUCTOR.

1. Earth bus is a copper strip or flat of specified size interconnecting all earth electrodes.
2. Switchers and power Distribution Boards shall be earthed by a copper flat strip.
3. Panels fused DBs shall be earthed by a continuity conductor, as specified. Minimum size of continuity conductor shall be 6 SWG bare soft drawn.
4. Road Lighting poles shall be earthed with GI stranded wire conductor while for lighting and power wiring bare copper conductor shall be provided unless otherwise specified to use insulated conductor.

◆ RESISTANCE TO EARTH:

The resistance to each earthing system shall not exceed 1.0 ohm to 3.0 ohm.

◆ Earthing Station:

1. Plate Electrode Earthing:

Earthing electrode shall consist of copper plate not less than 600 X 600 X 3.15 mm thick, as called for in the drawings. The plate electrode shall be buried as far as practicable below permanent moisture level but, in any case, not less than 2.5 Mts. Below ground level. Wherever possible earth electrode shall be located as near the water tap, water drain or a down take pipe as possible, Earth Electrodes shall not be kept clear of

the factory foundations and in no case shall it be nearer than 2 meters from the outdoor face of the wall. The earth plate shall be set vertically and surrounded with 150mm thick layer of charcoal dust and salt mixture 25mm GI pipe shall run from the main earth conductors shall be connected to the electrode just below the funnel, with proper terminal lugs and checks nuts of copper/brass for copper plate. The funnel over the GI pipe and earth connections houses in a masonry chamber, approximately 350-mm length X 300 mm wide and 300mm deep.

The masonry chamber shall be provided with a cast Iron hinged cover resting over a Cast Iron frame embedded in masonry.

◆ INSTALLATION AND CONNECTION:

1. The plate/ pipe electrode as far as practicable shall be buried below permanent moisture level but in no case not less than 2.5 M below finished ground level.
2. The plate /pipe electrode shall be kept clear of the building foundation and in no case; it shall be nearer by less than 2 M from outer face of the finished ground level. The plate electrode shall be installed vertically and shall be surrounded with 150 mm. thick layers of Char- coal dust and Salt mixture. 25mm. Dia. of G.I. pipe for watering shall run from top edge of the plate / pipe Electrode to the mid-level of block masonry chamber.
3. Top of the pipe shall be provided with G.I. funnel and screen for watering the earth / ground through the pipe
4. The funnel with screen over the G.I. pipe for watering to the earth shall be housed in a block masonry chamber as shown in the drawing.
5. The masonry chamber shall be provided with a cast Iron hinged cover resting over the Cast Iron frame which shall be embedded in the block masonry.
6. Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of India Standard IS 3043, Code of practice for Earthing Installation.
7. The earth conductors (Strips / Wires – copper / Hot dip G.I.) inside the building shall properly be clamped /supported on the wall with Galvanized Iron clamps and Mild Steel Zinc plated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level.
8. The earth conductors shall either terminate on earthing socket provided on the equipment shall be fastened to the foundation bolt and/ or on frames of the equipment. The earthing connection to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.
9. Over lapping of earth conductors during straight through joints, where required, shall be of minimum 75mm long.
10. The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

◆ EARTH LEADS AND CONNECTIONS.

Earth led shall be bare copper or galvanized steel 25mm x 6 mm sizes shown on drawings. At road crossing necessary Hume pipes shall be laid. Earth led run on surface of wall or ceiling shall be fixed on saddles so that strip is at least 8 mm away from the wall surface.

The complete earthing system shall be mechanically and electrically bonded to provide an independent return path to the earth source.

◆ EQUIPMENT EARTHING.

All apparatus and equipment transmitting or utilizing power shall be earthed in the following manner. Copper / G. I. earth strips / wires shall be used unless otherwise indicated in the schedule B.

◆ POWER TRANSMISSION APARTUS.

1. Metallic conduit shall not be accepted as an earth continuity conductor A separate insulated/ bare earth continuity conductor of size 50 % minimum & maximum shall be provided. Copper Aluminum G.I. Minimum (Sq.mm.) 2.54.06 Maximum 65100200
2. The earth continuity conductor to the drawn inside the conduit shall be insulated.
3. Nonmetallic conduit shall have an insulated earth continuity conductor of the same size as for metallic conduit. All metal junction and switch boxes shall have an inside earth stud to which the earth conductor shall be distinctly colored (Green or Green / Yellow) for easy identification.
4. Armored cable shall be earthed by two distinct earth connections to the armoring at both the ends and the size of connection being as for the metallic conduit.
5. In the case of unarmored cable, an earth continuity conductor shall either be run outside along with the cable or shall from a separate insulated core of the cable.
6. Three phase power panel and distribution boards shall have two distinct earth connections of the size correlated to the incoming cable size. In case of single phase DB's a single earth connection is adequate.

◆ UTILIZING EQUIPMENT:

1. All street light poles shall have an earth stud and be connected to the cable armoring using 6.5 sq.mm. Copper or equivalent unless shown otherwise. For street lighting poles planted in ground, 2.4 M long 6 SWG bare GI wire shall be coiled and buried with every fourth pole in addition to connection to cable armoring.
2. An equipment-earthing grid shall be established as shown in the drawing. All earth connections to all panels, DB's and equipment shall be connected to the nearest point of the earthing grid.

◆ TEST:

1. The entire earthing installation shall be tested per requirements of Indian Standard specification IS: 3043,
2. The following earth resistance values shall be measured with an approved earth megger and recorded. Each earthing station Earth continuity conductors.

3. Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 1 to 3 Ohm in each case.
4. Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.
5. All tests shall be carried out in presence of the Engineer In charge /Electrical Inspector – if required.

♦ **MODE OF MEASUREMENT:**

1. Provision of earthing station complete with excavation, electrode, and watering pipe. Soil, treatment, masonry chamber with cast iron cover etc. shall be treated on unit of measurement;
2. The following items of work shall be measured and paid per unit length covering the cost of the earth wires/strips clamps. Labour etc.

- a. Main equipment earthing grid and connection to the earthing stations
- b. Connection to the weight board, power panels, DB etc.

♦ The cost of earthing the following items shall become part of the cost of the item itself and no separate payment for earthing shall be made.

1. Isolating switches and section pillar shall form part of amounting frame, switch starter etc.
 2. Light fittings form part of installation of the light fitting.
 3. Conduit wiring, cabling shall form part of the wiring of cabling.
- Street lighting shall form part of the street light poles.

Item No.185

Providing and erecting required size Copper strip for earthing of H.T. OCB / ACB/ Transformer, LT panel board, Motors etc. using copper clamp.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Kg. basis.

Item No.186

Providing and erecting required size HOT deep Galvanised iron strip for earthing of H.T. , OCB/ ACB/ Transformer LT panel board, Motors etc. using proper clamp.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Kg. basis.

Item No.187

Supplying and erecting approved make oscillating type bracket fan A.C. 230V. 50cy/s 400/450 mm sweep wall mounted with height adjustment and rotary tilting device complete with guard, flexible Core plug top complete erected with lead wires as directed.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.188

Providing & erecting Approved make Power Saving 50 Watt Ceiling Fan with double ball bearing ISI mark with Condenser 230 volt A.C. 50 Hz 1200 mm sweep complete having 3 blades with aluminium blades with , canopy & 30 cm. down rod erected with earthing.(Make shall be approved by Engineer in charge)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.189

Supplying and erecting 19 / 20 mm. nominal bore Medium Class M.S. Pipe down rod erected duly painted for fan complete with proper insulation without leakage and earthing.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.190

Supplying & erecting fan hook box of 10 mm M.S. round bar bounded to the RCC bars up to 50mm length each side and pierced through a 16 Gauge M.S. box / Heavy Duty PVC box complete erected concealed in Ceiling with necessary finishing.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.191

Providing 2.5mm.thick laminated acrylic sheet to cover the fan hook or Fan box.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.192

Supplying & erecting approved make low noise decorative exhaust fan having square frame ABS body with inbuilt lowers & square frame. 200mm with 1350RPM Cat.II

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.193

Providing recess in wall or window frame suitable for erection of Exhaust fan complete with plastering and colour washing to match the colour of the wall or window complete with expanded metal in order to render the fitting in accessible and the room water-proof.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.194

Supplying and erecting approved make Instantaneous type water heater with 3ltr.capacity rust free container housed in ABS plastic body insulated with glass wool / puff insulation and 3 Kw heating elements, adjustable thermostat 300 C to 850 C with set to operate at 850 C (+ /-60 C) auto reset indication lamps, thermal cut-out, safety valve fusible plug etc. Premium Category

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.195

Supplying and erecting led lamps with following wattage capacity of 220 to 240 voltage, minimum 15000 burning hours life, 500 V in built-surge protection, Polycarbonate diffuser, mounting suitable for E14 / E27 / B22 lamp holders, pf >= 0.5 (A) LED Lamps integral type, with PC diffuser suitable LAMP holder (ii) 5 to 8 watts cat - III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.196

Supplying and erecting led lamps with following wattage capacity of 220 to 240 voltage, minimum 15000 burning hours life, 500 V in built-surge protection, Polycarbonate diffuser, mounting suitable for E14 / E27 / B22 lamp holders, pf >= 0.5 (A) LED Lamps integral type, with PC diffuser suitable LAMP holder (v) 21 to 30 watts cat - III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.197

Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V, Power Factor more than 0.95, THD < 15 %, CCT 3000 K to 6500K, Luminaire efficacy > 85 lumens/watt, LED driver efficiency > 85 % (fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer incharge may select any wattage capacity between the ranges shown.)

(A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring loaded mounting clips complete.IP20 (iii) 16-20 watts, Surge-2 KV cat - III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.198

Supplying and erecting LED indoor fittings with LEDs of wattage 0.2 Watt to 0.5 Watt assembled on single MCPCB, with housing used as a heat sink shall be made of thick sheet Steel conforming to IS: 513/CRCA/aluminium pressure die cast powder coated and high U.V. & corrosion resistance with diffuser housed in aluminium casted body with company mark/name 160V to 270V, Power Factor more than 0.95, THD < 15 %, CCT 3000 K to 6500K, Luminaire efficacy > 85 lumens/watt, LED driver efficiency > 85 % (fitting required LM-79 & LM-80 Certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings.The Engineer incharge may select any wattage capacity between the ranges shown.) (A) Square/ Circular shaped Surface/Recessed Mount Downlight with provision for spring loaded mounting clips complete.IP20 (iv) 22-24 watts, Surge-2 KV cat - III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.199

Supplying & erecting dual channel amplifier ,power handling capacity of 180 watt ,four micro phone inputs with independent level control ,built in FM tuner,with preset memories,USB drive & SD card for MP3 playback ,100v /telephone input with priority and VOX,frequency response-80 Hz to 18k Hz Philips / /distortion less than 1% @ rated power up to 50 units [[Approved by Competent Authority i.e. not Below the rank of Executive Engineer]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.200

SITC of 3LCD Lamp based projector having wxga (1280x800) or better resolution with minimum white brightness of 3800 lumens and color brightness of 3800 lumens. The projector should have minimum 1HDMI,1VGA input. Having contrast ratio of 15000:1 or more. the projector should have auto vertical key stone correction of +/- 30 degree and Manual Horizontal of +/-30 degree. the projector should have optical lens, throw ratio 1.30-1.56:1. Zoom Factor of 1.2. Lens focus Manual having focal length 16.9mm to 20.28mm. projector should have features like AV mute slide, quick corner and split function and should support wireless functionality with inbuilt wifi or wifi dongle. [Approved by Competent Authority i.e. not Below the rank of Executive Engineer]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.201

SITC of 100 inch Self Lock MW (7 x 5) Instalock Slow Retraction Screen, Aspect Ratio-4:3 [Approved by Competent Authority i.e. not Below the rank of Executive Engineer]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.202

SITC of Rack Mounting kit for the control unit.

[Approved by Competent Authority i.e. not Below the rank of Executive Engineer]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.203

Providing and erecting water cooler having storage capacity 80Ltr. & cooling capacity 40 Ltr.per hour @ an ambient temp of 45° C. The outlet temp. of the water should drop by 15° C within a hour, The water cooler should be comprising of hermetically sealed compressor, fan motor, condensing unit, water tank surrounded by evaporating coil, thermostats, relay etc. complete with necessary inlet & outlet connection. The body of water cooler will be made from Stainless Steel.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.204

Supplying & erecting reverse osmosis (RO) water purification system with M.S. powder coated pedestal frame, prefilter housing carbon filter suitable buster DC pump, auto low & high pressure switches with following size of LPH capacity & erected as directed [D] 100 LPH with 1 phase / 3 phase Raw water pump of 500LPH @ 2.5kg/cm² - (1No - Kirloskar /CRI/Lubi), Dual media filter 10"x54" - (1 No), Micron cartridge filter 20" x 2.5" (1No), High pressure pump 500LPH @ 10kg/cm² - (1No - Shimge /CRI /Lubi), RO Membrane housing with RO membrane of 40*40 - (1No), RO pressure tube 4" x 1E - (1No), 0 - 1200LPH Rotameter -(2 Nos), with Recovery Rate 50%.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.205

Supplying and erecting approved make Conical Pole (Standard) Made from HR sheet steel. The pole should be made as per IS. and shall be coated with hot dip galvanizing as per IS 2629/2633/4759 with required base plate and integral Junction box consist of terminal plate of min 6mm Hylam sheet, standard profile

35mmX7.5mm Din-Rail for MCB Mounting, stud type terminal and arrangement for cable termination as erected on suitable foundation (included) with necessary GI nut-bolts/J-Bolts. as per details given by manufacturer considering site requirement. The length of poles are as below
(C) 5 Mtr. Long 65mm Top X140 mm bottom dia, 3mm thickness.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Structure:

Poles shall be continuously tapered Conical cross section, presenting a good and pleasing appearance and based on proven design conforming to international standards, to give an assured performance, and reliable service. The pole shall be suitable for wind loadings as per IS 875 part 3 1987.

Poles shall be provided with base plate, which shall be free from any lamination or incursion. The welded connection of the base flange shall be fully developed to the strength of the entire section. The base plate shall be welded to the bottom of the pole before dipping in the galvanizing bath. The base of the pole shall be complete in all respects with base plate before hot dip galvanizing internally and externally as per ASTM A 123 and 153. Pole shall be hot dip galvanized in single dipping method. No cutting or welding shall be allowed on the pole after hot dip galvanizing.

An adequate door opening shall be provided at the base of the pole at a convenient location. Provision shall be given inside this door for fixing the electrical terminals. The opening shall be such that it permits clear access to the inside of the pole. The door opening shall be complete with a close fitting, vandal resistant, door; provided with a screw type locking facility.

The Decorative bracket shall be fabricated having the design to be approved by the Department/Engineer-In-charge. Suitable arrangement shall be provided at the top of the street light pole for fixing of street light fixtures. MS plate to be welded at the bottom of the pole and the necessary earthing termination bolt and the cable entry for the Luminaries etc. shall be provided at proper distance for fixing of junction box.

The installation of pole shall be done as per direction of Engineer –In- charge at distance of approx. 25 Mtr or as per site requirement between two poles. Special care shall be taken while erection of poles so that these are not strained or damaged during erection and are firmly stayed till the foundation are secured, as per instruction of Engineer- in-charge and as per drawing.

The alignment of all the poles and the height shall be in one line so that from the distance it looks in one line. The material shall not be dispatched without prior inspection by the inspecting authority appointed by the department or DEE (M&E) GIDC Vapi.

The pole must be erected on suitable Reinforcement Cement Concrete (RCC) foundation of 45 cm x 45 cm plinth or 45 cm dia x 45 cm in M - 20 Cement Concrete with necessary water curing FE 415 Steel and Excavation & finishing in approved manner and as per drawing & including excavation and as per instruction of Engineer In charge or as per St.lgt Pole OEM recommendation. - (1 No. Per St. Light Pole)

The pole should have suitable long 'J' type EN 8 grade foundation bolts along with template for the above poles as per instruction of Engineer In charge or as per St.lgt Pole OEM recommendation.

Item No.206

Providing and erecting street light pole bracket comprising main B Class MS pipe of 4.2 cm/require outside dia. complete with suitable B Class M.S. sleeve tubing of approx. 45cms.length and suitable for 76.5 mm / 80mm. / require size pole top having sufficient fasteners for fixing the brackets and having spread of 1 mtr. length with suitable rise as per site condition & suitable welded stiffener reducer and nipple with check nut complete painted with one coat of Red oxide / PU base primer

and two coats of Aluminium / PU paint. paint with following nos of arms.
[A] Single Arm bracket 1 Mtr

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.207

Supplying & erecting approved make SMC press moulded composite FRP. loop-in, loop-out approx. 2mm thick box complete with Bakelite connector strip 5way(3P+N+E), DIN rail for mounting mob & hinged doors as per requirement having locking arrangements with mounting clamp with nuts, bolts & washers suitable for erection on pole with cable clamps & earth bolt of following size of box. (A) 300mm x 200mm x 100mm [deep]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.208

Supplying and erecting LED street light / Flood light fittings with High power White LEDs wattage of 3 Watt and above assembled on single MCPCB, efficiency more than 130 lm/w and corrosion free High pressure die cast aluminum housing with smooth finish powder coated and heat sink extruded aluminium with diffuser and Polycarbonate optics/ lenses, with toughened glass with company mark/name engraved or embossed 160 to 270 V, Power Factor more than 0.95, THD < 10 %, CCT 3000 K to 5700K, Uniformity ratio > 0.45, Luminaire efficacy > 100 lumens/watt. LED driver efficiency > 85 %.(fittings required LM-79 & LM-80 certificates)(NOTE: Below description have shown ranges of Wattage capacity of LED fittings. The Engineer in charge may select any wattage capacity between the ranges shown.)(A) Street Light (IP-65), Surge protection -4KV integral and ,Light must have 440VAC line supply with over-voltage protection. (i) above 36 to 48 watts Cat-III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.209

Providing and fixing Terminal board of size 5.0 x 127 x 152.4 mm. bakelite sheet with suitable brass studs with nuts, washers and clamps of size 25mm x 3mm suitable for pole painted with one coat of red lead paint.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.210

Supplying & erecting approved make Digital time switch having lithium cell 6 years operative and operate battery backup 1 channel day clock with 14 memory programme, suitable to operate on 240V + 5%, 16A with, floating contacts Minimum switching setup time 1 minimum & LCD display. Also comprised permanent ON/OFF switching. Programming switches & housed in fire proof thermoplastic enclosure & transparent cover erected as required with necessary connection erected as directed.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.211

Supplying & erecting power contactor ,AC3 duty for time switch complete erected as per direction Cat III (B) 2 pole 250V 32 Amp.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.212

Supplying and erecting Flexible PVC insulated multi strand multi core 1.1 kv grade ISI marked copper wires of following size to be erected as directed. (e) 1.50 Sq.mm 3 core round PVC sheathed

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.213

Supplying and erecting B class Galvanized iron pipe having smooth finished bore of the pipe on both ends erected nuts and bolts along the pole / wall shaping the pipe as per site requirement. Pipe dia as following. (C) 40 mm dia.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rmt. basis.

Item No.214

Providing and erecting Pipe type earthing with 40 mm dia 2.5 mtr long 'B' grade G.I. pipe with necessary coupling buch buried in specially prepared earth pit & G.I. earth wire of 8 SWG erected & connected as directed (For panel) For using salt and charcoal / coke as required for pipe type earthing.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.215

Providing & laying approved make Double walled corrugated pipes (DWC) of polyethylene(conforming to IS 14930 II)with necessary connecting accessories of same material at required depth in existing trench for laying of cable. below ground / road surface for enclosing cable (A)50 mm outer dia

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Rmt. basis.

Item No.216

Providing & erecting 240 V MCB double pole switch for lighting Load (B Curve) having 10 KA breaking capacity & confirms to IS : 8828 in existing box having following capacity(A) 6 to 32 Amp. Cat-III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.217

Making trench in Hard Murrum / Tar Road of suitable width of 90 cm or required depth for laying any size of cable or locating the fault all over the run and back filling the same and making the surface as normal ground.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.218

Making trench in soft soil of suitable width of 90 cm deep for laying cable or locating the fault all over the run and back filling the same and making the surface as normal ground.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.219

Supplying & erecting carbon dioxide (CO2) fire extinguisher user of following capacity with necessary clamps made from 50 x 6 mm M.S. Flat with nut & bolts grouted in wall complete.[A] For 4.5 Kg Capacity

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.220

Supplying & erecting ABC powder type 'Ceasefire' type Fire extinguisher as per IS 13849 or 1 Kg capacity with necessary clamp for erection on wall

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.221

Providing & erecting open well type horizontal mono block pump set with stainless steel body having following specification (C) 1 H.P. single phase open well motor pump set suitable for 185 LPM discharge @ 25 mtr. head, suitable for 32 mm dia. Delivery pipe with control panel. Cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.222

Providing & erecting open well horizontal mono block pump set with cast iron body, complete for three phase submersible motor having [C] For 3 HP 3 phase open well horizontal mono block pump set suitable for 85 LPM to 270 LPM @ 11 mtr to 33 mtr head suitable for 50/65 mm dia delivery pipe Cat III

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.223

Supplying & erecting approved make Automatic liquid level controller 6A. with sensor testing as per instruction of Engineer in charge on site complete with wiring connection with existing wires , with copper conductor from pump to upper and lower tank.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.224

Supplying & erecting approved make motor control cubical panel [Star delta] made from 16G CRCA sheet duly epoxy powder painted inside and outside with hinged doors and locking with suitable size of ON - OFF isolator (AC 3 / 23 duty) main fuses. Digital volt and current meter (in a single unit) with micro controller based control unit and current sensing single phasing preventer electronic overload protection, over voltage (Programmable) protection and under voltage (Programmable) protection, prod less dry run protection programming facility for setting of all parameter like overload current, high voltage limit, low voltage limit, dry run limit with digital indication on seven segment LED display for any fault like over load, high voltage, low voltage, dry running

single crimped, electronic star delta timer, feather touch start / stop push buttons to be erected on angle iron frame. Grouted on wall the contactors will be of L& T, Siemens, BCH make only) (A) DOL up to 5.0 H.P.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.225

SITC of Analogue Addressable Manual Call Point with Integral Short Circuit Isolator, Analogue Addressable Protocol having, Bi-coloured status LED (red for alarm, amber for (short-circuit), Non-frangible element fitted as standard (conforms to EN54), pulsing/non-pulsing can selectable via panel, Electronically addressed, Approved by LPCB. (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.226

SITC of addressable loop powered Base sounder with integral Beacon, includes 51 user- selectable tones (all tones EN54-3 compatible), variable sound output 50 ~ 98 dB(A) (± 2 dB(A)) output at 1 metre, Auto shut down feature prevents noise pollution, 'O' rated beacon to EN-23, IP21 rated for internal use, sounder and beacon can operate independently, Approved by LPCB (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.227

Supplying & laying of 2x1.5 sqmm fire alarm armoured cable, 600/1000V rated with annealed copper conductor having XLPE insulation, steel wire armouring & FRLS outer sheath complete as required.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Mtr. basis.

Item No.228

SITC of Microprocessor based Net-workable Analogue Addressable Fire Alarm Control Panel. The Panel shall be compliant with EN54-2, EN54-4 and approved by LPCB. The Fire Alarm Control Panel shall have inbuilt 3 loops and expandable upto 4 Loops. The Panel must have large graphic display. The Panel must also have the capability to take Addressable Intelligent Wired and Wireless Devices on same loop. Each loop shall have a capacity of 127 analogue Addressable devices and 127 Base sounders/Base Sounder Beacons. The Panel shall have 240 V AC power supply along with automatic Battery Charger. Approved by LPCB (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.229

Supply, Installation, Testing and Commissioning of 4MP Varifocal Lens Dome Type Camera, H.265 4MP IR Turret Dome N/W Camera, Manual Varifocal 2.8-12mm, 50M, Micro SD, DC12V/PoE, IP67/IK10, Basic IVA, 4MP resolution (2560 × 1440), True day/night, Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Built in MIC, Cyber Security, Basic intelligent video analytics, Audio In, NDAA Compliance, UL, CE, FCC Certified (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.230

Supply, Installation, Testing and Commissioning of 4MP Varifocal Lens Bullet Camera, H.265 4MP IR Bullet N/W Camera, Manual Varifocal 2.8-12mm, 50M, Micro SD, DC12V/PoE, IP67/IK10, Basic IVA, 4MP resolution (2560 × 1440), True day/night, Digital WDR, 3D DNR, HLC & BLC, Triple streams, Smart codec by ROI, Cyber Security, Basic intelligent video analytics, NDAA Compliance, UL, CE, FCC Certified (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.331

Supply, Installation, Testing and Commissioning of 16 Channel Network Video Recorder (NVR), 1, RJ-45 10/100/1000 Mbps self-adaptive Ethernet interface, Supports H.265+/ H.265/H.264/H.264+ decoding formats, Embedded NVR, 2 HDD Bays, up to 6TB capacity each disk, HDMI, VGA output, 1-ch @ 8 MP / 4-ch @ 1080p, Incoming bandwidth 160Mbps, Outgoing 80 Mbps, CE FCC, BIS, Operating Temp -10 deg to 55 deg C, 2xUSB 2.0 1USB and serial Interface (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.232

SITC of SCREEN SIZE 80 cm diagonal (32" INCH), RESOLUTION HD (1366*768), USB INPUT (2.0 SUPPORT) 2*Side(USB2.0), HDMI INPUT 3*Side(HDMI 1.4), USB DEVICE SUPPORT USB Supported HDD, HOTEL MODE Yes, Basic, BLUETOOTH Yes (Ver. 4), WIFI TYPE(STANDARD) 802.11a/b/g/n 2.4G 2T2R, Built-in, WIFI BAND TYPE 2.4GHz, OS & VERSION INFO Android 'P' - 9.0, MEMORY FLASH 8GB EMMC, RAM 1.5GB, DDR3 2133 Mhz. (Including Five year free maintenance with guarantee)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.

- The rate shall be for a unit of Each. basis.

Item No.233

SITC of 8 x 10/100/1000BASE-T PoE ports 2 x Gigabit SFP ports Advanced L2 switching and security features L2+ Static Routing Optional “standard mode” or “surveillance mode” management user interface 65W PoE budget [Approved by Competent Authority i.e. not below the rank of Executive Engineer]

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.234

Supply, Installation, Testing and commissioning of 4 TB Surveillance Series Hard disk supporting 24X7 operational efficiency

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.235

Providing & Erecting Network rack with following capacity with Necessary cooling fan, Cable manager, 6A PDU, equipment rack with necessary mounting accessories. (A) 9 U

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.236

Providing and erecting Inverter based approved make split air-conditioning unit consisting of condensing unit with variable speed fan motor, inverter type hermetically sealed rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by means of extra supplied proper insulated copper tubing, drain PVC pipes suitable for (cost includes Eco Friendly green gas charging and 15A plug top & Remote Control & MS Stand) with necessary core cutting. (2) For 4/5 Star Rating of current year (A) for 1.0 ton capacity- Premium Cat.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.237

Providing and erecting Inverter based approved make split air-conditioning unit consisting of condensing unit with variable speed fan motor, inverter type hermetically sealed rotary compressor with accessories etc. duly connected separately erected evaporating unit and blower motor with its accessories by means of extra supplied proper insulated copper tubing, drain PVC pipes suitable for (cost includes Eco Friendly green gas charging and 15A plug top & Remote Control & MS Stand) with necessary core cutting. (2) For 4/5 Star Rating of current year (C) for 2.0 ton capacity- Premium Cat.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Each. basis.

Item No.238

Supply, Installation, Testing & Commissioning of following size of Grid Tied Solar Power Plant with Solar Panels (ALMM approved): Frame Material : Anodized Aluminum alloy Frame With Twin Wall Profile, Front Cover : High Transmission Low-Iron Tempered Glass (AR Coated), High efficiency and positive power tolerance Pmax: 0/+5, Module Efficiency should be approx. 18%-21%, Normal operating temperature 45'C, Junction Box with Waterproof IP67 & MC4 Compatible and Enclosed with Bypass diodes, 100% Electroluminescence test to ensure error free Modules, Thep. temp. co-efficient of the PV module shall equal or better than -0.45%/degree C. Solar PV modules of minimum fill factor 75% to be used. Unit Production:- 4 to 5 Unit /kw /day (Actual)(1Year Avg) With 10 year Product warranty and 25 year Linear Power Warranty., Solar Inverter: MPPT Range: 80-1000 V, Max efficiency: 97.5% - 98.9%, O/p Frequency: 50/60Hz, Operating Altitude (m) ≤4000, O/p Power Factor: ~1, O/P THDi: <3%, Operating Temperature Range: -25~60°C, Anti-islanding Protection: Integrated, Input Reverse Polarity Protection Integrated, Insulation Resistor Detection Integrated, Residual Current Monitoring Unit Integrated, Output Over Current Protection Integrated, Output Short Circuit Protection Integrated, Output Over Voltage Protection Integrated, Protection Degree: IP65, User Interface LCD & APP,Datalogger & Communication: GPRS / Wi-Fi, Module Mounting Structure: Seamless Box Pipe / 'C' Channel of suitable size for rooftop solar installations with good stability against wind & weight load., Hot Dipped Galvanized steel coils. suitable arrangement for base plate for foundation , solar panel mounting, the structure should be suitable for carry the load of solar panel,wiring, sprinkler system etc. with necessary foundation work/wall mount, j bolt, anchor fastner etc. the nut bolt used for installtion of stucture should be (SS 304) quality. and Balane of System with necessary Swithgears (Suitabel size and protection of ACDB & DCDB), inter connecting wiring, earthing system, lightning arrester system, all liasoning work with various gov. dipartment like state nodal agency,DISCOM & CEIG is included in agency scope(Excluding GEDA Application fees, Solar connectivity Charges, Meter connectivity Charges, Meter testing Charges.) (D) Grid Tied Solar Power System: 26 - 50 kW (3 - phase)

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Per KW. basis.
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Item No.239

Providing & erecting Automatic solar panel cleaning system for solar power projects which includes necessary plumbing work (UPVC pipes and accessories) from source of water to project site (upto 30 meters),Suitable size of sub mercible/ open well motor, necessary wiring for motor and sprinkler system with safety, timer circuit for automatically on/off the sprinkler system, necessary size oand number of nozzles/JET (minimum 1 Nozzle/Jet per module). (D) 21KW-50KW System

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Per KW. basis.

Item No.240

Booster Pump- Electric Motor Driven:SITC of: Back Pull-out End Suction Type -Single Stage, Self Priming, Centrifugal Pump for booster Fire Pump with Electric Motor, Mechanical Seal, Base-frame and Couplings. MOC:-Casing-CI, Impeller- Bronze, Shaft- SS 410, Sleeve-SS410.Capacity: 450 LPM, 3HP Speed: 2900 Approx Pump shall be capable of furnishing not less than 150% of rated capacity at a head not less than 65% of rated head The shut off head shall not exceed 120% of rated head. UOM:-Price Per Complete set of Pump + Motor + Accessories. Note:-01. Minor civil work like hole/ Core Cutting etc. are in bidders scope. Make: KSB/Kirloskar/Wilo

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Set. basis.

Item No.241

Booster Pump Control Panel- Auto/Manual Type. Supply, Installation and Testing of: Electric Control Panel for Booster Pump. all pumps can be Start Automatically (by Pressure Switch) or Manually. Design As per the Detail Specifications given.UOM:-Price Per Set.Make: L&T, SIEMENS

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of Set. basis.

Item No.242

Pressure Gauge with Siphon Tube and Cock. Supply, Installation and Testing of: Pressure Gauge with Siphon Tube and Cock. MOC:-4" Dial- Glycerin filled- Stainless Steel Body Pressure Gauge with GI Siphon Tube andBrass Cock. Size:-Dial: 4" (100 mm) Range: 0 – 16 Bar (kg/cm2) UOM:-Price Per Unit

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.243

Pressure Switch with Siphon Tube and Cock. Supply, Installation and Testing of: Pressure Switch with Siphon Tube and Cock. Size:- Range suitable for System Design Pressure. UOM:-Price Per Unit

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.244

Pipe Laying. Supply, Fabrication, Installation, Hydro Testing & Painting of Under Ground Pipe. With necessary Pipe Fitments (Flanges, Bands, Socket etc.), MS Support/Clamps/Hangers/rapinf-coating etc. Hardware (Gaskets, Nut-Bolts, Paint etc.), Consumables (Welding Rod, etc.) and Labour Charge. Quality: GI, C-Class (Heavy). Paint: UOM:-Price Per Running Meter Size: 100 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of RMtr. basis.

Item No.245

Pipe Laying. Supply, Fabrication, Installation, Hydro Testing & Painting of Above Ground Pipe. With necessary Pipe Fitments (Flanges, Bands, Socket etc.), MS Support/Clamps/Hangers etc. Hardware (Gaskets, Nut-Bolts, Paint etc.), Consumables (Welding Rod, etc.) and Labour Charge. Quality: GI, C-Class (Heavy). Paint: UOM:-Price Per Running Meter Size: 100 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of RMtr. basis.

Item No.246

Check Valve (Non Return Valve) Supply, Installation and Testing of: Check Valve (Ball type or Swing type) with necessary pipe fitments, hardware and consumables. MOC:-Body: Cast Iron (With Flange Ends) Standard: ISI Marked. UOM:-Price Per Each No. Size: 100 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.247

Butterfly Valve Supply, Installation and Testing of: Butterfly Valve with necessary pipe fitments, hardware and consumables.MOC:-Body: Cast Iron, Disk: SS, Seat: Nitrile.UOM:-Price Per Each No. Size: 100 mm

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.248

Air Release Valve- 25 mm Supply, Installation and Testing of: Air Release Valve Check Valve with necessary pipe fitments, hardware and consumables. MOC:-Body: Gunmetal / SS. UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.249

Fire Hydrant Landing Valve (Stainless Steel (SS-304), ISI Marked):Supply, Installation and Testing of: Fire Hydrant Landing Valve with necessary pipe fitments, hardware and consumables.MOC:-Body: Stainless Steel (SS-304), Working Parts: Stainless Steel (SS-304), Coupling: Stainless Steel (SS-304), Standard: -ISI Marked. Size:-63 mm (Flange End: NB 75 mm, PCD 160 mm) UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.250

Fire Hose Pipe (Delivery Hose)- 63 mm x 15 m Supply, Installation and Testing of: Fire Hose with Hose Couplings. RRL (ISI Mark- Type A) Fire Hose. Hose Couplings: ISI Marked Stainless Steel. With SS Wire Binding. Standard: - ISI Marked & TAC Approved Hose. Size:-63 mm dia x 15m long Hose. UOM:-Price Per Each Set.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.251

Cabinet For Fire Hose (Hose Box)- Single Type Supply, Installation and Testing of: Fire Hose Cabinet (Hose Box) suitable to accommodate 01 no. of 15 m long fire hoses and 01 no. of nozzle. With Lock-n-key facility. Wall Mounting Design. MOC: 16 Gauge MS Box with Powder Coating Standard: - As per Guidelines. Size:- Suitable for 01 nos. of 15 m long hoses. UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.252

Fire Hose Nozzle- Short Branch Pipe Nozzle. Supply, Installation and Testing of: Short Branch-pipe Nozzle. MOC: Stainless Steel (SS-304). Standard: ISI Marked, Heavy Quality. Size:- 63 mm X 20 mm UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.253

Fire Hose Reel Set (ISI)-19 mm x 30 m -Rubber Hose. Supply, Installation and Testing of: Fire Hose Reel Set with necessary pipe fitments, hardware and consumables. MOC:-Drum: 16 G Powder Coated MS, Hose: 19 mm X 30 m heavy-duty RUBER hose. Shut-off Nozzle: SS-304. With Control Valve: SS- 25mm Ball Valve. Standard: ISI Marked. Heavy Quality. Size:-19 mm dia x 30m long Hose. UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.254

Fire Service In-let (In-let Connection for Fire Brigade)-2 Way Type. Supply, Installation and Testing of: Fire Service Inlet with necessary hardware and consumables. MOC:-Body: Heavy-duty CI. Couplings/NRV: Gunmetal. Standard: -Made As per IS Standard- Heavy duty quality. Size:-Couplings: 63 mm, 100 mm E-table Flange End. UOM:-Price Per Each No.

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

Item No.255

Approval of Fire Hydrant & Entire Fire Protection System from Local Fire Authority and any other relevant statutory authority at initial and various other stages of work, including preparation of report/drawings as per fire authority requirement. Contractor shall include cost of all liason work which are not explicitly mentioned above but are mandatory to have fire authority approval (any statutory charges will be paid extra).

Mode of measurements and payment:

- The rate includes cost of all labour, materials, tools and plant & all accessories, etc required for satisfactory completion of this item as described above.
- The rate shall be for a unit of No. basis.

LIST OF APPROVED MAKE / MANUFACTURER FOR ELECTRICAL WORK MATERIALS		
SR NO	DESCRIPTION	MAKE LIST
1	DG ENGINE	CUMMINS / SUPERNOVA/ PERKINS/ KISLOSHKAR/ POWERICA/ SUDHIR/ CATTER PILLAR
2	DG SET AMF PANEL	AS PER THE DG SET SUPPLIER. (SWITCHGEAR AS PER MAKE LIST AND & PANEL AS PER LT PANEL SPECIFICATIONS.)
3	ALTERNATOR	CUMMINS-STAMFORD / KIRLOSKER GREEN / SUPERNOVA - PERKINS
4	MEDIUM VOLTAGE CABLE / CONTROL / FLEXIBLE CABLE / WIRES FOR INTERNAL WIRING	RR KABLE / HAVELLS / POLYCAB / KEI /FINOLEX
5	LT PANELS AS PER CPRI / IEC 61439	FABRICATED PANELS WITH STANDARD APPROVED SWITCH GEARS & ACCESSORIES CPRI / ERDA APPROVED PANEL SUPPLIERS/ 65 KA SHORT CIRCUIT WITHSTHAND CAPACITY
6	APFCR / RTPFC PANEL	SCHNEIDER/ LK /LEGRAND /SIEMENS /ABB
7	DISTRIBUTION BOARDS	LEGRAND /SCHNEIDER /LK /ABB /SIEMENS
8	LT ACB	SIEMENS /SCHNEIDER /ABB /LEGRAND /LK
9	LT MCCB WITH EARTH FAULT	SIEMENS /SCHNEIDER /ABB /LEGRAND
10	LT MCB/ ELCB/ISOLATOR/ LT CONTACTORS	SIEMENS/ SCHNEIDER/ ABB/ LEGRAND /HAGER/ INDOASIAN
11	CURRENT TRANSFORMER & POTENTIAL TRANSFORMER	AE / ASHMOR / SEI / NEWTON / ECS.
12	METERS (DIGITAL)	SCHNEIDER / SECURE /RISHABH / LK
13	LOAD MANAGER/MFM	SCHNEIDER / SECURE /RISHABH / LK
14	INDICATING LAMP	SIEMENS / SCHNEIDER ELECTRIC / LK- ESBEE / TEKNIC - KEYCEE
15	ELECTRIC TIMER	SIEMENS / SCHNEIDER / ABB / LEGRAND /LK
16	ROTARY SWITCH	TEKNIC - KEYCEE / SALZER
17	PUSH BUTTON AND PUSH BUTTON SET	SCHNEIDER ELECTRIC / ELMEASURE / RAAS CONTROL
18	SELECTOR SWITCH	TEKNIC - KEYCEE / SALZER / LK
19	ANNUNCIATOR	PROTON / EAPL / TEKNIKA
20	LUGS / BIMETALLIC LUGS	DOWELL'S / HMI / COMET / HEX
21	CABLE GLAND	JAINSON / COMET / POLYCAB / HEX
22	CONNECTORS (COLOURS AS PER PHASE & NEUTRAL)	SALZER / ELEMEX / LK
23	CABLE TRAY (ALL TYPE)	LEGRAND / OBO BETTERMAN / PROFAB
24	ELPS SYSTEM	OBO / CAP ELECTRIC / JEF
25	DWC PIPE	REX / TIRUPATI / GEMINI / ASTRAL / SUPREME
26	L.T. CABLE JOINTING KIT	RAYCHEM / 3-M
27	PVC CONDUITS AND ACCESSORIES	PRECISION / BEC / POLYCAB
28	FLOOR TRUNKING/ RACEWAY & FLOOR JUNCTION BOX	MK-HONEYWELL/ LEGRAND /OBO /PROFAB
29	MODULAR SWITCHES/ SOCKETS & OTHER ACCESSORIES	MK-HONEYWELL /LEGRAND /SCHNEIDER /PANASONIC

30	METAL CLAD SOCKET WITH MCB	LEGRAND /SCHNEIDER /HENSEL /LK
31	PVC TAPE	STEEL GRIP/ANCHOR
32	PVC JUNCTION BOX	PRECISION / BEC / POLYCAB / HENSEL / FIBOX
33	INTERNAL LIGHT FIXTURE	PHILIPS / WIPRO / HAVELLS / CROMPTON / JAQUAR / KESSLEC OR AS PER INTERIOR/ARCHITECT SELECTION
34	HIGH SPEED FAN & EXHAUST FAN	BAJAJ/ HAVELLS/ CROMPTON
35	EXTERNAL LIGHT FIXTURE	PHILIPS / WIPRO / HAVELLS / CROMPTON / JAQUAR / KESSLEC OR AS PER INTERIOR/ARCHITECT SELECTION
36	POLE / HIGH MAST POLE	UTKARSH/ TRANSRAIL/ VOLMOUNT
37	FRP / GRP POLE	SUMIP/ BAJAJ/ TRANS RAIL
38	METAL CONDUIT	BEC / AKG / STEEL CRAFT / PRECISION
39	EARTHING SYSTEM	OBO BETTERMANN / ABB / CAP ELECTRIC / DEHN / JEF /ASHLOK / ELINK
40	IP JUNCTION BOX	HENSEL / LEGRAND / FIBOX / OBO
41	BUSDUCT	SCHNEIDER/ LEGRAND/ C&S/ LK
42	UPS SYSTEM	NUMERIC / EATON / SCHNEIDER / FUJI / APC
43	PUMP / MOTOR	LUBI / CROMPTON / KIRLOSKER / HAVELLS
44	FIRE EXTINGUISHER	FIREEX / MINIMEX /KANEX/CEASEFIRE
45	RUBBER MATE (11KV & 1.1KV)	ANY REPUTED MAKE (WITH TEST CERTIFICATE)
46	FIBRE OPTIC CABLE	STERLITE TECH. (STL) / FINOLEX CABLES / BIRLA CABLE
47	CCTV	CP PLUS / PRAMA / HONEYWELL / MATRIX COMSEC
48	NETWORK SWITCH & ACC.	CISCO / NETGEAR / D-LINK / TP-LINK
49	HARD DISK	SEAGATE / WD / SAMSUNG
50	BATTERY	AMARA RAJA / EXIDE / AMCO / QUANTA
51	BATTERY CHARGER	AMARA RAJA / EXIDE / AMCO / QUANTA
52	DISPLAY	SAMSUNG / SONY / LG
53	CAPACITOR	LEGRAND / LK / NEPTUNE / TPCOS / SIEMENS
54	SOLAR	WAAREE / TATA / RAYZON
55	PC System	LENOVO / DELL / HP
56	Printer	BROTHER / CANON / HP
57	HVAC / AHU / OUTDOOR UNIT	CARRIER/ DAIKEN /MISTUBUSHI/BLUE STAR/HONEYWELL