



**Office of the Superintending Engineer,
Planning Circle, SD & SWM Sector, KMDA
Block- 'A', 5th Floor, Unnayan Bhavan,
Salt Lake City, Kolkata-700091
(Mob: 8479817935)**

**eNIT No : 06/SE(Plg)/SD&SWM/KMDA of 2022-2023
Memo No.: 12/SE(Plg)/SD&SWM/KMDA/W-125/22**

**Dated:28.07.2022
Dated:28.07.2022**

Abridged e-NIT

Invitation: - Superintending Engineer, Planning Circle, SD&SWM Sector invites online tender in two parts viz. Part-I & Part-II from reliable, resourceful, bonafied and experienced agencies having successfully completed any Drainage / Sewerage / Civil work involving Pipe network of C.I / D.I / NP3 make in Government / Govt. Undertaking / Autonomous Bodies / Statutory Bodies and Local Bodies of value not less than i) 40% of the estimated amount in a single contract OR ii) two contracts each of at least 30% of the estimated amount OR iii) single running work having completed 80% or more and value of which is not less than as in i) above, during last 5 (five) years from the date of issue of this NIT.

Table-1

Sl No	Name of work	Estimated Cost (Rs)	EMD (Rs)	Time of Completion
(1)	(2)	(3)	(4)	(5)
1.	Construction of Underground NP3 Pipe Network for improvement of the storm Water system from Indian Oil Petrol Pump Near Sonarpur Station Road to Kamal Gazi Bypass canal Road at Ward No 8 & 27 Under Rajpur Sonarpur Municipality.	4,34,73439.86	8,69,469.00	12 Months

Intending bidder may download the tender documents from <https://wbtenders.gov.in> directly with the help of Digital Signature Certificate. Date of uploading NIT is **04.08.2022** & last date & time for online submission in the tender is **26.08.2022 up to 18:50 Hrs.** Further details may be had from the detailed NIT at the office of the undersigned or from the KMDA web site: www.kmda.wb.gov.in. The Authority reserves the right to reject or accept any or all tender without assigning any reason.

**Superintending Engineer,
Planning Circle
SD & SWM, KMDA**

Copy forwarded for information & necessary action to:-

- 1 The C.E.O, KMDA.
- 2 The Director of SUDA and State Mission Director, MNB (U).
- 3 The DGO, Water & Sanitation Sector, KMDA.
- 4 The DOF, KMDA.
- 5 The Joint Secretary (Works), KMDA.
- 6 The Chairman, Rajpur Sonarpur Municipality.
- 7 The Chief Engineer, Water & Sanitation /P & M Cell/ E & M Sector, KMDA.
- 8 The Chief Engineer, SD&SWM Sector, KMDA.
- 9 The Deputy Director, Public Relation Cell, KMDA along with 4 (four) copies of this NIT for Publication in three leading News Papers and for display this NIT in KMDA Web Site.
- 10-11 The SE, South Circle /North Circle / Programme Circle/Programme Circle-I, SD&SWM, Sector, KMDA.
- 12-16 The Executive Engineer, Planning/South/WBD/EBD/Central Div. SD&SWM Sector, KMDA.
- 17 The A.C.F.A, Water & Sanitation Sector, KMDA.
- 18 The Estimator, Planning Circle, SD&SWM Sector, KMDA.
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Memo No.: 12/SE(Plg)/SD&SWM/KMDA/W-125/22

Dated:28.07.2022
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Detailed e-NIT

Invitation: - Superintending Engineer, Planning Circle, SD&SWM Sector invites online tender in two parts viz. Part-I & Part-II from reliable, resourceful, bonafied and experienced agencies having successfully completed any Drainage / Sewerage / Civil work involving Pipe network of C.I / D.I / NP3 make in Government / Govt. Undertaking / Autonomous Bodies / Statutory Bodies and Local Bodies of value not less than i) 40% of the estimated amount in a single contract OR ii) two contracts each of at least 30% of the estimated amount OR iii) single running work having completed 80% or more and value of which is not less than as in i) above, during last 5 (five) years from the date of issue of this NIT.

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The Authority reserves the right to reject or accept any or all tender without assigning any reason.

1. Intending bidder may download the tender documents from <https://wbtenders.gov.in> directly with the help of Digital Signature Certificate. As per order of KMDA earnest Money will be deposited by the bidder electronically: online through his net banking enabled bank account, maintained at any bank **or** offline through any bank by generating NEFT / RTGS Challan from the e-tendering portal. Intending Bidder will get the Beneficiary details from e-tender portal with the help of Digital Signature Certificate and may transfer the **EMD** from their respective bank as per the Beneficiary Name and Account No., Amount, Beneficiary Bank Name (ICICI) and IFSC Code and also e-procurement ref. no.
2. **Submission of Tender:** - a) Pre-qualification/Technical Bid and Financial Bid both will have to be submitted online concurrently duly digitally signed in the website <https://wbtenders.gov.in> as per time schedule stated herein under.
b) The financial Bid of the prospective bidder will be opened only if the bidder qualifies in the Technical Bid. Decision of the Tender Inviting Authority will be final and binding to the bidder and any challenge against such decision will not be entertained.

3. Time Schedule and Important information for Downloading, Uploading and Opening of Tender Documents:-		
No	Item	Details
3.1	Location of Work Site	: Within the Rajpur Sonarpur Municipality.
3.2	Date, time & Place of Pre-bid meeting	: 11.08.2022 at 12:30 Hrs at the office of the SE (Planning Circle), SD&SWM, KMDA
3.3	Submission of hard copy Bid documents	: The original bid documents including KMDA Form No: 1 shall be submitted duly signed and sealed on all pages after selection of the contractor before award of the work.
3.4	Price per copy of the complete set of tender documents for formal agreement (including printed tender form-1) to be submitted by the vendor awarded the work.	: Rs. 600/- for each set.
3.5	Date of uploading (Publishing) of NIT Documents(Online)	: 04.08.2022 after 15:00 Hrs
3.6	Documents download start date (Online)	: 04.08.2022 after 18:00 Hrs
3.7	Start date & time for Bid submission (Online)	: 04.08.2022 after 18:30 Hrs
3.8	Documents download end date(Online)	: 26.08.2022 up to 14:50 Hrs
3.9	Last date & time limit for submission of tender through online	: 26.08.2022 up to 14:50 Hrs
3.10	Scheduled date & time for opening the Part-I tender document	: 29.08.2022 after 14.00 Hrs
3.11	Scheduled date & time for opening Part-II tender document	: To be intimated later on

Tenders will be opened by the Superintending Engineer, Planning Circle, SD &SWM Sector, KMDA or his authorized representative in presence of bidders or the authorized representatives who may like to be present.

4. Eligible criteria for the bidders:

A) The bidders should have the credentials as detailed below:

The prospective bidders shall have satisfactorily completed, as a prime agency during the last 5 (five) years, prior to date of issue of this notice, construction of at least one any drainage / sewerage / civil work involving conduit network of C.I. / D.I / NP3 make having value of 40% of the estimated amount put to tender, or must have completed same nature of multiple works (more than one) of 30% of the estimated amount put to tender or must have completed 80% of work of a running project of same nature, in a single tender, amounting to 40% of the estimated amount put to tender, under the authority of State/Central Government, State/Central Government undertaking/ Autonomous Bodies/Statutory bodies constituted under the statute of the State/Central Government or local bodies.

B) Other terms and conditions of the credentials:

- i) Payment certificate will not be treated as credential.
 - ii) Completion Certificate issued by the Executive Engineer or equivalent competent authority of a State/Central Government, State/Central Government undertaking, Autonomous/Statutory bodies constituted under the statute of the State/Central Government or local bodies on the executed value of completed/running works will be considered as Credential.
 - iii) No credential will be considered as valid unless it is supported by work order, price schedule or BOQ of work and completion certificate mentioning the date of completion issued by the competent authority not below the rank of the Executive Engineer or equivalent or competent authority of a State/Central Government, State/Central Government undertaking, Autonomous/Statutory bodies constituted under the statute of the State/Central Government or local bodies. The Completion Certificate should indicate the value of the work (equal to booked expenditure).
N.B.: Estimated amount, Date of Completion of the project & detail communicational address of Client must be indicated in the Credential Certificate.
- C) Scanned copy of Certificate of Incorporation/Registration of firm or company (Memorandum and Articles of Association, if any), PAN Card, Professional Tax Certificate with up-to-date challan, valid Income Tax Returns (for last 3 financial years), valid 15 digit Goods and Services Taxpayer Identification Number (GSTIN) under GST Act, 2017 and up-to-date challan, latest valid Trade License, last 3 financial years' audited Balance Sheet, Credentials, Work Orders, Completion Certificates, Payment Certificates, Bank Solvency Certificate (of minimum 25% of quoted amount) within one year from the date of publishing of NIT, valid Provident Fund Registration Certificate with up-to-date challan, ESI Registration Certificate with up-to-date challan and other supporting documents, valid Electrical Contractor's License and Supervisory License, Registration Certificate and/or trade license for supply of machineries must be submitted duly digitally signed at desired location in the website <https://wbtenders.gov.in>.
- D) Scanned Copy of one affidavit before Notary will have to be submitted mentioning the correctness of the documents and a declaration of penalty debarment etc. faced by him under any Government/Semi-Government/Autonomous Body/Institution through online at desired location.
- E) Joint Ventures / Consortiums are not allowed to participate in the bid.
- F) **Earnest Money:** The tenderer shall have to deposit requisite initial earnest money along with the tender document in prescribed manner failing which the tender shall be rejected and treated as non-responsive. The balance earnest money if any

to fulfil 2 (two) percent of the estimated value is to be deposited before the time of execution of formal agreement.

5. Security Deposit:

The amount of Security Deposit will be 3% of the contract value, as per Memorandum, vide No. 796-F(Y) dated 25.02.2022 of the Finance Department, Government of West Bengal. The amount already deposited as Earnest Money Deposit (EMD) will be converted as initial security deposit. Successful bidder has to submit the balance amount of 2% of the contract price, i.e., the tendered amount, if submitted EMD is less than 2% of the contract value, before execution of formal agreement. Balance security of 1% of the amount of each running account bill, will be recovered from each and subsequent bill till the balance of the amount of security deposit is realized.

6. **Additional Performance Security @ 10% of the tendered amount in the form of Bank Guarantee from a Scheduled Bank, valid up to the date of completion of the work, shall have to be submitted by the successful bidder, if the accepted bid value is 80% or less than the estimated/DPR amount.**

If the bidder fails to submit Additional Performance Security within 7 (seven) working days from the date of issue of Letter of Acceptance/Letter of Intent or the time period as mentioned by the tender inviting authority, his Earnest Money will be forfeited. The Bank Guarantee shall be returned immediately on successful completion of the Contract.

If the bidder fails to complete the work successfully, the Additional Performance Security along with Security Deposit lying with KMDA, shall be forfeited at any time during the pendency of contract period as per relevant Clauses of the Contract.

Necessary provisions regarding deductions of Security Deposit from the progressive bill of the Contractor as per relevant clauses of the contract will in no way affected/altered by this Additional Performance Security.

7. List of common documents shall have to be uploaded by each tenderer at the time of Tender through online:

- i) All annexure as annexed.
- ii) Certificate of Incorporation/Registration of firm or company
(Memorandum and Articles of Association, if any)
- iii) Deed of Partnership (constituted/reconstituted/amended, if any)
(only for Partnership Firms)
- iv) Income Tax Return (for the last 3 financial years)
- v) Audited Balance Sheet (for the last 3 financial years)
- vi) PAN Card
- vii) GST registration certificate with up-to-date challan

- viii) Latest Professional Tax paid challan and P-Tax Enrolment Certificate.
- ix) Latest valid Trade License
- x) Provident Fund Registration Certificate with up-to-date challan
- xi) ESI Registration Certificate with up-to-date challan
- xii) Technical Credential
 - a) Work Order
 - b) Completion Certificate for the work completed/running
 - c) BOQ of work or price-breakup schedule
 - d) Payment Certificate of the said work
- xiii) Current Bank Solvency Certificate (of minimum 25% of quoted amount) from a scheduled bank recognized by the Government of India, obtained within one year from the date of publishing of NIT.
- xiv) Affidavit before Notary mentioning the correctness of the documents and declaration of penalty or debarment etc., before the issuance of this NIT.

8. The prospective bidders shall have in their full-time engagement experienced technical personnel with the sufficient knowledge of PERT/CPM, the minimum being one Civil Engineering Degree holder and one Civil Engineering Diploma holder (authenticated documents in respect of qualification and engagement shall be furnished for Technical Evaluation).

9. The prospective bidders must not have been debarred to participate in any tender invited by the KMDA during the last 5 (five) years prior to the date of this NIT. Such debar will be considered as disqualification towards eligibility (a declaration in this respect has to be furnished by the prospective bidders as per prescribed format without which the Technical Bid shall be treated as non-responsive).

10. **Language of Tender:**

The bid and all related correspondences and documents shall be written in the English language. Supporting documents and printed literature furnished by the eligible bidder with the proposal may be in any other language if they are accompanied by an appropriate translation into English. Supporting materials that are not translated into English shall not be considered. For the purpose of interpretation and evaluation of the Proposal, the English language translation shall prevail.

11. All materials required for execution of the work (as per BOQ) shall be supplied by the contractor at their own risk and cost.

12. Bid shall remain valid for a period not less than 120 days (one hundred twenty days) from the last date of submission of financial bid/sealed bid. If the bidder withdraws the bid during the period of bid validity, the earnest money as deposited will be forfeited without assigning any reason thereof.

13. The Tender Notice along with other documents like Tender Form-1, Terms and Conditions, BOQ and Corrigendum, if any etc. whatever documents uploaded by the department concern, shall be part and parcel of the Tender. The agency must go through carefully the Special Terms and Conditions uploaded by the department before quoting his/her rate.
14. The Tender Inviting Authority reserves to right to cancel the NIT due to unavoidable circumstances or may accept or reject any or all the tenders without assigning any reason what so ever. No claim in this respect will be entertained.
15. During scrutiny, if it is come to the Tender Inviting Authority that the credential or any other papers found incorrect/manufactured/fabricated, that tenderer will not be allowed to participate in the tender and that application will be out rightly rejected without any prejudice with forfeiture of earnest money forthwith.

List of technically qualified bidders will be published in the web portal only. Financial Bid will be opened within a short period after such publication. Therefore, bidders are requested to view the tender status on a regular basis. In case if there be any objection regarding pre-qualification/list of technically qualified bidders, that objection should be lodged to the Chairman, Tender/Bid Evaluation Committee within 24 hours from the date and time of publication of the list of qualified agencies and beyond that time schedule no objection will be entertained by the Tender/Bid Evaluation Committee.

16. Before issuance of the Letter of Intent (LOI), the tender inviting authority may verify the credential and other documents of the lowest tenderer if found necessary. After verification, if it is found that such documents submitted by the lowest tenderer is either manufactured or false, in that case, LOI will not be issued in favour of the tenderer under any circumstances.

For detailed information please visit the Government website: <https://wbtenders.gov.in>.



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Superintending Engineer, Planning Circle.
SD&SWM Sector, KMDA

SPECIAL TERMS AND CONDITIONS OF THE CONTRACT (CIVIL)

1. GENERAL

All works are to be carried out in accordance with special terms and technical specifications as mentioned herein after.

- 1.1. In addition to the above, General specifications of the Schedule of Rates of Public Works Department, Government of West Bengal on Building Works for the year 2017, Sanitary, & Plumbing Works for the year 2017 and Road & Bridge Works for the year 2018, shall be applicable for works not covered by above.
- 1.2. In addition to the above General specifications of the schedule of rates of presidency Circle - I, P.W.D., Government of West Bengal (briefly referred to as the “P.C. Schedule” and as defined below) shall be applicable. The “P.C. Schedule” referred to above shall comprise the following two schedules (taken together) of Presidency Circle - I, P.W.D. Government of West Bengal for the year 2017. Schedule of rates for building materials and labour (briefly referred to as the building schedule).
- 1.3. The specifications for works not covered by the specifications referred in Clause - 1.1. or 1.2. shall be governed by the Bureau of Indian Standards Code of Practices. MoRTH Specification, IRC Codes of Practices and as per base practice according to the direction of the Engineer-in-Charge.
- 1.4. Unified Schedule of Rates of Irrigation & Waterways Department for the year 2018.
- 1.5. The contract documents are to be considered as a whole. The several documents forming the contract, are to be taken as mutually explanatory of one another. If, however, the stipulations of the different documents be at variance in any respect, one will override the others (only in so far as these are at variance) in order of precedence as given below:
 - (i) Letter of Intent (L.O.I.)
 - (ii) Notice Inviting Tenders
 - (iii) Special Terms & Conditions
 - (iv) Special Specifications
 - (v) Specific Priced Schedule
 - (vi) The Printed Tender Form (KMDA Form No.- I)
 - (vii) The Schedule (as defined on clauses - 1.1. above)
 - (viii) P. C. Schedule (as defined on clauses - 1.2. above)

2. ENHANCEMENT OF TENDER RATE

In no circumstances, the tendered rate shall be enhanced after acceptance of the tender.

3. EXPLANATION OF TERMS

Heading and marginal notes are only for convenience of reference and have no contractual significance.

Words importing the singular also includes the plural and vice-versa where the context so requires.

- 3.1. The words “Approved” or “Direct” appearing anywhere in the tender documents shall indicate (unless specifically mentioned otherwise) the approval or direction of the Engineer-in-Charge.
- 3.2. The term “At the site of work” or “Near the site of work” wherever it appears in the tender documents, shall mean anywhere within 150 (one hundred and fifty) meters from the actual site of work.
- 3.3. The word “Department” appearing anywhere in the tender documents, shall mean “Kolkata Metropolitan Development Authority (KMDA in abbreviation)”.
- 3.4. The Engineer-in-Charge shall mean the Executive Engineer of the Division concerned as mentioned in the tender notice.
- 3.5. The Sub-divisional officer shall mean the concerned Assistant-in-Charge of the work authorised to carry out on behalf of the Engineer-in-Charge, general supervision, issue of day-to-day instructions and to approve materials and workmanship.
- 3.6. The words “Superintending Engineer” and “Chief Engineer” appearing anywhere in the printed tender form shall mean the concerned Superintending Engineer and the Chief Engineer of the particular wing of Sector concerned respectively.

4. CHARACTER OF SITE

Before submission of tenders, the intending tenderer shall inspect the site of work and get them thoroughly acquainted with the local conditions and difficulties under which the work will have to be carried out. They should consider, among others, the nature of soil, climate conditions of the locality, dearth of water in the area of work, condition of the existing roads, transport facilities, nonexistence of roads in many places etc. Extra cost involved due to above factors to be borne by the contractor and should, thereof, be included in the rates to be quoted by them.

5. INCIDENTAL FEES

All rates to be quoted by the contractors shall be inclusive of all incidental fees and charges, e.g., Royalties, Ferry charges, Octroi and Toll Tax of Materials, Electricity, Water and other charges of Municipalities or Statutory Bodies, Sales Tax, Goods & Services Tax (GST), Income Tax etc. Nothing extra will be paid against such account.

6. STATUTORY OBLIGATIONS

- 6.1. The Contractor shall give all notices and pay all fees required to be given by any statute or any regulation or bye-law of any local or other statutory authority which may be applicable to the works and shall keep KMDA indemnified against all penalties and liabilities of every kind for breach of such statute, regulation or bye-laws.
- 6.2. The Contractor shall indemnify the KMDA against any loss/harm and also against all claims, demands, suit and preceding on account of infringement of any patent rights, design, trademark or name of other protected rights in respect of any constructional plant, machine, work material thing process used for in connection with the work or temporary works.

7. SAFETY PRECAUTIONS

- 7.1. All necessary precautions are to be taken by the contractor for the safety of his workmen and of the general public. The work must be done in such a way as not to damage any property, existing structure or public utility services during work. Close cooperation must be ensured with other contractor or contractors working the area of work. All claims arising out of any damage to the existing structures or properties due to works of the contractor shall be borne by the contractor.
- 7.2. The Contractor shall provide necessary fencing and lighting arrangements around the trench excavated by him and / or at the site of work for the safety of his workmen and of the general public. Such arrangement shall not be paid for separately and the cost thereof shall be included in the Contractor's rate for the work.

8. IDLE LABOUR

Whatever may be the reason no claim for idle labour, additional cost of establishment, hire and labour charges for Tools & Plants will be entertained and shall be borne by the tenderer.

9. TRANSPORT

The Contractor shall arrange all transport including Railway Wagons required for carriage of all tools & plants, implements and materials etc. at their own risk and cost.

10. PUMPING, DEWATERING ETC.

The Contractor shall provide all pumping and other arrangements that may be necessary to remove from or keep out of foundations, trenches or any part of the structure under construction, water free (whether canal water, sub – soil water and water from any source, whatsoever). Such pumping or other necessary arrangements shall not be paid for separately and the cost thereof is to be included in the contractor's rate of relevant items of work.

11. WATER AND ELECTRICITY

The Contractor shall have to make his own arrangement for adequate supply of water and for electrical power that may be required for or in connection with execution of the work. All these will have to be done at contractor's own cost and expense and no separate payment for any of these shall be made, the cost thereof being deemed to be included in the rate for the work.

- 11.1. Arrangement for supply of piped water from existing service lines may not be possible. In that case the Contractor will have to make arrangements for supply of drinking water and all water required for execution of the work by sinking tube wells or other suitable alternatives that may be approved by the Engineer-in-Charge. Nothing extra will be paid for such account.

- 11.2. Electrical power from usual supply agencies may not be available. In that case the Contractor will have to make his own arrangement for electrical power through generator. Nothing extra will be paid for such account.

12. CLEARANCE OF SITE

- 12.1. Before starting any work, the work site where necessary, must be properly dressed after cutting, cleaning and clearing all varieties of jungles and shrubs including bamboo clusters or any undesirable vegetation, rubbish, sludge etc. from the site of works for which nothing will be paid extra.
- 12.2. The site must be cleared by the Contractor from time to time in the course of execution of the work.
- 12.3. On completion of work, all temporary works shall be removed by the Contractor. All scars of construction shall be obliterated and the whole site left in a clean and workman like manner to the entire satisfaction of the Engineer – in – Charge. No separate payment shall be made for these, the cost thereof being deemed to have been included in the Contractor's rate for the work.

13. SERVICEABLE MATERIALS

All serviceable materials obtained from excavation or from dismantling of existing structures shall remain the property of KMDA. The responsibility for stacking materials that are considered serviceable by the Engineer-in-Charge and hand delete over the same to the Engineer-in-Charge shall in custodian of with the Contractor and nothing will be paid on this account. In case of any loss or damage of serviceable materials prior to hand delete over the same as aforesaid full value thereof will be recovered from the Contractor's bill at rates as assessed by the Engineer-in-Charge.

14. UNSERVICEABLE MATERIALS

The contractor shall remove all unserviceable materials to the place as directed. He should level and dress the work site on completion of the relevant portion of work as per direction of the Engineer-in-Charge of work. No extra payment will be made on this account.

15. QUALITY OF MATERIALS

All materials brought to the site must be to the approval of the Engineer-in-Charge. Rejected materials must be removed by the Contractor from the site within 24 hours of the issue of orders to that effect. In case of non-compliance with such orders the Engineer-in-Charge shall have the authority to cause removal at the cost and expense of the Contractor and the Contractor shall not be entitled to claim any loss or damage on that account.

16. MATERIALS AND LABOUR

All materials and labour (skilled & unskilled) including their water supply, sanitation, procurement of food staff, medical aid etc. are to be arranged by the Contractor. Cost

of transport of materials and labour and allied items aforesaid shall have to be borne by the Contractor and included in his rate for the work.

17. UNSKILLED LABOUR

For all items of work under contractor unskilled labourers will have to be local labourer. Normally, without the consent of the Engineer-in-Charge, no unskilled labourer shall be imported from any district other than that where the work is to be executed imported labourers could be engaged with the permission of the Engineer-in-Charge, when the exigency or progress of works demands. Seventy percent of the unskilled labours shall never the less have to be recruited locally.

18. CONTRACTOR'S AGENT OR REPRESENTATIVE

- 18.1. The contractor shall not assign the agreement or sublet any portion of the work. The contractor shall appoint an authorised representative and requisite technical personnel in respect of one or more of the following purposes only.
 - (a) General day to day management of the work.
 - (b) To attend measurements when taken by KMDA officers and to sign the records of such measurements.
- 18.2. The selection of the authorised representative is subject to the prior approval of the Engineer-in-Charge and the contractor shall seek in writing such approval giving therein the name and address of the representative he wants to appoint and the specific purpose for which the representative will be authorised for. Even after initial approval, the Engineer-in-Charge may issue at any subsequent date, revised directions about such authorised representative and the contractor shall be bound to abide by such directions. The Engineer-in-Charge shall not be bound to assign any reason for any of his directions with regard to the appointment of authorised representative.
- 18.3. The provisions of power of Attorney, if any, must be to the approval of KMDA, otherwise KMDA shall not be bound to take consigne of such power of Attorney.
- 18.4. Any notice, correspondence etc. issued to the authorised representatives or left at his address will be deemed to have been issued to the contractor himself.

The provision of a notarized power of Attorney, if any, must be to the approval of the Department, otherwise the Departmental shall not be bound to take cognizance of such power of attorney. The authorised agent or representative, when appointed by the contractor, as per provisions of the contract for supervision of works on their behalf, shall either be a Degree or Diploma holder in Engineering.

19. SITE OFFICE

The Contractor shall have an office adjacent to the work site as may be approved by the Engineer-in-Charge, where all directions and notice of any kind what so ever, which the Engineer-in-Charge or his representative may desire to give to the Contractor in connection with the contract may be left and the same when left at or sent be post to such office or delivered to the Contractor's authorised agent or representative shall be deemed to be sufficiently served upon the Contractor.

20. GODOWN, LABOUR SHED ETC.

- 20.1. The contractor shall make his own arrangements for storage space and godown for his tools and plants, materials etc.
- 20.2. The Contractor shall arrange for temporary sheds latrines, water supply etc. for the accommodation of the use of his staff. These shall be properly maintained all through the period of construction in clean and hygiene condition to the satisfaction of the Engineer-in-Charge.
- 20.3. The locations of godown, stacking place other temporary structures must be to the prior approval of the Engineer-in-Charge. The land, if available within the site will be given free of rent. Any land outside the work site as may be required for the purpose will have to be arranged by the Contractor himself at his own cost.
- 20.4. On completion of the work all sheds, godown, vats, platform etc. erected by the Contractor for constructional purpose, shall have to be removed by him at his own cost and the ground restored to its original condition to the satisfaction of the Engineer-in-Charge.

21. SITE ORDER BOOK

- 21.1. The contractor shall within 7 (seven) days of the receipt of the order to take up works, supply at his own cost SITE ORDER BOOK to Assistant Engineer concerned. The site order book shall be kept at the site of work under the custody of the Assistant Engineer or his authorised representative. The site order book shall have machine numbered pages in triplicate. Directions or instructions from KMDA officials issued to the contractor will be entered (in triplicate) in the site order book (except when such directions or instructions are given by the separate letters). The contractor or his authorised representative shall regularly note the entries in the site order book and also record thereon the action taken or being taken by him complying with the said directions or instructions or any relevant point relating to the work, contractor or his authorised representative may take away the duplicate page of the work order book for his own record.
- 21.2. The first page of the work order book shall contain the following particulars:
 - (a) Name of the work.
 - (b) Reference to contact no.
 - (c) Date of opening the site order book.
 - (d) Name and Address of the Contractor (with phone no. if any).
 - (e) Signature of the contractor.
 - (f) Name and Address of the authorised representative who is authorised to act on behalf of the Contractor.
 - (g) Specific purposes for which the contractor's representative is authorised to act on behalf of the Contractor.
 - (h) Signature of the authorised representative dully attested by the contractor.
 - (i) Signature of the Assistant Engineer concerned.
 - (j) Date of written order to commence work.
 - (k) Time of completion of work with date.
 - (l) Extension of time granted, if any.
 - (m) Date of actual completion of works.

(n) Date of recording of final measurements.

Entries vide (m) & (n) above shall be filled in on completion of work and before the site order book is recorded in the office of the Assistant Engineer concerned.

22. ADDITIONAL ITEMS BEYOND THE SCOPE OF THE CONTRACT:

- 22.1. During the process of execution of the job under the contract if any additional item of works quantities beyond the scope of contract is required to be done as per the opinion of the Engineer-in-charge, such additional items and quantities shall have to be executed by the contractor as supplementary items when so directed by the EIC.
- 22.2. Notwithstanding what has been stated in clause 12 of the printed tender form, rates of supplementary items of works will be determined according to sub-clauses in order of precedence as given below.
 - 22.2.1. The rates shall be analysed to the maximum extent possible from the rates of allied items of work appearing in the specific priced schedule.
 - 22.2.2. To complete the analysis if necessary, the rates appearing in the "Schedule" (as defined under clause-1.1. above) shall be applicable for the portion remaining after application of clause- 22.2.1.
 - 22.2.3. To complete the analysis if necessary, the rates appearing in the "P.C. Schedule" (as defined under clause-1.2. above) shall be applicable for the portion remaining after application of clause-22.2.1 and 22.2.2.
 - 22.2.4. If the analysis cannot be completed even after application of clause- 22.2.1, 22.2.2 and 22.2.3 above, the balance shall be determined from the market rates of material and labour.
 - 22.2.5. The contractual percentage shall be applicable in regard to the portion of the analysis based on clause 22.2.1, 22.2.2 and 22.2.3 above.
 - 22.2.6. Profit inclusive of overhead charges shall be added at the rate of 10(ten) percent in regard to the portion of the analysis based on clause-22.2.4 above.

23. Issue of KMDA Materials

- 23.1. No departmental materials shall be issued to the agency by any extent. All materials are needed to be procured by the agency as per requirement at site and as decided by the EIC.
- 23.2. Materials, so procured, will be checked by the EIC at site. Upon approval of the EIC, the agency can use his materials as per his/her requirement.
- 23.3. The contractor itself shall be responsible for any damage or loss of such materials and the department will not take any responsibility of such damage or loss, by any circumstances.
- 23.4. The contractor shall also have to satisfy the EIC regarding the proper utilization of such materials.

- 23.5. The contractor should have to submit the Manufacturer's Test Certificates (MTCs) and challans as and when he/she procures materials for his/her site, batch wise. The materials, if needed, should have to be tested at any NABL accredited laboratory, as per decision and direction of the EIC. If it is so required, departmental officers may visit the manufacturer's workshop for verification of its certification and methodology of production of such material. All such costs would have to be borne by agency itself.
- 23.6. The consumption of different materials of construction against the various items of works will be assessed on the basis of the 'chart for consumption of materials', given in the P.C. Schedule, unless specifically mentioned otherwise in the technical specifications. If any item is not available in the 'Schedule', the same shall have to be obtained from 'P.C. Schedule'. The permissible variation as given in the preamble to the said chart for consumption of materials will normally apply provided what has been stated under the clauses. The EIC under special circumstances shall be component to allow (for recorded reasons) for a greater variation.

24. WORK PROGRAMME

The Contractor, on receipt of the letter of acceptance of his tender, shall submit to the Engineer-in-Charge the work programme in the form of CPM Network chart and or in Bar Chart, each in triplicate for his approval.

- 24.1. The work must be taken up within 7 (seven) days from the date of issue of work order and be complete in all respects within the specified time of completion as mentioned in Detailed Notice Inviting Tender.
- 24.2. The Contractor shall submit the work programme clearly showing the materials, men and equipment and a time table divided into four equal periods of progress of the work for the approval of the Engineer-in-Charge who will have authority to make additions, alteration and substitution to such programme in consultation with the Contractor, unless the same is subsequently found impracticable in some or all respect, in the opinion of the Engineer-in-Charge and is modified by him. The stipulations laid down in clause – 2 of the condition of contract in the printed tender form regarding the division and progress as provided in the said clause, shall be deemed to have been sufficiently complied with if the actual progress of work does not fall short of the progress as laid down in the approved time table for one – fourth, half and three fourth of the time allowed for the work. The work programme shall be submitted in the form of CPM Network chart and or in Bar Chart each in triplicate.

25. SETTING OUT OF WORK

- 25.1. The contractor shall be responsible for the true and perfect setting out of the works and for the correctness of the position, levels, dimensions and alignment of all parts of the work. If at any time during the progress of the work any error shall appear or arise on the position, levels, dimensions or alignment of any parts of the works the contractor on being directed to do so by the Engineer-in-Charge shall at their own expenses rectify such error to the satisfaction of the Engineer-in-Charge.

- 25.2. Any setting out that may be done or checked by the Engineer-in-Charge or his representative or any line or level that may have been given or checked by either of them shall not in any way relieve the contractor of his responsibility for the correctness thereof.
- 25.3. Before starting the work, the Contractor must at his own cost and expense, erect temporary pillars as may be required in suitable places as directed by the Engineer-in-Charge. These pillars, from which the layout of all-important levels and alignment will be fixed, must be at such locations and of such a nature as not to be disturbed in the process of construction. The Contractor shall provide all instruments, appliances and labour required for setting out of the works and for the use and attendance upon the Engineer – in – Charge and / or his authorised representative whenever required for any purpose in connection with the works.

26. WORKING DRAWINGS

- 26.1. It is to be clearly understood that drawings forming a part of the tender documents are only for the purpose of indicating the type and nature of work involved. These are subject to be subsequently modified and/or supplemented by other drawings as required during actual execution of the work.
- 26.2. All works shall be carried out in conforming to drawings approved by KMDA. In token of such approval the drawings shall bear the signature of the Engineer-in-Charge before the same are issued for execution of the work in accordance therewith. Such approval on drawings may be furnished on piecemeal as and when required during the progress of the work. The Contractor shall keep in touch with the Engineer-in-Charge about the drawings that may be under checking or in the process of approval and keep him informed well in advance of the particular drawing and drawings he would next require for the smooth progress of work.

27. WORKMANSHIP AND TESTING

- 27.1. All materials and workmanship shall be of the respective kinds described in the contract and shall be subject from time to time to such tests as the Engineer-in-Charge may direct at the place of manufacture of fabrication or on the site or at any such place. The Contractor shall provide assistance, instruments, machines, labour and materials as the Engineer-in-Charge may require for examining, measuring and for testing the works and the quality, weight or quantity of the materials used and shall supply samples for testing as may be selected and required by the Engineer-in-Charge. Necessary charges shall be borne by the Agency.
- 27.2. The Contractor shall keep in mind that officials of quality control unit of KMDA may be deputed at the site of works for testing of materials and workmanship. The Contractor shall extend necessary help in performing such tests at their own cost.
- 27.3. The Contractor shall also keep in mind that KMDA may provide 3rd party agency viz. Jadavpur University, Indian Institute of Engineering, Science and Technology, Shibpur, Indian Institute of Technology, Kharagpur etc. at the site of works for testing of materials and workmanship in addition to KMDA Quality Control unit. If any discrepancies arise regarding results between KMDA Quality Control and 3rd party quality, the decision of Tender Accepting Authority will be final. Necessary charges shall be borne by the Agency.

28. CO-OPERATION AND CO-ORDINATION WITH OTHER CONTRACTORS

During the pendency of this contract KMDA shall have the liberty to engage a number of contractors for ancillary works (not provided in this contract) on completion of any part of the job and the contractor shall extend co – operation to other contractors.

29. COMPLETION DRAWINGS

Immediately on completion of the work the Contractor shall submit completion drawings, made in auto CAD software, 6 (six) hardcopies (preferably in A1 sheet), including the original softcopies (autoCAD and pdf formatted) of the same, each for all the works executed by him under the contract, for approval of the Engineer-in-Charge. The Contractor's rate shall be inclusive of such costs.

30. TOOLS AND PLANTS

The Contractor shall install tools and plants including HOT MIX PLANT at the land to be arranged by him at his own cost and he/they shall have to provide necessary approach road to the plant site from the site of work at his own cost.

Mobilization and installation of TOOLS and PLANT shall have to be completed by the Contractor at his own cost within 30 (Thirty) days from the date of receipt of the letter of acceptance of his Tender or the provisional work order, whichever is later, failing which the contract will be liable to termination with forfeiture of the amount of initial security as per detailed N.I.T. that may be lying with KMDA at that time without any reference to the contractor.

31. GUARANTEE AND MAINTENANCE

The Contractor shall stand guarantee for the works done by him for a period of 12 (twelve) months from the date of completion of work. Any defects and short comings due to defective construction shall have to be made good by the Contractor at his own cost and expense inclusive of all cost of materials and labours. The Contractor shall have to make good the damages due to natural wear and tear at his own cost and expense inclusive of all cost of materials and labours. The Contractor shall have to maintain the assets for the entire guarantee period. The rate to be quoted by the Contractor shall be inclusive of all such costs.

32. REGISTRATION OF ESTABLISHMENT AND COLLECTION OF CESS

As per Building and other construction workers (RECS) Act 1996 and Building and other construction workers Welfare Cess Act 1996 and rules framed there under, the contractor employing more than ten construction workers should obtain registration from the registering officer (Assistant Labour Commissioner at regional labour offices) and an amount @ 1% as Cess shall be deducted from the progressive bill for the work executed as per G. O. No. 853 – F dated 01. 02. 2006 issued by Finance department, Govt. of W. B., Finance Dept. Memo No. 6895 – F dated 11. 09. 2006 and Memo No. 100 (7A)/LC dated 30. 08. 2006 from the Labour Commissioner, W. B.

33. EARNEST MONEY

Earnest money deposit of amount written in invitation for tender shall be deposited online either by Net Banking (through any Nationalised Bank/Scheduled Bank) or through RTGS/NEFT as per requirement of the system: <https://wbtenders.gov.in>. The Earnest money deposit shall be valid for a period of not less than one hundred twenty (120) days from the date of tender submission. Tenders not accompanied by an Earnest money deposit shall be out rightly rejected as non-responsive without showing any reason whatsoever. Earnest money of unsuccessful tenderers will be refunded automatically, without any interest thereon within 90 days after award of the contract to the successful tenderer. The successful tenderer shall have to submit an additional amount against Earnest Money @ 2% of the estimated value, as mentioned in the e-NIT, in the form of Demand Draft drawn in favour of “KMDA” of a nationalised/scheduled Indian Bank, payable at Kolkata.

The Earnest money will be forfeited:

- If the tenderer withdraws his tender during the period of tender validity.
- If the tenderer does not accept the correction of his tender price pursuant to provision of contract.
- If successful tenderer fails within the specified time limit to execute the Formal Agreement with the Employer or to furnish the required performance security.

33.1. DEPOSITION OF ADDITIONAL EARNEST MONEY FOR SUCCESSFUL TENDERER

The successful tenderer shall have to deposit 2% of the contract amount less the initial earnest money in the form of Demand Draft in favour of KMDA during execution of formal agreement with KMDA as initial security Deposit.

34. SECURITY DEPOSIT:

The amount of Security Deposit will be 3% of the contract value, as per Memorandum, vide No. 201-F(Y) dated 18.01.2021 of the Finance Department, Government of West Bengal. The amount already deposited as Earnest Money Deposit (EMD) will be converted as initial security deposit. Successful bidder has to submit the balance amount of 2% of the contract price, i.e., the tendered amount, if submitted EMD is less than 2% of the contract value, before execution of formal agreement. Balance security of 1% of the amount of each running account bill, will be recovered from each and subsequent bill till the balance of the amount of security deposit is realized.

35. Additional Performance Security @ 10% of the tendered amount in the form of Bank Guarantee from a Scheduled Bank, valid up to the date of completion of the work, shall have to be submitted by the successful bidder, if the accepted bid value is 80% or less than the estimated amount.

If the bidder fails to submit Additional Performance Security within 7 (seven) working days from the date of issue of Letter of Acceptance/Letter of Intent or the

time period as mentioned by the tender inviting authority, his Earnest Money will be forfeited.

The Bank Guarantee shall be returned immediately on successful completion of the Contract, i.e. on completion of construction and 12 months period of operation and maintenance. If the bidder fails to complete the work successfully, the Additional Performance Security along with Security Deposit lying with KMDA, shall be forfeited at any time during the pendency of contract period as per relevant Clauses of the Contract.

Necessary provisions regarding deductions of Security Deposit from the progressive bill of the Contractor as per relevant clauses of the contract will in no way affected/alterd by this Additional Performance Security.

36. RELEASE OF SECURITY DEPOSIT

Release of normal security deposit shall be made after 12 (twelve) months from the date of successful completion of the work. This supersedes the clause 17 of tender form no.1.

- 37.** There shall be no addition/deduction of any contract price on account of rise /fall in the cost of labour and/or materials or any other items which may affect the cost of the execution of works. Only the effect due to change of tax structure by legislation will be applicable.

38. INCOME TAX

Income tax will be deducted from the contractor's bills at the rate in accordance with the orders/circulars of the Government of India, that will be in force during the contractual period. The tenderer shall declare his permanent income tax account number (PAN) issued by the income tax authority in the tender.

39. SALES TAX/GOODS & SERVICES TAX (GST)

Sales tax/GST will be deducted from the contractor's bills at the rate in accordance with the orders/circulars of the Government of West Bengal in force during the contractual period. The tenderer shall declare his Goods and Services Tax Registration Number in the tender.

40. NECESSARY INFORMATIONS REGARDING TENDER

- 40.1. No claim will be entertained due to delay in making payment of any bill related to work.
- 40.2. No extra claim will be entertained for any change in design and drawing that in the opinion of the Superintending Engineer may be necessary for the work.
- 40.3. No departmental materials will be supplied to the agency. Consumption of such materials will be calculated from measurements entered in measurement book of the department and will be checked with the procurement challan.

- 40.4. Terms of payment: interim payments against individual items of price schedule on percentage pro-rata basis depending on the progress of the concerned items of the work accepted by the EIC. In case of any dis-agreement between the E.I.C & Contractor, the decision of the Superintending Engineer will be final and binding upon both the parties.
- 40.5. The rates against different items should be reasonable and commensurate with one another. Any rate which in the opinion of the authority accepting tenders, is absurdly high or absurdly low in comparison to the quoted rates of other items may lead to rejection of the tender.
- 40.6. All the specifications stated in the tender documents shall form overall scope of the work. In case of any dispute regarding the works, the decision of the Superintending Engineer (Civil), North Circle, SD&SWM Sector will be final & binding upon the Contractor.
- 40.7. If required, designs and drawings submitted by the agency shall have to be checked and verified by any recognized University/Institute i.e., Jadavpur University, Indian Institute of Engineering, Science and Technology, Shibpur or Indian Institute of Technology, Kharagpur etc., and the cost of which shall be borne by the contractor.
- 40.8. All necessary tests as suggested by the E.I.C. relating to the works shall be conducted by the contractor at their own cost.
- 40.9. Any left-out components stated in the specification of the pay items of the tender documents shall have to be done by the tenderer without having any extra claim.
- 40.10. Rate shall be quoted in the respective items as specified in the price schedule of the tender document only not in tender form no. 1.
- 40.11. The agency may Visit the working site before quoting their rates.
- 40.12. All the Civil drawings submitted by the agency shall have to be approved by the Superintending Engineer (Civil), North Circle, SD&SWM Sector, KMDA.
- 40.13. No extra Claim shall be entertained by the department for executing shoring/shit pilling/dewatering that shall be necessary as per site condition.

41. ACCEPTANCE OF TENDER

The acceptance of tender will rest with the concerned Superintending Engineer (Civil), Planning Circle, SD&SWM Sector, KMDA who does not bind himself to accept the lowest tender and reserves to himself the authority to reject any or all the tenders received without assigning any reason thereof.

42. WITHDRAWAL OF TENDER

A tender once submitted shall not be withdrawn within a period of 120 (One Hundred Twenty) days from the last date of receipt of tenders. If a tenderer withdraws his tender within this period without giving any satisfactory explanation for such withdrawal, he shall be disqualified from submitting any tender for works under Planning Circle, SD&SWM Sector, KMDA, for a minimum period of 1 (one) year.

43. COPIES OF AGREEMENT

The contractor shall within 7 working days from the date of receipt of the letter of acceptance of his tender submit 5 (Five) additional copies of the full set of the contract documents.

- 43.1. The documents required for the additional copies of the contract will have to be purchased by the contractor from the office of the concerned Executive Engineer, SD&SWM Sector, KMDA. All the copies must be duly completed as per the original and signed on every page by the Contractor before submission of the same to the concerned Executive Engineer, SD&SWM Sector, KMDA within the specified date and time. Drawings and other documents attached to the tender shall also be attached to all the copies of the agreement.

44. LEVELS ETC.

The contractor shall perform necessary survey along the alignment of the drain and temporary Bench Mark shall be marked over permanent structure.

The contractor must erect temporary pillars at his own cost, as many as required, in suitable places as directed by the Engineer-in-Charge, before starting the work, from which the contractor shall layout all important levels and alignment jointly with the Departmental Engineers. All instruments, threads, pegs, nails, flags etc. required for setting out the alignment and levels etc. shall also be supplied by the contractor at his own cost.

The contractor will be responsible for accurate setting out and constructing the whole of the work in accordance with the Bench Mark, centre line etc. as directed by the Engineer-in-Charge and the contractor must supply for their own and for the Departmental Engineer's use all the instruments, Leveling staff, tapes etc and other things that may be required for this purpose. The sight Rails shall be fixed at suitable intervals which should not be more than 30.0 M. apart.

The excavated earth from trench shall not be the property of the contractor. A part of the excavated earth shall be utilised for filling of low lying area nearby. The contractor shall have to fill up the low lying area with the excavated earth as per direction of EIC and remaining excavated materials shall be removed by the contractor as directed by EIC].

ADDITIONAL GENERAL SPECIFICATIONS

1.0 GENERAL

All works including materials to be used in works shall conform to Indian Standard Specification as published by Bureau of Indian Standard from time to time and as approved by the Engineer-in-Charge.

2.0 MATERIALS

Items of materials to be used in the work, not covered by the following specifications, shall conform to relevant B.I.S. Codes of practices and as per base practice as approved by the Engineer-in-Charge. The Contractor's rate for the job shall be inclusive of cost of all materials including taxes, handling, carriage, storage, guarding etc. all complete.

2.1 BRICKS

All Bricks shall be of approved quality of standard specifications, made of good brick earth, uniform deep red, cherry or copper colour, thoroughly burnt in kiln (machined made) without being verified, regular in shape and of standard dimensions and shall be free from cracks, chips, flaws, stones or humps of any kind and shall not show appreciable sings of efflorescence either dry or subsequent to soaking in water. The size of bricks shall be 9¾ " x 4¾ " x 2¾ " (conventional), 190 x 90 x 90 mm (modular). The bricks shall emit a clear ringing sound on being struck and have a minimum crushing strength of 105 kg/sq.cm. All the bricks which absorb water more than 20% of their own dry weight after 24 hours immersion in cold water shall be rejected. Specification for Building Bricks shall conform to IS : 1077.

2.2.1 COARSE AGGREGATES FOR CEMENT CONCRETE WORKS

Stone chips or stone ballast for cement concrete (plain or reinforced) shall be hard, of uniform and fine texture, free from faults or planes of weakness and free from weathered faces. The ballast or chips must be free from loam, clay or any surface coating, free from organic matter or other impurities and screened, free of dust. Stone of black and hard variety as is generally available from quarries in pakur or chandil areas will be normally used. Stone aggregates from other sources may also be used provided the same is found suitable in the opinion of the Engineer-in-Charge. The opinion of Engineer-in-Charge must be recorded in writing. The ballast or chips shall be obtained by breaking from large blocks and must be more or less cubical in shape.

2.2.2 The grading of coarse aggregates for cement concrete works shall be in conformity with the requirements laid down in IS : 383-1970 including amendments upto date. The Contractor shall arrange to supply single sized coarse aggregates. Such single sized coarse aggregates of different nominal sizes shall be mixed at site with other ingredients of concrete either directly in the mixture or on the platform in suitable proportions to get the desired overall grading of aggregates as per I.S. Specifications. Such proportions may be decided on making sieve analysis of the aggregates brought to the site, for obtaining better density and strength of concrete. The maximum size of aggregates shall not be more than 20 mm.

2.3 JHAMA CHIPS FOR CEMENT CONCRETE WORKS

Jhama chips for cement concrete work shall be obtained by breaking good quality Jhama bats, must not be spongy or with any coating of foreign materials and shall be homogeneous in texture. The chips shall be more or less cubical in shape. These shall be screened for removal of dust and if so necessary in the opinion of the Engineer-in-Charge, shall be washed at the cost and expense of the contractor.

2.4 **SAND**

All sand shall be clean sharp and free from clay, loam, organic or any other foreign matter, shall be obtained from approved source. The contractor shall get the sample of sand to be used in different kinds of work approved by the Engineer-in-Charge before using the same in work. Sand which in the opinion of the Engineer-in-Charge or his representative is dirty, must be washed to his satisfaction at the cost and expenses of the contractor.

2.4.1 Sand for all cement concrete work must be coarse. The sand shall pass through a mesh 4.75 mm. square measured in the clear. Sand shall not be used for concrete works if it contains more than 10% of fine grains passing through a 76 mesh sieve as used for cement test, nor should the fineness modulus be less than 2.00 unless specific permission is obtained from the Engineer-in-Charge.

2.4.2 Medium sand may be used for cement mortar for masonry, plaster etc., and also for bituminous works of road. Fineness modulus shall be between 2 to 1.8

2.4.3 Sand filling in plinth or foundation shall be done with fine sand or Silver Sand.

2.5.1 **CEMENT**

Ordinary Portland Cement shall conform to I.S. : 283-1967

2.5.2 No cement excepting those supplied by KMDA shall be used in work or brought to site by Contractor. Cement bags must be stored in a water-tight shed having wooden floor or platforms raised at least 50 mm from ground or as approved by the Engineer-in-Charge. Cement which is partly set or which is lumpy or caked is to be treated as damaged and shall be removed from the site immediately.

2.5.3. **FLY ASH**

Grade of Fly ash of concrete works conforming to I.S:3812(Part-II) **Construction** of road embankment with **fly ash** conforming to IRC: SP: 58

2.6 **WATER**

Water used for both mixing and curing shall be potable and free from injurious amounts of deleterious materials which are likely to affect the strength or durability of concrete, water containing any sugar, excess of acid, alkali or salt shall not be allowed for use. The PH value of water shall be between 6 to 8.

2.7.1 **STEEL**

Where deformed high strength reinforcement bars are specified in the design of R.C.C. construction, the Contractor shall use Tor Steel conforming IS : 1786 – 1965 (With latest revision). All steel shall be clean and free from loose mill scales, dust, loose rust and coats of paints, oil or other coatings before its use in the work. No reinforcement bars excepting those supplied by KMDA shall be used in the work or brought to the site by the Contractor.

2.7.2 All other structural steel to be used in the work shall conform to IS : 226 (up to latest revisions)

3.0 **EXECUTION**

All works shall be carried out in proper workman like manner. Items of works not covered by the following, shall be carried out relevant B.I.S. codes of practice and as per base practices according to the direction of the Engineer-in-Charge and to his satisfaction. The cost of all stages of works shall be deemed to have been included in the rate to be quoted by the Contractor.

3.1 **EXCAVATION OF FOUNDATION AND FILLING UP TRENCHES**

Excavation for information shall be done as per drawing and direction of the Engineer-in-Charge. The excavated areas around the foundation structures are to be filled up properly to the required levels with earth obtained from excavation of foundation and also with carried earth if necessary in layers not exceeding 150 mm at a time.

3.2.1 **CEMENT CONCRETE WORKS (PLAIN OR REINFORCED) SHUTTERING AND STAGING**

Wherever necessary, shuttering and staging must be provided and the cost thereof will be deemed to have been covered by the rate quoted by the Contractor.

Shuttering may be of approved dressed timber true to line, not less than 25 mm thick, Surface to be in contact with concrete are to be planed smooth except where otherwise stated. As an alternative, sufficiently rigid steel shuttering may be used. In every case, joints of the shuttering are to be such as to prevent the loss of liquid from concrete. In timber shuttering the joints must be perfectly closed and the entire shuttering surface shall be covered with polythene sheets of approved quality. In case of steel shuttering also the joints are to be similarly lined.

All shuttering and framing must adequately be stayed and braced to the satisfaction of the Engineer-in-Charge for properly supporting the concrete during the period of hardening. It shall be so constructed that it may be removed without shock or vibration to the concrete.

Before the concrete is placed, the shuttering shall, if considered necessary, be coated with an approved preparation for preventing the adhesion of the concrete to the moulds, and it is to be of such a nature and so applied that the surface of the finished concrete is not stained. Care shall also be taken that such approved preparation shall be kept out of contact with the reinforcement.

In no circumstances shall forms be struck until the concrete reaches a strength of at least twice the stress of which the concrete may be subjected at the time of striking.

Interior of all moulds and boxes must be thoroughly washed out with a hosepipe or otherwise so as to be perfectly clean and free from all extraneous matter prior to the deposition of concrete.

All form works shall be removed without shock or vibration. Before the form work is stripped, the concrete surface shall be exposed where necessary in order to ascertain that the concrete has hardened sufficiently. In normal weather and with ordinary cement. Vertical or side shuttering may be removed after three days and the bottom shuttering of horizontal members after fourteen days in case of slabs and twenty one days in case of beams and cantilevers etc. from the date of placing the last portion of the concrete in the structure. The above are the minimum and may be extended if found necessary. Before stripping the shuttering of structural members the Contractor shall take previous permission of the Engineer-in-Charge or his representative.

No plugs, bolts, ties, hold fasts or any other appliances whatsoever for the purpose of supporting the shuttering are to be fixed in the structure or placed in such a way that damage might result to the work in removing the same when the shuttering is struck.

3.2.2 **SCAFFOLDING**

The scaffolding with steel pipe must be strong and rigid stiffened with necessary cross bracers and always decked and boarded on the stills with close boarded ceiling and

swings to prevent any injury to persons or materials. The Contractor shall have to allow other traders to make reasonable use of his scaffolding as and when directed by the Engineer-in-Charge.

If for the interest of the work contractors have to erect scaffolding in other's properties including local bodies or corporation, the arrangement for the same including the cost of licensing fees etc. shall have to be borne by the Contractor and the department should be kept free from any liability on this account.

3.2.3 **MIXING OF CONCRETE**

(The Structural concrete & ready mix concrete)

Boxes of suitable size shall be used for measuring sand and aggregate in specified proportion. The unit of measurement for cement shall be bag of cement weighing 50 kg and this shall be taken as 0.035 cubic meter. While measuring the aggregate, shaking, ramming or hammering shall not be done, the proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowance for bulking be made. The aggregate in each batch of concrete are to be so proportioned as to contain full bags of cement.

Normally all structural concrete shall be mixed in mixture machine of appropriate proportion, shall have to be vibrated with suitable vibrator. Mixing shall be continued until there is a uniform distribution of the materials and the mass is uniform in color and consistency, but in no case shall the mixing be done for less than two minutes. For particular job the Engineer-in-Charge may allow hand mixing and or hand tapping of concrete. In case of hand mixing concrete, extra cement up to 10% over the standard requirement of cement for machine mix of particular mix shall have to be provided by the Contractor at his own cost.

As the bulking of sand may vary from day to day and at different parts of the day on account of varying moisture content, frequent tests for bulking shall be carried out with the sand to be used and the amount of bulking allowed for in the field mix so as to keep the actual proportion constant throughout.

Only such quantities of concrete as are required for immediate use are to be mixed at any one time. Sufficient water is to be added to obtain proper workability so that the mixture may flow readily round the reinforcements and into every part of the moulds. The workability shall be measured by the amount of slump.

The quantity of water to be used for each mix of 50 kg cement to give the required consistency shall not be more than 34 litres for 1:3:6 mix, 3:6 mix, 32 litres for 1:2:4 mix, 30 litres for 1:1½ :3 mix and 27 litres for 1:1:2 mix. In the case of vibrated concrete, the limit specified may be used suitably reduced to avoid segregation.

The total water content in each batch of concrete shall always be kept constant as the amount previously determined by experiments. The quantity of water to be actually added may, therefore, vary depending on the moisture content in the aggregates. In actual job, if the quantity of the ingredients remain constant the amount of slump may be taken as good guide indicating the total water content in the mixture. The consistency and consequently the water content of the concrete shall, therefore, be kept constant and checked from time to time as work proceeds by means of standard slump tests. The slump test shall be carried out with concrete immediately after it has been mixed and before any initial set has commenced, the sample being taken preferably at the point where the concrete is being delivered for placing in the moulds.

The mould shall be filled about one-fourth of its height with concrete which shall then be tamped, using 25 strokes of a 18 mm. diameter steel rod, 80 cm long and bullet-pointed at the lower end. The filling shall be compacted in successive layers similar to the first and the top struck off so that the mould is exactly filled.

The mould shall then be removed by raising vertically immediately after filling. The moulded concrete shall then be allowed to subside and the height of the specimen measured after coming to rest.

Sl. No.	Type of Work	Slumps	
		When vibrators are used	When vibrators are not used
1.	Mass concrete in foundation footings, retaining walls and pavements.	10 to 25 mm	50 to 75 mm
2.	Mass concrete in R.C.C. foundation footings and retaining walls.	10 to 25 mm	80 mm
3.	Beams, slabs and columns simply reinforced.	25 to 40 mm	100 to 125 mm
4.	Thin R.C.C. section or section with congested steel.	40 to 50 mm	125 to 150 mm

The consistency shall be recorded in terms of millimeters of the subsidence of the specimen during the test, which is known as slump.

The following slumps shall be adopted for different works.

I.S.: 456-2000 allows use of nominal mix of concrete upto grade M20 and may be allowed in works at the discretion of Engineer-in-Charge and will be guided by the provision of IS : 456-2000. For graded of concrete above M20, design mix has to be adopted. For determination of mix proportion for design mix concrete, the target strength should be higher than the specified characteristic strength to ensure that characteristic strength is attained at 28 days.

Target strength = Characteristic strength + 1.65 x standard deviation. Standard deviation for different grades of concrete in absence of any test may be taken as per IS: 456-2000 as follows:-

Grade of concrete	Assumed standard deviation N / MM ²
M 10	3.5
M 15	3.5
M 20	4.0
M 25	4.0
M 30	5.0

Once the target strength of cube moulds with specific mix design is obtained in the laboratory, it may be inferred that the corresponding characteristic strength of concrete, prepared with the materials used in the test mould (s) cured under identical condition as that of the test specimen, shall be obtained at site at 28 days.

An approximate formula for expressing the strength of concrete at age 't' (in days) is given below :-

$$f_t = \frac{t}{a + bt} \times f_{28} \text{ where } f_{28} \text{ is the strength at 28 days,}$$

$$f_t = \text{strength of concrete at any age 't' (in days), } a = 4.7 \text{ and } b = 0.833$$

3.2.4 **ACCEPTANCE CRITERIA**

The concrete shall be deemed to comply with the strength requirements if:

- a) Every sample has a test strength not less than the characteristic value; or
- b) The strength of one or more samples though less than the characteristic value, is in each case not less than the greater of :
 - 1) The characteristic strength minus 1.35 times the standard deviation; and
 - 2) 0.80 times the characteristic strength, and average strength of all the samples is not less than the characteristic strength plus

$$\left[1.65 - \square \frac{1.65}{\text{number of samples}} \right] \text{ Times the standard deviation}$$

The concrete shall be deemed not to comply with the strength requirements if :

- c) The strength of any sample is less than the greater of :
 - 1) The characteristic strength minus 1.35 times the standard deviation; and
 - 2) 0.80 times the characteristic strength; or
 - d) The average strength of all the samples is not less than the characteristic strength plus

$$1.65 - \square \frac{3}{\text{number of samples}} \text{ Times the standard deviation}$$

Concrete which does not meet the strength requirements as specified in (a) and (b) above but has a strength greater than that required by (c) and (d) may, at the discretion of the designer, be accepted as being structurally adequate without further testing.

If the concrete is deemed not to comply pursuant to (c) or (d) above the structural adequacy of the parts affected shall be investigated and any consequential action as needed shall be taken.

Concrete of each grade shall be assessed separately.

Concrete shall be assessed daily for compliance.

Concrete is liable to be rejected if (i) it is porous or honey-combed; (ii) its placing has been interrupted without providing a proper construction joint, (iii) the reinforcement has been displaced beyond the tolerances specified; or (iv) construction tolerances have not been met, however, the hardened concrete may be accepted after carrying out suitable remedial measures to the satisfaction of the Engineer-in-Charge.

3.2.5 **FREQUENCY OF SAMPLING**

Sampling procedure – A random sampling procedure shall 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 and cover all mixing units.

Frequency: - The minimum frequency of sampling of concrete of each grade shall be in accordance with the following;

Quantity of concrete in the work, M ³	Number of samples	
1 – 5	1	Plus one additional sample for each additional 50 m ³ or part thereof.
6 – 15	2	
16 – 30	3	
31 – 50	4	
51 and above	4	

3.2.6 **TEST SPECIMEN**

Three test specimens shall be made from each sample 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. Additional cubes may also be required for testing cubes cured by accelerated methods as described in IS : 9013. The specimen shall be tested as described in IS : 516-1959.

3.2.7 **TEST RESULTS OF SAMPLE**

The test results of the samples shall be the average of the strength of three specimens. The individual variation should not be more than @ 15 percent of the average if more, the test results of the sample are invalid.

3.2.8 **PLACING OF CONCRETE**

Concrete shall be handled from the place of mixing to the place of final deposit as rapidly as practicable by methods which will prevent the segregation or loss of the ingredients. It shall be deposited as nearly as practicable in the final position to avoid re-handling or flowing. Unless specially permitted by the Engineer-in-Charge, concrete shall not be dropped freely from a height of more than 2 metres.

Before placing the concrete, the moulds shall be cleaned for shavings, pieces of wood or other rubbish. When placing the concrete, the fine materials must be carefully worked against the moulds so that the faces of the concrete shall left perfectly smooth and free from honey-combing upto withdrawal of the moulds. Any defect in this respect must be dealt with by the Contractor as directed by the Engineer-in-Charge without any extra charges therefor.

Depositing concrete under water shall not be allowed without specific permission from Engineer-in-Charge. The method of concreting to be adopted in such cases shall have to be previously approved by him.

3.2.9 **COMPACTION OF CONCRETING**

During placing and also immediately after deposition, the concrete shall be thoroughly compacted by ramming spreading etc. until it has been made to penetrate and fill all the spaces between and around the steel rods, around embedded fixtures, and into the corners for formwork in such a manner as to ensure a solid mass entirely free from voids. If so directed by the Engineer-in-Charge, in addition to usual ramming, spreading etc. sufficient number and suitable type of vibrators may have to be used on important jobs to enable working with homogeneity. It is imperative that the work

should be done quickly as well as efficiently and adequate number of hands must therefore be employed to ensure this. Mechanical vibrators used shall comply with IS : 2505, IS : 2506, IS : 2514 and IS :4656.

Concrete shall be placed and compacted in its final position before setting has commenced and shall not subsequently be disturbed.

3.2.10 **CONTINUOUS CONCRETING**

Concreting shall be carried out continuously upto construction joints, the position and arrangement of which shall be predetermined by the Engineer-in-Charge or his representative. Any rest, pauses, such as for meal, shall also be subject to his approval. All concreting work should be so programmed as not to necessitate work at night. If for any reason this becomes imperative, the Contractor shall obtain previous permission of the Engineer-in-Charge or his representative and make proper lighting arrangement to his satisfaction.

3.2.11 **PROTECTION AND CURING**

The Contractor shall adequately protect freshly laid concrete, about 1 to 2 hours after its laying from too rapid drying due to sunshine, drying winds etc. and also from rains or surface water and shocks. About 24 hours after laying of concrete, the surface shall be cured by flooding with water of minimum 25 mm depth or by covering with wet absorbent materials. The curing shall be done for a minimum period of 10 days. Over the foundation concrete the masonry work may be started after 48 hours of its laying, but the curing of cement concrete shall be continued along with masonry work for a minimum period of 10 days.

In case of cement concrete used as sub-grade for flooring, the flooring may be commenced with 48 hours of the laying of sub-grade. In case it is not possible to do so due to exigencies of work, the sub-grade shall be roughened with steel wire brush without disturbing the concrete, wetted and neat cement slurry at the rate of 1.75 kg. of cement per square metre applied to the base before laying floor. The curing to be continued along with top layer of flooring for a minimum period of 10 days.

3.2.12 **CONSTRUCTION JOINTS**

All construction joints in slabs and other horizontal members are to be formed by inserting vertical boards against which the concrete deposited can be properly rammed. The positions where such construction joints may be made will be indicated by the Engineer-in-Charge or his representative.

In the case of horizontal joint any excess mortar or laitance shall be moved from the surface after the concrete is deposited and before it has set.

When the work has to be commenced on a surface which has hardened, such surface shall be well roughened and all laitance removed, the surface shall then be swept clean, thoroughly wetted and covered with a thin layer of mortar composed of equal volumes of cement and sand.

3.3 **TEST FOR CONCRETE**

For R.C.C. work, (where concrete is specified by strength) the mix should not be leaner than 1 : 1½ : 3 so as to give ultimate crushing strength not less than 20 N / MN² at 28 days cured under field condition. The mix for the concrete is to be so adopted and the slumps is to so allowed as to give specified strength and proper workability at

the existing site conditions. Contractor shall remain fully responsible for producing concrete of specified strength in the actual job and therefore cast at his own cost test specimens of 15 cm. cube as already specified during work and cure the same in similar way as for laid concrete for being tested for strength. Each set of test specimen shall be taken to cover the quantity of concrete laid on the job during the period from the time of taking the previous set of specimens and the quantity will be estimated by the Engineer-in-Charge from records maintained by him.

The interior surface of the mould and base plate shall be lightly oiled before the concrete is placed in the mould.

- a) When the job concrete is compacted by ordinary methods, the test specimen shall be molded by placing the fresh concrete in the mould in three layers, each approximately one-third of the volume of the mould. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete there slides from it in order to ensure a uniform distribution of concrete within the mould. Each layer shall be rodded, 25 times with a 16 mm rod, 60cm in length, bullet pointed at the lower end and the strokes shall be distributed in a uniform manner over the cross-section of the mould and shall penetrate into the underlying layer. The bottom layer shall be rodded, throughout its depth. After the top layer has been rodded, the surface of the concrete shall be struck off with a trowel and covered with a glass plate at least 6.5 mm thick or a machined metal plate. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of the water-cement ratio of the concrete, by loss of water either by leakage from the bottom or overflow from the top of the mould.
- b) When the job concrete is placed by vibration and consistency of the concrete is such that the test specimens cannot be properly moulded by hand rodding as described under (a) above, the specimens shall be vibrated to give a compaction corresponding to that of the job concrete. The fresh concrete shall be placed in the mould in two layers, each approximately half the volume of the mould. In placing each scoopful of concrete, the scoop shall be moved around the top edge of the mould as the concrete there slides from it, in order to ensure a symmetrical distribution of concrete within the mould. Either internal or external vibrator may be used. The vibration of each layer shall not be continued longer than is necessary to secure the required density. Internal vibrators shall be of appropriate size and shall penetrate only the layer to be compacted. In compacting the first layer, the vibrators shall not be allowed to rest on the bottom of the mould. In placing the concrete for the top layer, the mould shall be filled to the extent that there will be no mortar loss during vibration. After vibrating the second layer, enough concrete shall be added to bring the level above the top of the mould. The surface of the concrete shall then be struck off with a trowel and covered with a glass or steel plate as specified under (a) above. The whole process of moulding shall be carried out in such a manner as to preclude the alteration of water-cement ratio of the concrete by loss of water either by leakage from the bottom or overflow from the top of the mould. After curing, the specimen properly wrapped shall be made over to the Engineer-in-Charge or his representative who will arrange to have them tested at 28 days from the date of casting. If there is any delay for any reason whatsoever the result of the test shall nevertheless be valid and will be applicable as per rules in each case for all test specimens whatsoever. The Contractor shall be responsible for proper packing of the specimens at his own cost, for safe and convenient transport of the same from the site to the testing laboratory. The cost of testing the test moulds and other charges including cost of carriage of the test moulds

from the work site to the particular laboratory (both ways) and other incidental charges in this connection will have to be borne by the Contractor.

In case of concrete showing, on the result of the cube tests, strength less than that specified in (a) and (b) of the Acceptance Criteria but has a strength greater than (c) & (d) of the said Acceptance Criteria concrete may, at the discretion of the Engineer-in-Charge, be accepted as being structurally adequate without further testing.

If the concrete is deemed not to comply pursuant to (c) & (d) of the Acceptance Criteria, the Structural adequacy of the parts affected may be investigated as per provision of Clause 16.3 and / or clause 16.5 of I.S. 456-1978 i.e. core test and / or load test, as the case may be before rejection on the application of the Contractor with the undertaking to bear the cost of such tests.

If the strength of the concrete is such that it satisfies provisions made in sub clause 16.3.3 and / or sub-clause 16.5.3 of I.S. 456-2000 concrete in the member represented by such tests shall be considered acceptable but the Engineer-in-Charge shall have the full power to fix the rate of deduction @ Rs. 200/- per cubic metre.

In case the test results do not satisfy the relevant requirement of the preceding paragraph, the volume of concrete so deficient shall be deemed to be un-acceptable and shall be removed from the structure and replaced by fresh concrete of specified strength and the Contractor shall, in the case, have to carry out the instruction of the Engineer-in-Charge irrespective of the amount of loss, inconvenience and difficulties involved.

The Contractor shall remain liable to act / to carry out instructions under the provision of this clause, notwithstanding issuing by the Engineer-in-Charge of any certificate or the passing of any bills or accounts.

3.4 1ST CLASS BRICK WORK

Cement mortar shall be prepared by mixing sand and cement in specified proportion. Sand shall be measured on the basis of its dry volume. In case of damp sand, its quantity shall be increased suitably to allow for bulkage.

Brickwork shall be laid in English bond. The brick shall be laid by larrying method, a layer of mortar shall be spread on full width for suitable length of the lower courses. Each brick shall first be laid so as to project over the one below, both at the end and at the side, then pressed into the mortar and shoved into final position so as to embed the brick and to fill its inside face fully with mortar. Cut bricks shall not be used except where necessary.

The walls shall be taken up truly plumb with plumb bob. The thickness of brick courses shall be kept uniform and for this purpose, wooden straight edge with graduations giving thickness of each brick course including joint shall be used. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical.

Vertical joints in alternate course shall come directly one over the other. A set of tools comprising wooden straight edge, masons spirit level, square, half metre rule, line and pins, string and plumb shall be kept for every 3 masons for frequent checking during progress of work. Faces of walls found not in plumb shall be dismantled.

Both the faces of walls of thickness greater than 25cm (10") shall be kept in proper plane. All the connected brickwork shall be carried up nearly at one level and no

portion of the work shall be left than 1m below the rest of the work. Where this is not possible, the work shall be raked according to bond (and not left toothed) at an angle not steeper than 45°. Bricks shall be so laid that all joints are quite full of mortar. The thickness of joints shall not exceed 10 mm. (2/5)". Bricks shall be laid with frogs upward except in the top course where frogs shall be placed downward. The face joints shall be raked to a minimum depth of 15 mm (3/5") by racking tools daily during the progress of work when the mortar is still green, so as to provide proper key for plaster or pointing to be done. Where plastering or pointing is not required to be done, the joints shall be struck flush and finished at the time of laying.

The face of brickwork shall be cleaned the very day that brick work is laid daily and all mortar droppings removed.

Green work shall be protected from rain suitable covering. The brick work shall be kept wet for a period of at least 7 days. The top of masonry work shall be left flooded at the close of the day.

Scaffolding shall be sound and strong and holes left in masonry work for supporting the scaffolding shall be filled and made good, before plastering.

3.5 DAMP PROOF COURSE

This shall be laid to specified thickness over walls for the full thickness of the super structure walls. The surface shall be levelled and prepared before laying the cement concrete. Edges of damp proof course shall be straight, and even vertical. Side shuttering shall consist of wooden form and shall be strong and properly fixed so that it does not get disturbed during compaction and the mortar

does not leak through. The concrete mix shall be of workable consistency and shall be tamped thoroughly to make a dense mass. When the sides are removed the surface should come out smooth without any honey-combing. The damp proof course shall be laid continuous and the surface shall be double chequered. Damp proof course shall be cured for at least seven days, after which it shall be allowed to dry. Water proofing materials of approved quality shall be added to the concrete mixture in accordance with the manufacturer's specifications stating the quantity of water proofing material in litres or kg. per 50 kg of cement and will be paid for separately. Similarly, polymer based paint used under damp proof course as per manufacturer's specification shall also be paid separately.

3.6 CEMENT PLASTER

The proportion of mortar for exterior or interior plaster shall be as specified in the items of work.

The plaster shall be of thickness as specified and the surface shall be similarly cured as for cement concrete. The moulding shall be carried out as shown in the drawing and shall be separately measured in overall length unless otherwise specified in the items. Interior corners and edges of openings if so directed by the Engineer-in-Charge shall be rounded off or chamfered with the same mortar for which no extra payment will be allowed. All cement concrete surface should be chipped off properly before taking up to the plastering work.

3.7 ARTIFICIAL STONE FLOORING

The Artificial stone flooring shall be laid in panels of shape and size as directed. The casting of the panels will be so programmed as to prevent bonding on the freshly laid panel with advancement panels.

Unless otherwise specified, the underlay shall be with graded stone chips 12mm. down, the thickness of topping shall be of 10mm thick and colouring pigment as may be required shall only be added with the topping. The topping and the underlay shall not be laid in one operation. After laying the 'Underlay' the surface shall be left out to dry. The topping shall be laid only after the underlay as sufficiently dried and initially set and after thoroughly brushing with hand wire brush and sweeping clean and after application of slurry. The topping shall be finished with an English towel and a piece of clean dry linen. During all the stages the required level shall be carefully observed and maintained. Suitable grading, where required shall be provided in the flooring for water drainage as directed by the Engineer-in-Charge.

The corner between floor and wall shall be round off as directed by the Engineer-in-Charge for which no separate payment shall be made. All cement concrete surfaces should be chipped off properly before taking up the flooring work.

ADDITIONAL TECHNICAL SPECIFICATIONS FOR ROAD WORKS

GENERAL

1.1 Materials

All materials used in the construction of permanent work shall be of the best quality of the kind and to the approval of the Engineer-in-Charge. Any materials not covered by these specifications, shall comply with the relevant Indian Road Congress standard specifications and code of practice and Indian Standard Specifications (referred to hereinafter as I.R.C. and I.S. respectively), as revised or modified upto the date one month prior to the Tender Notice.

Samples of materials to be supplied and used by the contractor in the works shall be to the prior approval of the Engineer-in-Charge for this purpose the contractor shall furnish in advance representative samples in sufficient quantities and in the manner as directed by the Engineer-in-Charge for this approval materials brought to the site which, in his opinion do not conform to the approved sample, shall not so directed by him, be removed by the contractor from the site and replaced by materials of approved quality.

In spite of the approval of the Engineer-in-Charge of any materials brought to the site, he may subsequently reject the same if in his opinion the materials has since detracted due to long and defective storage or for ant reason whatsoever and is thereby considered unfit for use in the permanent works .any materials thus rejected shall be immediately removed from the site at contractor's cost and expense.

All materials brought to site shall be properly stored and guarded in the manner as directed by the Engineer-in-Charge or his authorised representatives and to his satisfaction.

The Engineer-in-Charge may carry out test of materials as he may decided. The contractor shall, at his cost and expense, for this purpose supply requisite materials and render such assistance to the Engineer as he may decide. The cost and expense of such tests are to be borne by the contractor.

2. Workmanship

All works are to be carried out in proper workman like manner, items or works not covered by those specifications or by the Tender Documents shall be carried out as per the best practice according to the direction of the Engineer-in-Charge and to his satisfaction. The relevant I.R.C. specifications or code of practice shall be taken as guide: or this purpose. Publication - "Handbook of Quality. Control for the construction of roads and Runway" (1977). In case relevant particulars are not available in the said publication, reference shall be made to the "Specification for Road and Bridge Works" of the published by I.R.C. (1978).

3. Basic Materials

3.1 Paint

All paints shall be delivered in strong containers, marked with the colour of the paint, brand, volume of paint content in litres and of the best quality of approved make and brand as approved by the Engineer-in-Charge. Under no circumstances shall the paint be diluted with Linseed oil or otherwise. Any paint or enamel although of approved brand, which so hardens in the container that it cannot be readily broken up with a stirrer to a smooth uniform painting consistency, shall be rejected. Any paint or enamel too thick for proper brush application shall be rejected. **In case of Acrylic exterior emulsion paint the following Brand such as shalimar paints, Nerolac or**

Berger to be used during execution of the work and obviously as per standard code of practice.

3.2 Cement

All cement to be used in the works shall be ordinary Portland cement of Indian manufacture or Foreign manufacture complying with I.S. 269 of Blast Furnace slag cement complying with I.S. 445. The quantity of cement required for the work will be procured by the department and issued to the contractor at the rate specified in Annexure of the Special Terms and Condition. The cost, of the cement consumed in works will be recovered at the issue rate from contractor's bill.

3.2.1 With regard to the quality of cement to be used in concrete of specified strength, the responsibility of the Department shall cease on making *over* to the contractor such consignment or consignments of cement if the contractor is apprehensive about the quality of cement in any consignment, the contractor will have to write immediately to the Engineer-in-Charge about such consignment on receipt of such written intimation will arrange to collect sample of cement in presence of the contractor and get sample so collected tested for complete test both physical and chemical at the Central Laboratory, KMDA, Unnayan Bhavan, Salt Lake City. The result of the Central Laboratory, KMDA will be binding on both the parties. If the results of such test be satisfactory i.e. complying with relevant IS specifications, the cost of the test including all incidental charges as determined by the Engineer-in-Charge shall have to be paid by the contractor and will be recovered from the bills of the contractor. If test results fail to comply with IS specification then the cost of the test shall be borne by the department and the Engineer-in-Charge shall arrange the concerned consignment to be replaced by cement of requisite quality. In spite of unsatisfactory test result the Engineer-in-Charge at his discretion may direct to consume the cement in unimportant nature of works and in that case the contractor shall comply with the direction of the Engineer-in-Charge.

3.2.2 The responsibility for asking for a satisfactory test results in respect of any consignment shall rest with the contractor any failure on their parts in this respect shall not relieve the of the liability to produce concrete of specified strength. No subsequent plea that the under strength which the resultant concrete might indicate, as *per* tests specified hereinafter, was due to the quality of cement below specification shall be entertained.

4. PUMPNG AND DEWATERNG Etc.

The contractor shall provide all pumping and other arrangements necessary to remove from or to keep outer foundation or any part of the structures under construction free from water, whether canal water or at his own cost and expense.

5. Earth work

5.1 Earth work in excavation of foundation shall include

- a) Before taking up construction of work, the contractor may have to construct two earthen bundhs or may have to strengthen the earthen bundhs to protect the worksite free from seepage of canal or other stagnant water. All adequate protection for constructing such bundhs as per drawing and approval of the Engineer-in-Charge will have to be made by the contractor.
- b) Removing the spoils within a lead of 150 metre and including lift & stacking or spreading the spoils as per direction of the Engineer-in-Charge.
- c) Trimming the sides of the trenches, levelling dressing & ramming the bottom.

5.1.1 Adequate shoring as per approval of the Engineer-in-Charge during excavation of earth shall have to be made by the contractor at his own cost and expense.

5.2 Mode of payment

Irrespective of the area of excavation actually done by the contractor measurement for the purpose of payment for excavation of foundation and related items or works, such as trench filling, shall be on the following basis.

For excavation actually done by the contractor measurements shall be on the basis of vertical shaft excavation as per the drawing plus 31 (thirty one) cm. or 300 mm. (three hundred millimetre) on all sites of theoretical outlines of foundation or as actually executed whichever is less.

6. **Clearing and Grubbing**

Prior to commencement of earthwork the site, as will be shown by the Engineer-in-Charge/or his representative should be clearer of obstruction including buildings, fences, utility lines, abandoned drainage structures and vegetation such as tree (upto 3' -0" girth) roots, undergrowth grass, rubbish etc. except where it maybe desirable be retain the vegetation for appearance shade or other reasons as will be decided by the Engineer-in-Charge, whose decision in will be final and binding and complete clearance shall have to be as will be directed by the Engineer-in-Charge or his representative, so provide adequate sight distance for safe trader, to improve the obstruction to drainage or decayed or dead trees which might otherwise fall on the highway or to permit access to use of borrow pits and other sources of materials. The materials thus removed should be stacked in neat stacks in specially selected sites as will be directed by the Engineer-in-Charge or his representative. The cost of these works should be included in the earthwork rate of the contractors and they will have not claims over the recovered materials and tree etc.

6.1 The contractors at their own cost will then have to mark out the centre line of the alignment by stronger wooden pegs and other edges of slopes and scarify the space between the two lines (outer edges of the slopes). The contractor will at their own cost have to construct and maintain brick pillars at safe distance on both sides of the embankment for taking pre-work and post work levels. These level brick pillars (15" x 15") should be connected with pucca bench mark (S.M.) pilfer one for mile, i.e. two in a mile. R.L. should be kept inscribed on the plastered surface (with neat cement finish) in B.M. pillar which will have to enter in the level book & will have to enter in the level book & will to have to be signed jointly by the contractor and the representative of Engineer-in-Charge. Brick pillars are to be numbered serially and their reference may be noted in the level books. The contractor will remain solely responsible for same guarding the pucca B.M. pillars.

6.2 The contractor will have to arrange their own land for excavation or earth for the construction of embankment. Before earth is excavated from the land the site and quality of the earth available are to be shown tested and approved by the Engineer-in-Charge. In no case the contractor will be allowed to bring earth from other places than the approved one. No extra claim for selection of site testing of earth and etc. will be entertained. The contractor will have to arrange their transport (i.e. Lorries, Trailers and other suitable machineries) for carrying earth from the places of excavation to the work site. They will also have to arrange and provide rules lubricants etc. for their transport. The department in to case will be held reasonable for delay in carrying and completion of work due. non-availability of fuel and lubricants etc.

7 **Compacting original ground**

7.1 In all cases, the original scarified ground should be consolidated as must as possible by rolling or other means. Any empty pockets or depression left in the soil as result

of cleaning and grubbing operation should be filled up a compacted up to the satisfaction of the Engineer-in-Charge for which no extra payment will be made. Where embankment is to be placed on step sloping ground the surface shall be benched in steps or trenched or broken up in such way as directed by the Engineer-in-Charge at no extra cost.

- 7.2 Where the embankment is to be placed over an existing road surface that should be scarified to a minimum depth of 6" so as to provide to bend between the old and new materials. The embankment is to be broken up in pieces not be exceed on sq. ft. and may be left under the new embankment for which no extra payment will be made when the embankment is to be placed over any old black top concrete payment
- 7.3 The embankment work must not proceed until the foundation have been inspected by the Engineer-in-Charge or his representative for ensuring satisfactory condition and approved. The cost of the above items of work should be included in the earthwork rate of concrete. Embankment slope: As will be decided by the Engineer-in-Charge.
- 7.4 **Placing of soil in layers and drainage**
The contractor will make the road profile with the help of bamboo posts and ropes as per plan and section and / or as directed by the Engineer-in-Charge. All pages, posts, labour etc. for dug belling and making -the profile will have to be supplied by the contractor the cost of which should be included in the earthwork rate of the contractor.
- 7.5 **Produce of Building up embankment with earth**
Earth obtained from the contractor's land in elsewhere will then have to be spread uniformly between the tee lines of the embankment in layers not exceeding 9" loose, depth, either by machine or manual labour through the full width further road embankment including side slopes, layers exceeding 9" in loose depth may be permitted only when the Engineer-in-Charge is satisfied that the specified compaction plan. But in no case the depth of layer will be allowed to exceed 12".
Provided further then when a shop foot roller is used the thickness of the loose layer shall not exceed the length of the trimming feet by more than 2". All dads aid hard lumps are to be thoroughly broken up to have a minimum size of 6.2 mm and compacted to 55% proctor's density at O.M.C. by using mechanical equipments as will de determined by actual test at site by the department in presence of contractor of his representative. The field density test will be carried out an interval of 22' - 0" ,in staggered way equally in four longitudinal strip depending in the width of the layer concerned. The above specification will apply to the subsequent layers also upto the final formation levels and slopes as shown in the plans and sections or as directed by the Engineer-in-Charge.
- 7.6 The compaction is to be done at optimum moisture content and accordingly the natural moisture content of the soil is to be determined previously and water is to be added by way of sprinkling, if necessary and left for at least 12 hours before compaction starts. Variation of water content should be 2 percent on eight side, in case of excessive moisture content in the soil drying of the soil as per direction of the Engineer-in-Charge is to be done by the contractor
- 7.7 The compaction control in the filed will be exercised through frequently moisture content and density determination. The control of compaction through controlled comp active efforts (i.e. the number of the passes of compacting equipment) will not however be accepted as a substitute for control of compaction by moisture content and density determination.
- 7.8 The contractor will have to adjust his labour strength according to the scope of availability of the work, but no claim for idle labour shall be entertained in case

sufficient areas are not available at any time. The quantities of earth work showing the schedule are approximate and subject to wide variation where required and directed by the Engineer-in-Charge and no extra claim will be entertained for such variation. If there be any public road within the acquired area of the Highway. The condition at contractors cost.

- 7.9 Ancillary works required for the same or as directed by the Engineer-in-Charge in writing, stamps, roots, brush, dods, rubbish, soffits clay or any other unsuitable matter must not be used for the construction of road embankments. Road embankment shall be constructed to line, grades and cross section as shown on the drawings or as ordered by the Engineer-in-Charge in writing embankment shall have to construct systematically as far as possible from one end to the other and for full width of embankment. Earth work may be started from one or more changes at a time but these particular sections. No measurements of earth work however, will be taken for unfinished work which will not be completed upto formation level or any other levels as will be accepted by the Engineer-in-Charge and properly dressed to required slopes, grade and camber. While the excavation is being done and until the earthwork and the road embankment are specifically accepted by the Engineer-in-Charge the contractors shall be responsible for the maintenance of the embankment to prevent damage or loss of materials from the road way and shall replete at his own expense any portion which in the opinion of the Engineer-in-Charge have become displaced due to carelessness or negligence on the part of the contractors damage resulting from natural causes, such as storms floods burnt rains etc during the construction of roadway, the roaded that shall be maintained by the contractors in such conditions that it will be drained at all time. No maintenance is required to be done by the contractor if the road embankment for any continuous stretch measuring half mile is completed in all respects up to formation level as per specification and accepted by the Engineer-in-Charge.
- 7.10 The contractors rate earthwork, shall be inclusive of all leads and lift including approaches to bridges within the acquired or arranged land or channels that will be necessary during actual excavation of earth work for the road embankment including slopes and sub-grades, approaches to structures (bridges culverts etc.) grade separations and to complete the backfilling of structures. the earthwork shall also include all excavation of soil whether hard soft or mixed foreign substance and water shaping and dressing to proper camber and also as per drawing or as directed by the Engineer-in-Charge. No separate payment will be made for any extra lead or lifts due to less acquisition of land in particular spots. It may be necessary to earth arranged by the contractor after crossing water channels or from standing water in tanks existing channels requiring approach roads pumping or grabbing (the cost of which should be included in the earthwork) be entertained. The contractor shall have to inspect and find out the actual leads and lifts involved and availability of acquired and arranged land by personal inspection at his own cost before submitting tenders and no subsequent claim will be entertained on this account.
- 7.11 **Service Roads**
The contractor shall have to construct a kacha service road on the acquired land between the embankment borrow pits throughout length of the road and properly maintain the same in conditions fit for movement of jeep within their rates for earthwork.
- 7.12 **Finishing operations**
The embankment shall have finish in conformity with the alignment levels, cross section and dimension shown in the drawing. There are alignment of the road is

survey the top of the embankment will be formed with the super elevation and crest width.

- 7.13 Finishing operations shall include the work of shaping the dressing the shoulders, road bed and the side slopes to conform to the crossing shown in the drawing. Both the upper and lower ends of the side slope shall be rounded off to improve appearance and the merge and embankment with the adjacent terrain. The cost for finishing operation should be included in the rate for earth of the contractor.

7.14 **Mode of payment**

The earth work for the road embankment will be paid on the basis of measurements of the roads embankments constructed from time to time strictly according to the above specification by method of average areas of section based on the level sections taken before the commencement and after completion of the embankment upto a height as per direction of the Engineer-in-Charge as per approved specification and distance no' more than 30 M (Thirty metre) sparts in presence of the contractor or their authorised representative. However final payment of road embankment completed will be made on completion of the finished Road embankment completed as per above specification upto formation level. The contractor should satisfy himself before commencement of their authorised representative before commencement of their authorised representative will have to sign the level books as taken of their acceptance of the levels for the preparation of the sections. If the contractors or their representatives fail to attend the levelling work when door notice will be sent to them, the levels taken by the department will have to be accepted by the contractors and no subsequent claim in this respect will be entertained.

The measurement of road embankment shall include only the net amount of earthwork in the embankments between the original ground surface and the surface of the finished road embankments completed accordingly to the drawing and above specifications or instructions of the Engineer-in-Charge. At the time of taken levels the contractors will have to arrange labours at their own cost.

The volume of compacted earthwork out put by 8-10 tons per roller working day of 8 (eight) hours will be a minimum of 8,000 dft. And a maximum of 12,000 eft.

The contractor will remain bound to provide 85% proctor's density at O.M.C. in compacted soil in embankment. In case it appears that such density falls short and such shortage remains within 5% of the desired minimum results as stated above, the Engineer-in-Charge may allow such work accordingly to his discretion at a reduced rate of Rs, 5/- (Rupees five) per 28.317 m The top 300 mm (1'-0) of the compacted earth work in road embankment should be 100% minimum procure density at O.M.C

8. Embankment will have to be prepared for this contract mainly with Sand/Earth as per direction of Engineer-in-Charge. The sand used for the purpose shall be of Fine sand know as "Silver Sand". Sand should contain fine materials (passing 75 micron sieve) upto 2%. The sand shall be deposited in layers, each layer not exceeding 30 cm. in loose thickness compacted in saturated condition with road roller (8-10 ton) vibratory type of roller or suitable vibratory compactor or crawler mounted Dozer as may be approved by the Engineer-in-Charge. The compaction shall be continued till the specified density of 100% for the top 0.5m and at least 95% (for the lower portion) is obtained.

After compaction the compacted density should not be less than 90 1 b/cft. the volume of compacted fine sand output by 8-10 tons power roller (8 hrs. working) will be about 600 cft.

8.1 **Method of measurement**

All works relating to the formation of embankment will be measured in terms of volume on the basis of rework and post work cross sections of the Embankment at suitable intervals and the volume compacted by the method of average end areas

8.2 **Soil Blanket**

When the core of the embankment is formed with sand, the slopes on the sides will be provided with a blanket formed with soil. Such soil blanket shall be built up • in stages and simultaneously along the core of sand, Compaction of the blanket shall be carried out at each successive layers as the embankment is built up. The specification for this soil blanket work will be same as for all the embankment with the soil as stated earlier. After the blanket has been formed, it is to be dressed properly to the specified profile of the embankment or as directed by the Engineer-in-Charge.

8.3 **Method of measurement**

Soil blanket shall be measured in terms of finished work, this may be done by first working out the total volume of embankment (including the blankets) on the basis of rework and post work cross section and deducting there from the volume of the core, In the alternative, volume may be worked out on the basis of the surface area along the slopes and the average thickness as may be suitably determined.

8.4 **Permitted tolerance**

Permitted tolerance shall be as per relevant IRC code.

8.5 **Tube well with pump**

The contractor at his own cost will have to sink tube well if necessary, to obtain sufficient quantity of water. Pumping arrangements shall also have to be made to pour watering in soil sand and sub-base consolidation' tanks.

8.6 **Composition of carriageway pavement**

For works covered by the contractor package, the pavement of the carriageway (i.e portion of above sub-grade will be composed of

- a) Glandular Sub - Base
- b) Wet Mix Macadam
- c) Mix Seal surface

9.0 **Oversize brick bats consolidation Specification Description**

The work will consist of consolidation of brick bats in layers shall not exceed 11.25 cm. (loose) consolidation to 7.5cm.

9.1 **Materials**

Brick bats shall be obtained from departmental stockyard and carried out from the stockyard to the site by lorry or any other transport to be arranged by the contractor at his own cost. The material carried shall be kept at the roads beams and shall be broken to 6.25 to 7.25. the broken materials should be continuous and as per the direction of the Engineer - in - Charge,

9.2 **Construction Operation.**

The brick bats shall be taken in basket from the specified and measured stack and shall be spared *over* the compact furnished sub - base to the required width and to be required chamber. The surface of the aggregates spread shall be carefully checked with template and all high and low s its remedied by removing or adding aggregate as may be required. No segregation of large of fine particles shall be allowed and the coarse aggregate as spread shall be uniform gradation with packets of fine materials.

9.3 **Rolling**

The properly laid and packed bats shall be rolled dry with power roller and compactness with simultaneous hand packing as necessary, Rolling should be continue till interlocking of brick bats is achieved. After dry rolling completed to the satisfaction of Engineer-in-Charge, the surface shall have to be thoroughly sprinkled with water **and** rolled again. Any depression or heaved spots to be picked up and the necessary bats are to be added or removed as necessary and re - roiled. The camber has to be checked at every 5 metres with proper and well made camber board. Rolling shall commence at the edges and finish interlocked and the rolled leaves impression on the finished road surface. Finished surface shall be smooth and compact having proper grade camber.

Camber shall be provided in a curved section of the road where super elevation will have to be provided. Roads width shall be widened and proper super elevation shall be provided as directed by the Engineer - in - Charge in curved portion only.

No consolidation shall be started unless materials for consolidation are finally measured with approval of the Engineer - in - Charge or his authorised representative. Due protection by way of construction suitable embankment at both ends of the brick bats base be done before the following starts. No extra payment whatsoever will be made on this account.

10. Jhama Metal consolidation

Description

This work will consist of consolidation of jhama metal in the single layer shall be 11.25 cm. Loose jhama (size 5Cm. To 6.25 Cm broken previously) consolidation to 7.5 cm, consolidation to be done by power roller.

10.1 Materials

Well burnt jhama bats be issued. from the departmental stack yards to the contractor. This **bats any other transport** at their own cost to the work site. The materials thus **carried shall be** kept properly at the road beams and shall be broken 5 cm to **6.25** cm by contractor's labour. The broken materials should then be screened and stacked properly at the berms which would be continuous and as directed by the Engineer - in - Charge.

10.2 Construction Operation Spreading

Jhama metals shall be taken in basket from specified stacks and shall be spread uniformly and evenly upon the prepared bricks bats consolidated surface upto full width in lines and level to be required to the required camber and grade to the specified thickness (11.25 cm lose). After laying and packing must be done carefully with true to proper grade and camber, bigger size ones to fill up the interrices. The jhama metal shall not normally spread more then three Says in advance of subsequent rolling operation

10.3 Rolling

The properly laid and packed bats metal shall be rolled dry with power roller immediately to compactness with simultaneous hand packing as necessary. Dry. rolling should be continue till interlocking of metal is achieved.

Except on super levated portion where rolling shall proceed from inner edge to the outer, rolling shall beings from the edges gradually progressing towards the entire. For edge / edges shall be compacted with roller running forward or backward. The roller shall then more inward parallel to the centre line to the road, in successive **passes** uniformly lapping proceeding tracks lines adequate protection bundks on both sides of the edges are to be provided before starting of rolling. After dry rolling is completed to the satisfaction of the engineer-in-charge the surface shall have to be thoroughly sprinkled with water and rolled again. Any depressions on heaved spots

are to be added or removed and re-rolled. The rolled surface shall be checked transversely and longitudinally with templates and any irregularity is to be corrected by loosing the surface adding or removing necessary amount of aggregates and re-rolling until the entire surface conforms to make up depressions. No consolidation shall be started unless Jhama metal for consolidation are finally measured. Payment will be made for bats consolidation compacted and after section measurement.

11. Permitted tolerance of surface regularity

The surface of the compacted sub - base, brick and jhama metal basis are to be finished smoothly and proper grade and camber so that relevant tolerance both in longitudinal and transverse direction can be maintained as stated in the following table :-

Sl. No	Type of construction	Longitudinal profile mix max. variation permissible undulation when measured with 3m straight edge.	Cross profile max. variation permissible when a camber template
1.	Compacted Sub - base Cinder or fine sand	18mm	10mm
.2.	Brick bats consolidation base	18mm	10mm
3.	Jhama Metal Consolidation base (5 cm to 6.25cm)		10mm

11.1 Stone metal consolidation

This work will consist of consolidation of stone metal in the layer shall be 0.132M³ loose stone metal (size of stone metal 45 mm to 90 mm in hard crust) per sq. metre and consolidation to 100 mm compacted thickness to be done by power roller etc. etc. as per PW(R) 2001-2002 and as per direction of the EIC.

12. Tack coat / Prime coat

12.1 Description

The work shall consist of application of single coat emulsion bitumen to the existing road surface preparatory to another bituminous construction.

12.2 Materials

The binder used for tack coat shall be emulsion bitumen of a suitable grade as directed by the Engineer-in-Charge.

12.3 Construction operation

Preparation of Base

The surface on which the tack coat / prime coat is to be applied shall be thoroughly swept and scraped clean of dusts any other extraneous materials before application of the binder

12.4 Application of binder

Binder shall be bitumen emulsion used and approved by the Engineer - in -Charge, and sprayed on the base at the rates specified below

The rate of spray in terms of straight run between shall be 4 Kgs. Per 10 Sq. metre area for and untreated water bound macadam surface and 3 kg per 10 sq.m. area for black top surface, the binder shall be supplied uniformly with the aid of sprayers.

The tack coat shall be applied just ahead of the on coming bituminous construction.

12.5 Measurement for payment

The tack coat shall be measured in terms of surface area application in Sq. meter.

12.6 Corrective Course

If there are depressions, damage or pot holes in any surface of the existing road or in any portion thereof, prior treatment of the surface shall have to be done by the contractor before any ever lay is said there on. Bulges will have to be removed and depression filled up so as to bear the counter of the surface. And the desired profile.

12.7 Type of correctine course and description of different types

If the existing surface is blacked topped, the corrective course would consist of a suitable bituminous treatment of varying thickness as 'directed by the Engineer -in - Charge, as required to bring the finished surface to correct lines and levels. • For this purpose the existing blacktop surface is to be initially cleaned if all foreign matter and extraneous deposits (if any) the surface picked up at intervals of suitable roughened as directed. A tack coat of Bitumen as per specification is to be provided on the surface thus prepared. The bituminous corrective course is there to be laid to requisite varying thickness with due allowance for deduction of thickness when compacted. The specification adopted for this bituminous corrective course shall be the same as that of bituminous macadam impact that the maximum side of the aggregate will have to suitably adjusted as per direction and approval as directed by the Engineer - in - Charge. According to the thickness of the corrective course at different places of the area. Where the payment has already been done upto jhama meta state only any potholes. Depression or any other irregularities will have to be corrected to bring the surface to the desired. profile before the road base course is laid thereon. Such corrections shall be done with water bound macadam of compacted over burnt metal bricks metal as per the specification, or any extraneous provide the requisite to be 50mm or less the corrective course shall be done with bituminous treatment as directed by the Engineer - in - Charge. For areas requiring greater thickness 7.5cm or more the corrective course would be of over burnt brick metal.

12.8 Method of measurement and basis of payment

Because of varying thickness of the corrective course from place to place it would be difficult to measurement the work in terms af dimension of completed work. As such all on the basis of the loose volume after due deduction of sink age / shrinkage (1/13 les) of materials actually consumed in the corrective course. Proper records there of shall be kept in the form and manner as may be determined by the Engineer - in - Charge. And signed by the representative of the both parties in terms of mutual agreement.

The rate of the corrective courses are excluding the cost of prime or tack coat

13. Specification for Bituminous Macadam (Base course)

13.1 General

Bituminous Macadam of specified compacted thickness is to be provided as the base course of bituminous surfacing. Before laying the same the surface on which the Bituminous Macadam is to be provided shall be checked as to its correctness with regards to levels and profiles. In case of old surface which had done prior to this tender, corrective measure as necessary and as per approval of the Engineer - in - Charge would be carried out this tender and will be paid separately. In case however the surface is the result of the work done by the contractor under this tender the surface shall never the less have to be rectified as per the direction of the Engineer - in - Charge. But no payment for such rectification shall be made to the contractor.

13.2 Description of the work

The work Bituminous Macadam shall be done generally as per IRC 27-1967

Crushed stone brought to site shall be screened and / or washed as may be directed by the E.I.C. to his entire satisfaction. The sizes are to be mixed together in such proportion as may be found necessary to have the grading as directed and approved by the E.I.C.

Bitumen as binder for premixing the stone aggregate shall be of 60 / 70 or 80 / 100 penetration as may be directed by the Engineer-in-Charge. The binder content shall be between 3.5 to 4.5% by weight of the total mix. Bitumen required for the work shall be obtained from the Department at fixed issue rate as mentioned herein before in clause and will have to be brought to site of works by the Contractor at his own cost.

Bituminous macadam shall not be laid during rainy weather or when the surface on which it is to be laid is damp or wet.

The stone aggregate must be preheated before it is mixed with the bitumen binder. The temperature of the binder at the time of mixing shall be in the range of 150°C provided that the difference in temperature between the binder and the aggregate at no time exceeds 25°C. Mixing shall be done in Asphalt HOT MIX PLANT. Mixing shall be through to **ensure that a** homogenous mixture is obtained in which all particles of the aggregate are coated uniformly.

The mixture shall be transported from the HOT MIX PLANT to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered in transit if so directed by the Engineer-in-Charge. The mix shall be spread by self-propelled mechanical paver and / or otherwise laid to thickness as required so that when the finished work compacted is true to lines, grade and cross section and to the specified compacted thickness, The laying shall be done as quickly as possible after the mix prepared at the mixer machine. The temperature of the mix at the time of laying shall be in the range of 110° to 135° centigrade and be in the direction of the Engineer-in-Charge.

Immediately after spreading of mix while mix remains hot shall be done by 8 to 10 ton power rollers or other suitable equipment as may be approved by the Engineer-in-Charge. Rolling should start immediately after materials have been spread. Rolling shall be done with **care** to prevent any displacement or dislodgement of the spread material.

Rolling of the longitudinal joint (if any) shall be done immediately after the materials have been spread. After this, the rolling should commence at the edges and progress towards the centre longitudinal except that on super elevated pavements it shall progress from lower to the upper edge parallel to the centre line of the pavement.

The initial breakdown rolling shall be done as soon as possible -to roll the mixture without cracking the surface or having the mix pack up on the roller wheels and the closely as breakdown rolling as possible and to be done while the spread materials are still at a temperature. That will be done at maximum density. The final rolling shall be done while the materials are still workable enough for removal of roller marks.

When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding fresh materials. The rolling shall then be continued till, the entire surface has been rolled compacted there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. The roller wheels may be kept damp (but not dipping wet) to avoid the bituminous materials from sticking to the wheels and being picked up. In no case shall any oil, fuel or lubricating oil be used for this purpose.

Rolling operations shall be completed in any respect before the temperature of the mix falls below 80° centigrade and when the deflection of the rolled surface is almost nil or negligible.

Roller shall not stand on newly laid material while there is a risk that it will be deformed thereby. The edge along and transferred of the bituminous macadam laid and compacted with a thin surface coat of appropriate binder before the new mix is placed against it.

The procedure for the construction of the bituminous macadam not covered hereinabove shall be followed in accordance with "I.R.C." Specifications for such works.

13.3 Method of measurement and basis of payment

The work of bituminous macadam shall be measured in terms of volume of compacted work and finished as per specification. The measurement shall be on the basis of pre-work and post work sections as suitable intervals and volume computed on the basis of average areas.

The rate shall be provided for in the relevant items in the probable schedule of pay items. The rate is inclusive of the cost of all materials including that of crushed stone and of bitumen obtained from the department and the labour etc. all complete.

14. Bituminous Dense Carpet

General

Bituminous dense carpet (compacted to specified thickness; shall from the wearing course of the carriageway pavement. This is to be laid over the bituminous macadam base course prior to laying of the dense carpet if so directed by the Engineer-in-Charge, a bituminous tack coat may have to be provided over such are *or* areas of the Engineer-in-Charge may indicated. The dense carpet will be laid immediately thereafter. Tack coat thus provided will constitute a separate items of work and paid for as per provisions in clause hereinbefore.

When the dense carpet has to be laid on the bituminous macadam without application of any tack coat thereon the surface of the bituminous macadam must be properly cleaned of all dirt dust or any foreign matters. In some stretches the bituminous dense carpet shall have to be laid over. {The bituminous corrective course which will be paid separately as per probable schedule 'of any items.

14.1 Materials

Materials required for the work of bituminous dense carpet will consists of course aggregate, fine aggregate, filler materials and bitumen. The proportion of different materials will be as *per* direction approval of the Engineer-in-Charge on the basis of the tests as may be carried out as per direction of the Engineer-in-Charge.

The materials as received at Site shall be screened / or washed as may be directed by the Engineer-in-Charge and to his satisfaction. The two sizes of course aggregates are to be made together in proportion as per design mix as directed and approved by the Engineer-in-Charge.

Fine aggregate will have to be procured by-the contractor himself. This may comprise of crusher fun stone screenings (briefly referred to as crusher screenings) or of course sand or a combination of the two in such proportion as may be suitable to suit grading of the design mix.

In addition to the fine aggregate the work of dense carpet will require a filler which also would have to be procured by the' contractor himself. This filler will comprise of lime stone dust the while of which passes through 600 micron sieve at least 90% passing through 150 micron sieve and not less than 75% passing 75 micron sieve. The quantity of lime stone dust, as filler will be about 5% by weight of the total mix.

Bitumen used for the work will be straight run bitumen of 60/70 & 80/10 penetration as may be directed by the Engineer-in-Charge. Bitumen required for this purpose will be available from the department and will where from the materials are to be carried to site of works at contractor's own cost.

Bitumen requirement for the dense carpet would be between 5.5% to 6.5% by the total mix.

14.2 Constructional Operations

Bituminous dense carpet shall not be laid during rainy weather or when the surface on which is to be laid is damp or wet.

If the work is done with Asphalt mixer machines the filler (of lime stone dust) shall be initially mixed with bitumen in correct proportions. The bitumen (or bitumen mortar formed as above) shall be heated to the requisite temperature of 150° to 170° centigrade. All aggregate (coarse & fine) must also be preheated to a temperature of 155° to 163° C. The temperature of the bitumen and of the aggregate must however be such that at no time the difference in temperature between the two exceeds 14° C. Mixing of the aggregate and of the bitumen shall be done in suitable equipment - either in Asphalt Mixer Machine *or* in Hot Mix Plant as may be directed by the Engineer-in-Charge. The mixture shall be thorough to ensure that a homogenous mixture is obtained in which all particles of the aggregate are coated uniformly.

The mixed material shall be transported from the mixing plant to the point of use in, durable vehicles, The vehicles employed for transport shall be clean and covered in transit.

The mix transported from the mixing plant to the site of work shall be spread when it is still hot. This shall be done by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix true to specified grade, lines and cross sections. The temperature of the, mix at the time of laying shall be in the range 121° to 163° C as directed by the Engineer-in-Charge.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road Longitudinal macadam course below. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

After the spreading of mix by paver or otherwise as per approval of the Engineer-in-Charge, it shall be thoroughly compacted by rolling with a set or road roller moving at a speed not exceeding 8 km per hr. The initial or break down rolling shall be with 8 to 12 ton three wheel roller and the surface finished by final rolling with 8 to 10 tender rollers. The wheels but in no case shall fuel / lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edges and progress towards the centre except that on super elevated portions it shall progress from the lower to the upper edge parallel to the centre line of the pavement. The roller shall proceed on the fresh materials with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the proceeding pass. Rolling shall be continued till the density achieved is at least 95% of that of the laboratory Marshall specimen and all roller marks are eliminated. Intention or rolling of the dense carpet works is to attain density of 95% of the laboratory Marshall specimen normally but in some exceptional extreme or accidental cases density of and / or upto 90% of the Marshall specimen (laboratory) will be allowed but in that case the payment will be allowed but in that case the payment will be made at a reduced rate. A sum of 3/- per sq.m. will be deducted in case of density falls below 95% of laboratory Marshall specimen and up to 90%. The quantum i.e. area of deduction however be assessed from the field report of the authorised representative of the Engineer-in-Charge. If however the density falls below 90% of the laboratory Marshall specimen the affected area as where the Engineer-in-Charge whose deduction in this matter is final and binding will have to be removed & reconstructed as per direction of the Engineer-in-Charge. No extra payment for such reconstruction will be made.

Rolling operations shall be completed in every respect before the temperature of the mix falls below 100° C. Towards the latter part of rolling the surface shall be blind by spreading preheated sand (medium) at the rate of 0.02 to 0.03 cum per 10 sq.m of the

surface. Traffic may be allowed on the surface after completion of the final rolling and when the mix has cooled down to the surrounding temperature. The procedure for the construction of dense carpet works including rolling not covered herein above shall be followed in accordance with the Indian Roads Congress specification for such works.

14.3 Surface Finish

All works shall be very carefully carried out to ensure quality conforming to correct lines, grade, cross section and dimensions. The surface finish must be very even to ensure good riding quality. The maximum tolerance for surface evenness when measured with a 3 m long straight edge at the middle of each traffic lane along a line parallel to the centre line of the road shall not be more than 6 mm. Moreover the maximum numbers of such undulations permitted in any 300 m length shall not exceed 10.

As regards cross profiles, the maximum permissible variation from the specified profile shall not exceed 4 mm. If the surface as finished does not satisfy the above criteria necessary correction shall be carried out by the contractor at his own cost and as per direction of the Engineer-in-Charge to his satisfaction.

14.4 Method of measurement & Basis of payment

Works of bituminous dense carpet will be measured in terms of areas of finished works and the areas will be computed by method of multiplication of length into width of the dense carpeted surface. The rate is inclusive of the cost of all material (whether obtained from the departmental or supplied by the contractor himself) and all ancillaries required for the finished work including cost of labours etc. all complete.

Payment at full rate will be made where density of the finished works achieved is at least 95% of that of the laboratory Marshal Specimen. In case the density falls below 95% and achieved upto 90% payment will be made at reduced rate of Rs. 3/- (Rupees three) only sq.m. of the finished works will be deducted in such cases.

15. Specification and condition of Turning

15.1 Turffinq

Arrangements for sods (Durba) for turffinq should be made by the contractor at his own cost, the sods are to be closely placed as directed by the Engineer-in-Charge or his representatives, and thoroughly rammed and watered. The water should be continued till the grass grows in its natural colours. The sods be fixed * two feet inside from the outer edge of the flanks on both sides and slope. Portion of the road. The sods should be connected with each other pegged down with small pegs at intervals about 1'-0" long and 4' -0" ft. apart at contractor cost (both horizontal and vertical) in order to prevent from displacement by heavy shower or any other reasons.

All rain outs in slopes and flanks or depressions if any are to be filled up and repaired with earth before the grass sods are fixed and properly dressed and levelled for which not extra payment will be made for the earth and levelling, dressing etc. The sods are to be fixed in proper slopes as per direction of the Engineer-in-Charge and true to line both at the edge and at the tow. No sods will be collected from the terms of the road. Payment will be made in terms of area of finished works.

In case any specification and mode of measurement is not specified in the tender documents. The I.R.C. specifications and mode of measurements mentioned in General conditions and specification of Deptl. Schedule will held good.

15.2 In items involving supply of materials the supply is to be completed in or stretch / stretches as per direction of the Engineer-in-Charge and measurement after which the measured quantities be spread and consumed in the works as per relevant specification of the works.

16. **Site clearance**

On completion of work all temporary structures or ructions if any must be removed. All scars of construction shall be obliterated and the whole site left in a clean work man like manner to. the satisfaction of the Engineer-in-Charge. No separate payment shall be made for all these the cost there of being deemed to have been included in the rte of various items of works in the specific priced schedule of items.

17.0 **Semi dense Carpet**

Description

This work shall consist of construction^ single course of 20/25 mm. thick semi-dense carpet as wearing course on a previously prepared base to the requirements of these specification.

Materials

Binder

The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS : 73. The actual grade of the binder to be used shall be directed by the Engineer-in-Charge.

Coarse aggregates

The coarse aggregates shall consist of crushed stone, crushed gravel (single) or other stones. These shall be clean strong, durable of fairly cubical shape free of disintegrated pieces organic or other deleterious matter adherent coating. The aggregates shall preferably to hydrophobic and of low and shall satisfy the physical requirements.

Fine Aggregates

The fine aggregates shall consist of crusher run screenings natural sand or mixture of both, These shall be clean hard, durable uncoated dry & free from injurious, soft or flaky pieces ande organic or deleterious substances.

Filler

The filler where required shall be an inert material, the whole of which passes 600 micron sieve at least 90% passing 150 micron sieve and not less than 70% passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash or other no-plastic mineral matter approved by the Engineer-in-Charge.

Aggregate gradation

The mineral aggregates including mineral filler shall be so graded or combined as to conform to the grading.

The quantities of aggregates shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-Charge before starting the work.

Variation in proportioning of "materials

The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job-mix formula and producing a uniform mix. A variation in binder content of = 0.3% by weight of total mix shall however be permissible in individual specimens for quality control tests.

17.1 **Construction Operations**

Weather and seasonal limitations

Semi-dense carpet shall not be laid during rainy weather or where the base course is damp of wet.

Preparation of Base

The base on which semi-dense carpet is to be laid shall be prepared, shaped and conditioned to the specified lines grade and cross sections in accordance with as directed by the Engineer-in-Charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

Tack Coat

A tack coat complying with shall be applied over the base. Application of tack coat shall however not be necessary when the laying of carpet follows seen after the provision of a bituminous / levelling course.

17.2 **Preparation of the Mix**

Hot mix plant of adequate capacity and capable of producing- a proper and uniform quality shall be used for preparing the mix. The plant may be either a batch type or a continuous one, having a co-ordinated set of essential units such a dryer for heated the aggregates device for batching / feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder and aggregates.

The temperature of binder at the time of mixing shall be in the range 150° - 177 C and of aggregates in the range of 155° - 163° C provided also that at no time shall the difference temperature between the aggregates and the binder exceed 14° C.

Mixing shall be transported from the mixing plant to one point of use in suitable vehicle. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer-in-Charge,

17.3 **Spreading**

The mix transported from the hot mix plant to the site shall be spread by means of a self-propelled mechanical paver with suitable screeds capable of spreading, temping and finishing the mix, true to specified grade, lines and cross sections, The temperature of mix at the time of laying be in the range 121°- 163° C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of road. Longitudinal joints shall be off set by at least 150 mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix. and the surface painted with hot bitumen before placing fresh material.

17.4 **Rolling**

Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 K.M. per hr. The initial or break-down rolling shall be with 8-12 tonne three wheel rollers and the surface finished by final rolling with 8-10 tonne tandem rollers or suitable pneumatic rollers.

The rollers wheels shall be kept damp to prevent the mix from adhering to them in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that no superheated portions, it shall progress from the lower to upper edge parallel to the centre line of the pavement. The Roller should proceed on the fresh material with near or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the tack made in the proceeding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

17.5 **Measurement for payment**

Semi-dense carpet shall be measured as finished work in square metre.

18 **Asphaltic concrete Description**

- 18.1 This work shall consist of constructing a single layer of 25 to 50 mm thick asphalt concrete wearing course to the following specifications on a previously prepared base.

Materials

Binder

The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS : 73. The actual grade of the binder to be used shall be decided by the Engineer-in-Charge,

Coarse Aggregates

The coarse aggregates shall consist of crushed gravel (single) or other stones. These shall be clean, strong, durable of fairly cubical shape, free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set.

Fine Aggregates

The fine aggregates shall be the fraction passing 2.36 mm. sieve and retained on 75 mm iron sieve, consisting of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from any injurious, soft or flaky pieces and organic or deleterious substances.

Filler

The filler shall be inert material, the wheel of which passes 600 micron sieve at least 90% passing 150 micron sieve and not less than 70% passing 75 micron sieve. The filler shall be stone dust, cement hydrated lime, fly ash or other no-plastic mineral matter approved by the Engineer-in-Charge,

19 **Open graded premix carpet**

i) **Description**

This work shall consist of laying and compacting an open graded carpet of 2 cm thickness in a single course composed of suitable small sized aggregates premixed with a bituminous binder on a previously prepared base, in accordance with the requirements of these specification to serve as a wearing course.

ii) **Materials**

Binder

The binder shall be bitumen of a suitable grade appropriate to the region, traffic, rainfall and other environmental condition as directed by the EIC, and satisfying the requirements of IS : 73,217,454 or other approved cutback as applicable.

Aggregates

The aggregates shall consist of crushed stone, crushed gravel / shingle or other stones. This shall be clean, durable, fairly cubical in shape and free from disintegrated piece organic or other deleterious matters and adherent coatings.

They shall preferably be hydrophobic and of low porosity.

Proportioning of materials

The materials shall be proportioned as per quantities given in the following table

Quantities of Materials required for 10 sq.m. of Road surface for 2 cm thick open graded premix carpet

Aggregates for carpet

- a) Stone chippings 13.2 mm size stone passing 22.4 mm sieve and retained on 11.2 mm sieve 0.18
M3

b)	Stone chippings 11.2 mm size passing 13.2 mm sieve and retained on 5.6 mm sieve	0.09 M ³
		Total	0.27 M ³

Binder for premixing (quantities in terms of straight run bitumen)

a)	For 6.18 M ³ of 13.2 mm size stone chippings at 52 Kg per M ³	...	9.5 Kg
b)	For 0.09 M ³ of 11.2 mm size stone chippings at 56 Kg per M ³	...	5.1 Kg
		Total	14.6 Kg

Preparation of base

The underlying base on which the bituminous carpet is to be laid shall be prepared shaped and conditioned to the specified lines, grade and cross section in accordance with the specifications as directed by the EIC. The surface shall be well cleared by removing caked earth and other foreign matter with wire brushes, sweeping with brooms and finally dusting with sacks, as necessary.

Tack coat

A tack coat shall be applied over the base preparatory to laying of the carpet. Application of tack coat shall, however, not be necessary when the laying of carpet follows soon after the provision of a bituminous base / levelling course, without opening to traffic.

Preparation of premix

Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder.

The binder shall be heated to the temperature appropriate to grade of bitumen approved by the EIC in boilers of suitable design avoiding local over-heating and ensuring a continuous supply.

The aggregates shall be dry and suitably heated to a temperature as directed by the EIC before these are placed in the mixer. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregate at the rate specified.

The mixing of binder with chippings shall be continued until the chippings are 'thoroughly coated with binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel barrows. The vehicles employed for transport shall be clean and the mix being transported covered in transit if so directed by the EIC,

The temperature of binder at the time of mixing shall be in the range of 150°C to 163°C and that of aggregate in the range of 155°C to 163°C. The discharge temperature of mix shall be between 130°C and 160°C.

Spreading and –oiling

The premixed material shall be spread on the road surface with rakes to the milted thickness and camber or distributed evenly with the help of a drags spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened cut. As soon as sufficient length of bituminous material has been laid, rolling shall commence with 80-100 KN power roller, preferably of smooth wheel tandem' type or other approved plant. Rolling shall begin at the edges and progress towards the centre longitudinally, except that on the super elevated portions it shall progress from the lower to upper edge parallel to the centre line of the pavement

When the roller has passed over the whole area once, any high spots or depressions, which become apparent shall be corrected by removing or adding premixed materials. Rolling shall then be continued until the entire surface has been rolled to compaction and the roller marks eliminated. In each pass of the roller, proceeding track shall be overlapped uniformly by at least 1/3rd width. The roller wheels, shall be kept damp to

prevent the premix from adhering to the wheels and being picked up. In no case shall fuel / lubricating oil be used for this purpose. Excess use of water for this purpose shall be avoided.

Rollers shall not stand on newly laid material while there is a risk that it will be deformed thereby.

The edges along and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

Seal coat

A seal coat shall be applied to the surface immediately after laying the carpet. No traffic shall be allowed on the road till the seal coat has been placed.

Measurement for payment

Open graded premix carpet shall be measured as finished work in square metres.

20. Repairing pot holes and making up small depression with ramming or power rolling including screening, cleaning chips or metals and washing, drying as necessary heating the chips or metal where necessary cutting pot holes to rectangular shape, deepening, the edges inclined towards the back, cleaning surface, heating matrix and supplying tack coat (including edges) 3 kg. or 4 kg. of matrix /10 m² of road surface according as the road surface is in old bituminous stage or WBM stage respectively and finishing the top of repaired surface levelled with adjoining area including the cost and carriage of stone materials and matrix including the cost of tack coat.

21 **Granular Sub Base**

21.1 **Description**

This work' shall consist of spreading and consolidating cleaned crushed graded stone aggregate and granular materials premixed in accordance with specification. The material shall be laid in two layers as necessary to lines, grades and cross section as directed by the Engineer-in-Charge.

21.2 **Material**

Coarse Aggregate

The coarse aggregate shall consist of crushed stone. These shall be clean strong, durable of fairly cubical shape and free from organic or other deleterious constituents.

21.3 **Fine aggregates**

The fine aggregates shall consist of crusher run screenings, natural sand or mixture of both. These shall be clean hard, durable uncoated dry & free from injurious soft or flaky pieces and organic, deleterious substances.

Proportion of materials

The materials shall be proportioned as per quantities given in below.

Quantities of materials required for 1 cu.m.

Aggregates for G.S.B.

Close graded G.S.B. Grading - I

37.5 mm size	0.3450 m ³
22.4 mm size	0.2940 m ³
11.2 mm size	0.1280 m ³
5.6 mm size	0.1280 m ³
sand	<u>0.3830 m³</u>
	1.2780 m ³

21.4 **Measurement of payment**

The granular sub base shall be measured as the volume instructed and compacted and measured in cubic meters. sub-base satisfies the requirement of CBR and other physical requirements when compacted and finished. When directed by the Engineer-in-Charge, this shall be verified by performing CBR test in the laboratory as required on specimens re-moulded at field density, and moisture content and any other tests for the quality of materials, as may be necessary.

21.5 Preparation of Base

Immediately prior to the laying of sub base, the base shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with 8-10 Tonne roller.

21.6 Spreading and Compaction

The sub base material of specified grading shall be spread on the prepared sub-grade with the help of drag spreader, motor grader, manual mixing shall not allow at site. The equipment used for mix-in-place construction shall be a motivator or similar approved equipment cable of mixing the material to the desired degree.

22. Wet Mix Macadam Base Course

22.1 Description

This work shall consist of spreading and compacting cleaned crushed graded stone aggregate and granular materials premixed with water to a dense mass on a prepared sub base in accordance with specification. The material shall be laid in two layers as necessary to lines, grades and cross section as directed by the Engineer-in-Charge. the thickness of a single compacted wet mix layer shall not be less than 100 mm when vibrating or other approved types of compacted equipment are used. The compacted depth of double layer of WMM will be 200 mm thick

22.2 Material

Coarse Aggregate

The coarse aggregate shall consist of crushed stone. These shall be clean strong, durable of fairly cubical shape and free from organic or other deleterious constituents.

Fine aggregates

The fine aggregates shall consists of crusher run screening . These shall be clean hard, durable uncoated dry and free from injurious soft or flaggy pieces and deorganic deleterious substance.

22.3 Proportion of materials

The materials shall be proportioned as per quantities given in below, Quantities of materials required for 1 cu.m.

37.5mm size	0.3960 m ³
13.2mm size	0.2640 m ³
5.6 mm size	0.3560 m ³
stone dust	0.3040 m ³
	<hr/>
	1.3200 m ³

22.4 Measurement of payment

The Wet Mix Macadam shall be measured as the volume instructed after necessary compaction and must be measured in cubic meters.

22.5 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 span type mixer of concrete batching plant.

Optimum moisture for mixing shall be determined in accordance with IS : 2720 (Part VIII). However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

22.6 Spreading of Mix

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub base in required quantities. In no case should these be dumped in heaps directly on the area where these to be laid nor shall their hauling over a partly completed stretch be permitted. The mix may be spread either by power finisher or motor grader.

22.7 Spreading and Compaction

After the mix has been laid to the required thickness, grade and cross - fall / camber the same shall be uniformly to the full depth with suitable roller. For a compacted layer upto 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight 8-10 Mt or equivalent capacity. The speed of the roller shall not exceed 5 km / hr. The rolling shall be done as per standard procedure. After compaction the road shall be allowed to dry for 24 hours.

23. Mix Seal Surfacing

23.1 Description

This work shall consist of laying and compacting close-graded premix surfacing in a single layer of 20mm, composed of suitable aggregates premixed with a bituminous binder on a previously prepared surface in accordance with the requirements of these specifications to serve as a wearing course. Mix seal' surfacing shall be of Type A as specified.

23.2 Materials

Coarse Aggregate

The aggregates shall consist of crushed stone or other stones retained on 2.36 mm sieve. They shall be clean, strong, durable of fairly cubical shape and free of disintegrated piece, organic or other deleterious matter, and adherent coating. The aggregates shall preferably be hydrophobic and of low porosity.

Fine aggregates

This will consist of quarry sand, natural sand or mixture of both. These shall be clean hard, durable uncoated dry & free from injurious soft or flaky pieces and organic or deleterious substances.

Binder

The Binder shall be bitumen of a suitable grade appropriate to the region, traffic, rainfall and other environmental condition as directed by the Engineer-in-Charge, and satisfying the requirements IS : 73

23.3 Proportioning of materials

The materials shall be proportioned as per quantities given in below.
Quantities of materials required for 1 sq.m. (Type-A)

$$\begin{array}{r}
 5.6 \text{ mm size } 0.0200 \text{ m}^3 \\
 \text{Stone dust } \underline{0.0070 \text{ m}^3} \\
 - \qquad \qquad \qquad 0.0270 \text{ m}^3
 \end{array}$$

Measurement of payment

Mix seal surfacing, Type A shall be measured as finished work in square meters at a specified thickness. or mix.

Material:

The choice of a bituminous primer shall depend upon the porosity characteristics of the surface to be primed as classified in IRC: 16. These are:

- a) Surface of porosity : Such as wet mix macadam and water bound macadam.
- b) Surface of medium porosity : Such as cement stabilized soil base.
- c) Surface of high porosity : Such as a gravel base.

Quantity of Bituminous primer:

Low porosity: 6 to 9 kg per 10 sq.m.

Medium porosity: 9 to 12 kg per 10 sq.m.

High porosity: 12 to 15 kg per sq.m.

Weather and Seasonal Limitations:

The bituminous primer shall not be applied on a wet surface or during dust storm or when the weather is foggy, rainy or windy. The primer coat for surface treatment should not be applied when the temperature in the shade is less than 10°C. Surface which are to receive emulsion primer should be damp, but no free or standing water shall be present.

Construction operation Equipment:

The primer distributor shall be pneumatic typed self- propelled pressure distributor equipped for spraying the material uniformly at the specified rates and temperatures. Spraying by manual methods may be supplemented by hand as directed by the Engineer-in-Charge.

(B.) Preparation of road surface.

The surface to be primed shall be swept clean, free from dust and shall be dry. It shall be shaped to the specified grades and section. It shall also be free from ruts, any other irregularities and segregated materials. Minor depression and potholes may be ignored until the surface is primed, after which they shall be patched with a suitable premix material prior to the surface treatment

(C.) Application of bituminous primer:

The viscosity and rate of application of the primer shall be as specified in the contract, or as determined by site trials carried out as directed by the Engineer-in-Charge. The Bituminous primer shall be sprayed / distributed uniformly over the surface. The method of application of the primer will depend upon the type of equipment to be used, size of nozzles, pressure at a spray bar and speed of forward movement. The Contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerances specified.

(D.) Curing the priming and opening to traffic:

It shall always be ensured that while opening to any kind of traffic, the primed surface is fully cured and is not sticky to avoid being picked up by traffic. Normally, the primed surface shall be allowed to cure for not less than 24 hours and during this period no traffic of any kind shall be permitted. A very thin layer of sand may be

applied to the surface of the primer, to prevent the primer from being picked up by the wheels of the paver and the trucks delivering the bituminous materials to the paver.

Measurement for payment

Primer Coat Shall be measured in terms of surface area of application in sq

24 TACK COAT

24.1 Description.

"This work shall consist of application of a single coat of low viscosity liquid bituminous material to an existing road surface preparatory to another bituminous construction over it when specified in the contract or instructed by the Engineer-in-Charge.

24.2. Construction operation:

(A) Equipment:

The tack coat distributor shall be a self- propelled or towed bitumen pressure sprayer, equipped for spraying the material uniformly at a specified rate. Hand spraying of small areas, inaccessible to the distributor, or in narrow strips, shall be sprayed with a pressure hand sprayer, or as directed by the Engineer-in-Charge.

(B) Preparation of base:

The surface on which the tack coat is to be applied shall be clean and free from dust, dirt, and any extraneous material, and be otherwise prepared. The surface on which the tack coat is to be applied shall be clean and free from dust, dirt and any other extraneous material

(C) Application of tack coat.

The application of tack coat shall be at rate as specified in the contract, and shall be applied uniformly. The normal range of spraying temperature for a bituminous emulsion shall be 20°C - 70°C. For cutback bitumen of grade RC-70 / MC-70, the temperature range shall be 50°C - 80°C. The method of application of the tack coat will depend on the type of equipment to be used, size of nozzles, pressure at the spray-bar, and speed of forward movement. The contractor shall demonstrate at a spraying trial, that the equipment and method to be used is capable of producing a uniform spray, within the tolerance specified.

(D) Curing of Tack Coat.

The tack coat shall be left to cure until all the volatiles have evaporated before any subsequent construction is started. No Plant or vehicles shall be allowed on the tack coat other than those essential for the construction.

24.3 Measurement for payment:

Tack coat shall be measured in terms of surface area of application in sq.m.

25. DRAINAGE SYSTEM WITH PIPE CULVERTS:

25.1 Description:

This work shall consist of furnishing and installing reinforced cement concrete pipes/Stone ware pipes, of the type, diameter and length required at the location shown on the drawings or as ordered by the Engineer-in- Charge and in accordance with the requirements of these Specifications.

25.2. Materials:

Each consignment of cement concrete pipes shall be inspected, tested, if necessary, & approved by the Engineer-in-Charge either at the place of manufacture or at the site before their incorporation

25.3 Excavation for pipe:

The foundation bed for pipe culverts shall be excavated true to the lines and grades shown on the drawings or as directed by the Engineer-In-Charge. The pipe shall be placed in shallow excavation of the natural ground or in open trench cut in existing embankments, taken down to levels as shown on the drawings.

where trenching is involved, its width on either side of the pipe shall be a minimum of 150 mm or one-fourth of the diameter of the pipe whichever is more and shall not be more than one-third the diameter of the pipe. The sides of the trench shall be as nearly vertical as possible. Trenches shall be kept free from water until the pipes are installed and joints have hardened.

25.4 Bedding for Pipes:

Pipes shall be laid on the concrete *bedding before the concrete has set.*

25.5 Laying of pipes:

No pipe shall be laid in position until the foundation has been approved by the Executive Engineer-in-charge. Where two or more pipes are to be laid adjacent to each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to a minimum of 450mm.

The arrangement for lifting, loading and unloading concrete / S.W. pipes from factory / yard and at site shall be such that the pipes do not suffer any, undue structural stain, any damage due to fall or impact. The arrangement may be got approved by the Engineer-in-charge.

Similarly, the arrangement for lowering the pipe in the bed shall be got approved by the Engineer-in-charge. It may be with tripod-pulley arrangement or simply by manual labour in a manner that the pipe is placed in the proper position without damage.

The laying of pipes on the prepared foundation shall start from the outlet and proceed towards the inlet and be completed to the specified lines and grades. In case of use of pipes with bell-mouth, the belled end shall face upstream. The pipes shall be fitted and matched so that when laid in work, they form a culvert with a smooth uniform invert. Any pipe found defective or damaged during laying shall be removed at the cost of the contractor.

Any pipe found defective or damaged during laying shall be removed at the cost of the contractor.

The pipe shall be jointed either by collar joint or by flush joint. In the former case, the collars shall be RCC 150 to 200mm wide and having the same strength as the pipes to be joined, caulking space shall be between 13 and 20mm according to the diameter of the pipe, caulking material shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with caulking irons. Before caulking, the collar shall be so placed that its centre coincides with the joint and an even annular space is left between the collar and the pipe.

Flush joint may be internal flush joint, In either case, the ends of the pipes shall be specially shaped to form a self cantering joint with a jointing space 13mm wide. The jointing space shall be filled with cement mortar, 1 cement to 2 sand, mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids and excess mortar shall be removed.

All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing, the joint shall be kept covered and damp for at least four days.

For joining pipe lines under light hydraulic pressure, the recess at the end of the pipe shall be filled with jute braiding dipped in hot bitumen of other suitable approved compound. Pipes shall be so joined that the bitumen ring of one pipe shall set into the recess of the next pipe. The ring shall be thoroughly compressed by jacking or by any other suitable method.

Backfilling.

Trenches shall be backfilled immediately after the pipes have been laid and the joining material has hardened. The back fill soil shall be clean, free from boulders, large roots, and lumps and shall be approved by the E.I.C. Filling of the trench shall be carried out simultaneously on both sides of the pipe in such manner that unequal pressure do not occur.

Measurement of Payment

R.C.C. Pipe culverts shall be measured along their centre between the inlet and outlet ends in linear metre. Selected granular material and cement concrete for pipe bedding shall be measured as laid in cubic metre. Ancillary works like headwalls, wing wall, aprons etc. shall be measured as provided for under the respective Clauses.

26.0 SPECIAL SPECIFICATION FOR CONCRETE WORKS CONTROLLED CONCRETE

26.1 Design mix Concrete

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

26.2 Design of the concrete mix

- a) It shall be done as per provisions contains in I.S. 456-2000, S.P. 24-1983, I.S.10262 & S.P. 23, (all latest editions). At least 3 mixes should be tried and the most acceptable one shall be selected. The proposal shall be submitted by the contractor and to be approved by the Engineer-in-Charge. The job mix formula will be changed for every change of consignment / source of materials. This job mix formula shall be available at site.

c) Batching

In proportioning concrete the quantity of both cement & aggregate should be preferably determined by mass. Batching plant where used shall conform for IS-4925-1968. Where proportion is done by volume batching with the approval of the Engineer-in-Charge, periodic checks shall be made for mass / volume relationship of the material. If fine aggregate is moist and volume batching is adopted, allowance shall be made for bulking in accordance with IS : 2386 (Part - III)-1963

26.3 Transport, placing, compacting casting

These shall be done as per provisions contained in IS-456-2000 (latest edition) Sampling & Strength of concrete

Preliminary test cubes - 6 nos of test cubes shall be prepared for every mix (at least 3 mixes) - cubes shall be tested for 7 days strength, 3 cubes for 28 days' strength.

b) Works test cubes : 6 works test cubes shall be made, shall be tested for 7 days strength, 2 for 28 days' strength and the balance 2 nos to be tested at Alipore test house if any discrepancy occurs as to the strength.

c) Frequency of sampling, Test Strength of samples, standard duration.

These shall be as per provisions contained in IS-456-1978 (latest edition) and S.P. 24-1983 (latest edition)

26.4 **Acceptance criteria**

These shall be as per provisions contained in IS-457-1978 and S.P. 23-1983. 5
Inspection and testing structures

Inspection

Immediately after stripping the frame work, all concrete shall be carefully inspected and any defective work or shall defects either removed or made good before concrete has thoroughly hardened.

In case of doubt regarding the grade of concrete used, either due to poor workmanship or based on results of cube strength tests compressive strength tests of concrete on the basis of 6.3 and / or load test (see 3.5) may be carried out.

26.5 **Core Test**

26.5.1 The points from which cross are to be taken and the number of cores required shall be at the discretion of the Engineer-in-Charge and shall be representative of the whole of concrete concerned.

26.5.2 In no cases, however, shall fewer than three cores be tested.

26.5.3 Concrete in the member represented by a core test shall be considered acceptable if the average equivalent cube strength of the cores is equal to at least 85% of the cube strength of the grade of concrete specified for the corresponding age and no individual core has a strength less than 75%.

26.5.4 In case the core test results do not satisfy the requirements of 6.3.3 or where such have not been done, load test (see 6.5) may be resorted to. Load tests on parts of structures.

26.5.5 Load tests should be carried out as soon as possible after expiry of 28 days from the time of placing of concrete.

26.5.6 The structure should be subjected to a load equal to full dead load of the structure plus 1.25 times the imposed load for a period of 24 hrs. and then the imposed load shall be removed. Dead load includes self weight of structural members plus weight of finishes and walls or partitions, if any, as considered in the design.

26.5.7 The deflection due to imposed load only shall be recovered. If within 24 hrs. of removal of the imposed load, the structure does not recover at least 75% of the deflection under super-imposed load, the test may be repeated after a lapse of 12 hrs. If the recovery is less than 60%, the structure shall be deemed to be unacceptable. If the maximum deflection in mm, shown during 24 hrs. under load is less than $40\% D$, where D is the effective span in m and D , the overall depth of the section in mm, it is not necessary for the recovery to be measured and the recovery provisions of 6.5.3 will not apply.

Other non-destructive test methods may be adopted, in which case the acceptance criteria shall be agreed upon between the Engineer-in-Charge and the contractor and tests be done under guidance. Submission of design calculations & preparation of drawings For some important buildings the contractors might have to submit design calculation & drawings for ordinary slabs, columns, beams foundations etc. When asked by the Engineer-in-Charge. Such design calculations & drawings shall be prepared by competent Engineers & to be approved by the Engineer-in-Charge. If required modifications as suggested by the Engineer-in-Charge shall be incorporated in the calculations & drawings. No additional payment shall be made for such design & drawings.

Laying stabilisation coat (with painting of matrix and spreading dry medium sand over it) including thorough cleaning of the surface including uprooting weeds, grass or small plants, laying or requisite quantity of matrix (hot) spreading dry medium sand

uniformly in stages with total of 0.9 cum per 100 M² including cost and carriage of sand matrix heating matrix and returning empty drums to departmental godown and all other cost incidental of the work.

On water bound surface of stone metal consolidation with 18 Kg. of cost matrix per 10 M² of surface

Specification for Bitumen Mastic.

27.1 Scope

This work shall consist of constructing a single layer of mastic asphalt wearing course for road pavements and bridge decks.

Mastic asphalt is an intimate homogenous mixture of selected well-graded aggregates, filler and bitumen in such proportions as to yield a plastic and void less mass, which when applied hot can be trowelled and floated to form a very dense impermeable surfacing.

27.2 Materials

27.2.1 Binder

Subject to the approval of the Engineer, the binder shall be a paving/ Industrial grade bitumen meeting the requirements given in Table 500-39.

Table 59 : Requirements for Physical Properties of Binder (Table 500-39 of MORT&H)

Property	Test Method	Requirements
Penetration at 25°C	IS:1203	15 ±5*
Softening point, °C	IS:1205	65 ± 10
Loss on heating for 5h at 163°C, % by mass Max.	IS:1212	2.0
Solubility in trichloroethylene, % by mass Min.	IS:1216	95
Ash (mineral matter), % by mass Max.	IS:1217	1.0

□ In cold climatic regions (temperature less than 10°C), VG 40 grade bitumen may be used.

27.2.2 Coarse Aggregates

The coarse aggregates shall consist of crushed stone, crushed gravel/shingle or other stones. They shall be clean, hard, durable, of fairly cubical shape, uncoated and free from soft, organic or other deleterious substances. They shall satisfy the physical requirements given in Table 500-6.

The percentage and grading of the coarse aggregates to be incorporated in the mastic asphalt depending upon the thickness of the finished course should be as specified in Table 500-40.

Table 60 : Grade and Thickness of Mastic Asphalt Paving and Grading of Coarse Aggregates (Table 500-40 of MORT&H)

Application	Thickness Range (mm)	Nominal Size of Coarse Aggregate (mm)	Coarse Aggregate Content, % by Mass of Total Mix

Roads and bridge decks	25-50	13	40±10
Heavily stressed areas i.e. Junctions and toll plazas	40-50	13	45±10
Nominal size of coarse aggregate IS Sieve (mm)		13 mm Cumulative % passing by weight	
19		100	
13.2		88-96	
2.36		0-5	

Fine Aggregates: The fine aggregates shall be the fraction passing the 2.36 mm and retained on the 0.075 mm sieve consisting of crusher run screening, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry, and free from soft or flaky pieces and organic or other deleterious substances.

Filler : The filler shall be limestone powder passing the 0.075 mm sieve and shall have a calcium carbonate content of not less than 80 percent by weight when determined in accordance with IS:1514.

The grading of the fine aggregate inclusive of filler shall be as given in Table 500-41.

Table 61 : Grading of Fine Aggregate (Inclusive of Filler) (Table 500-41 of MORT&H)

IS Sieve	Percentage by weight of aggregate
Passing 2.36 mm but retained on 0.600 mm	0-25
Passing 0.600 mm but retained on 0.212 mm	10-30
Passing 0.212 mm but retained on 0.075 mm	10-30
Passing 0.075 mm	30-55

27.3 Mix Design

27.3.1 Hardness Number

The mastic asphalt shall have a hardness number at the time of manufacture of 50 to 70 at 25°C prior to the addition of coarse aggregate and 10 to 20 at 25°C at the time of laying after the addition of coarse aggregate.

The hardness number shall be determined in accordance with the method specified in ISM195-1978.

27.3.2 Binder Content

The binder content shall be so fixed as to achieve the requirements of the mix specified in Clause 516.3.1 and shall be in the range of 14 to 17 percent by weight of total mix as indicated in Table 500-42 of MoRT&H.

Table 62 : Composition of Mastic Asphalt Blocks without Coarse Aggregate (Table 500-42 of MORT&H)

IS Sieve	Percentage by Weight of Mastic Asphalt	
	Minimum	Maximum
Passing 2.36 mm but retained on 0.600 mm	0	22
Passing 0.600 mm but retained on 0.212 mm	4	30
Passing 0.212 mm but retained on 0.075 mm	8	18
Passing 0.075 mm	25	45
Bitumen Content % by mass	14	17

27.3.3 Job Mix Formula

The Contractor shall submit to the Engineer for approval at least one month before the start of the work the job mix formula proposed to be used by him for the work, indicating the source and location of all materials, proportions of all materials such as binder and aggregates, single definite percentage passing each sieve for the mixed aggregate and results of the tests recommended in the various Tables and Clauses of this Specification.

27.4 Construction Operations

27.4.1 Weather and Seasonal Limitations

The provisions of Clause 501.5.1 shall apply, except that laying shall not be carried out when the air temperature at the surface on which the Mastic Asphalt is to be laid is below 10°C.

27.4.2 Preparation of the Base

The base on which mastic asphalt is to be laid shall be prepared, shaped and conditioned to the profile required, in accordance with Clause 501 or 902 as appropriate or as directed by the Engineer. In the case of a cement concrete base, the surface shall be thoroughly power brushed clean and free of dust and other deleterious matter. Under no circumstances shall mastic asphalt be spread on a base containing a binder which might soften under high application temperatures. If such material exists, the same shall be cut out and repaired before the mastic asphalt is laid.

27.4.3 Tack Coat

A tack coat in accordance with Clause 503 shall be applied on the base or as directed by the Engineer.

27.4.4 Preparation of Mastic Asphalt

Preparation of mastic asphalt consists of two stages. The first stage shall be mixing of filler and fine aggregates and then heating the mixture to a temperature of 170°C to 210°C. Required quantity of bitumen shall be heated to 170°C to 180°C and added to the heated aggregated. They shall be mixed and cooked in an approved type of mechanically agitated mastic cooker for some time till the materials are thoroughly mixed. Initially the filler alone is to be heated in the cooker for an hour and then half the quantity of binder is added. After heating and mixing for some time, the fine aggregates and the balance of binder are to be added and further cooked for about one hour. The second stage is incorporation of coarse aggregates and cooking the mixtures for a total period of 3 hours. During cooking and mixing care shall be taken to ensure that the contents in the cooker are at no time heated to a temperature exceeding 210°C.

Where the material is not required for immediate use it shall be cast into blocks consisting of filler, fine aggregates and binder, but without the addition of coarse aggregate, weighing about 25 kg each. Before use, these blocks shall be reheated to a temperature of not less than 175°C and not more than 210°C, thoroughly incorporated with the requisite quantity of coarse aggregates and mixed continuously. Mixing shall be continued until laying operations are completed so as to maintain the coarse aggregates in suspension. At no stage during the process of mixing shall the temperature exceed 210°C,

The mastic asphalt blocks (without coarse aggregate) shall show on analysis a composition within the limits as given in Table 500-42 of MoRT&H.

The mix shall be transported to the laying site in a towed mixer transporter having arrangements for stirring and keeping the mix hot during transportation.

27.4.5 Spreading

The mastic asphalt shall be laid, normally in one coat, at a temperature between 175°C and 210°C and spread uniformly by hand using wooden floats or by machine on the prepared surface. The thickness of the mastic asphalt and the percentage of added coarse aggregate shall be in accordance with Table 500-40 or as specified by the Engineer. Where necessary, battens of the requisite dimensions should be employed. Any blow holes that appear in the surface shall be punctured while the material is hot, and the surface made good by further floating.

Laying surface over existing bridge deck : Before laying bitumen over existing bridge deck, the existing cross fall/camber, expansion joint members and water drainage spouts shall be carefully examined for their proper functioning in the bridge deck structure and any deficiency found shall be removed. Loose elements in the expansion joint shall be firmly secured. The existing wearing coat shall be removed, as per Clause 2809. The cracks in the concrete surface, if any, shall be repaired and filled up properly or replaced by new concrete of specified grade before laying the bitumen mastic over bridge deck.

Laying over new bridge deck : New concrete bridge deck which is not in camber/cross fall shall first be provided with required camber and cross fall by suitable concrete or bituminous treatment.

Treatment where mastic asphalt is laid over a concrete surface : In case of laying over concrete surface, following measures shall be taken :

- a) For proper bond with new concrete deck, surface shall be roughened by means of stiff broom or wire brush and it shall be free from ridges -and troughs.
- b) A thin bituminous tack coat (with bitumen of grade VG 30) shall be applied on the concrete deck before pouring mastic. The deck shall be dry. The quantity of bitumen for tack coat shall be as per Table 500-6 of MoRT&H.
- c) After applying tack coat, chicken-mesh reinforcement of 1.5 mm dia steel wire with hexagonal or rectangular openings of 20-25 mm shall be placed and held properly in position on the concrete surface before pouring mastic.

27.4.6 Joints

All construction joints shall be properly and truly made. These joints shall be made by warming existing mastic asphalt by the application of an excess quantity of the hot mastic asphalt mix which afterwards shall be trimmed to leave it flush with the surfaces on either side.

27.4.7 Surface Finish

The mastic asphalt surface can have poor skid resistance after floating, in order to provide resistance to skidding, the mastic asphalt after spreading, while still hot and in a plastic condition, shall be covered with a layer of stone aggregate. This aggregate shall be 13.2 mm size (passing the 19.0 mm sieve and retained on the 6.7 mm sieve) or 9.5 mm size (passing the 13.2 mm sieve and retained on the 6.7 mm sieve) subject to the approval of the Engineer. Hard stone chips, complying with the quality requirements of Table 500-16, shall be precoated with bitumen at the rate of 2 ± 0.4 percent of VG 30 grade. The addition of 2 percent of filler complying with Table 500-

9 may be required to enable this quantity of binder to be held without draining. The chips shall then be applied at the rate of 0.005 cu.m per 10 sq.m and rolled or otherwise pressed into the surface of the mastic layer when the temperature of the mastic asphalt is not less than 100°C.

27.5 Opening of Traffic

Traffic may be allowed after completion of the work when the mastic asphalt temperature of the completed layer has cooled to the daytime maximum ambient temperature.

28.0 CRACK PREVENTION COURSES (cl. 517 of MORT&H)

28.1 Scope

The work shall consist of providing one or two coats of an elastomeric rubber membrane known as Stress Absorbing

Membrane (SAM) over a cracked surface, followed by a covering of aggregate chips, and a Stress Absorbing Membrane Interlayer (SAMI), which is a material similar to SAM or which consists of a bitumen impregnated geotextile, as specified in the Contract.

28.2 Materials

28.2.1 Binder

Binder shall be a modified binder complying with the requirements of IS: 15462 and IRC: SP:53, according to the requirements of the Contract, except that viscosity grade VG 10 complying with the requirements of IS:73 shall be used in the case of a bitumen impregnated geotextile.

28.2.2 Aggregate

The requirements of Clause 510.2.2 apply except that the Polished Stone Value requirement does not apply in the case of SAMI. Where required by the contract, aggregates shall be pre-coated by mixing them with 0.75 to 1.0 percent of paving bitumen by weight of chips in a suitable mixer, the chips being heated to 160°C and the bitumen to its application temperature. The pre-coated chips shall be allowed to cure for at least one week or until they become non-sticky and can be spread easily.

28.2.3 Rates of Spread of Binder and Aggregate

The rate of spread of binder and aggregate shall be as given in Table 500-43, as required by the Contract.

28.2.4 Geo-textile

The geotextile as prescribed shall conform to the requirements of Clause 703.3 of MoRT&H.

28.3 Construction Operations

28.3.1 Weather and Seasonal Limitations

28.3.2 Preparation of Base

The base on which the SAM, SAMI or bitumen impregnated geotextile is to be laid shall be prepared, in accordance with Clause 501 and as directed by the Engineer. The surface shall be thoroughly cleaned either by using a mechanical brush or any other equipment/method approved by the Engineer. Dust removed in the process shall be blown off with compressed air.

28.3.3 Application of Binder

2.32.3.3.1 The equipment and general procedures shall all be in accordance with the Manual for Construction and

Supervision of Bituminous Works. The application temperature for modified binder shall be 160o-170°C. Binder for bitumen impregnated geotextile shall be applied according to Clause 703.4.4. The surface on which the binder is to be applied shall be dry.

Table 63 : Quantity of Materials Required for 10 sq.m of Road Surface for Stress Absorbing Membrane Table 500-43 of MORT&H)

S. No.	Type and Width of Crack	Specification of SAM to be Applied	Quantity of Binder Kg/10m2	Quantity of Chipping
1)	Hair cracks and map cracks upto 3 mm width	Single coat SAM or 2nd coat of two coat SAM	8-10	0.10 m3 of 5.6 mm chips
2)	Map cracks or alligator cracks 3 mm to 6 mm width	Single coat SAM	10-12	0.11m3 of 5.6 mm chips
3)	Map cracks or alligator cracks 6 mm to 9 mm width	Two coat SAM 1st coat 2nd coat	12 -14 8-10	0.12 m3 of 5.6 mm and 11.2 mm chips in 1:1 ratio 0.10 m3 of 5.6 mm chips
4)	Cracks above 9 mm width and cracked area above 50 percent	Two coat SAM 1st coat 2nd coat	14-16 8-10	0.12 m3 of 11.2 mm chips 0.10 m3 of 5.6 mm chips
5)	All types of cracks with crack width below 6 mm	Single coat SAM I	8-10	0.10 m3 of 5.6 mm chips
6)	All types of cracks with crack width above 6 mm	Single coat SAM I	10-12	0.10 m3 of 11.2 mm chips

28.3.3.2 Binder quantity for bitumen impregnated geotextile shall be in the range 0.9 to 1.2 litres/m2. Binder quantity outside this range is permitted according to the geotextile manufacturer's instructions and subject to the agreement of the Engineer.

28.3.4 Application of Aggregates

The equipment and general procedures shall all be in accordance with the Manual for Construction and Supervision of Bituminous Works. Immediately after application of the modified binder, clean, dry aggregate shall be spread uniformly on the surface.

28.3.5 Sweeping

The surface of SAMs and SAM Is shall be swept to ensure uniform spread of aggregate and that there are no loose chips on the surface.

28.3.6 Two Coat SAM or SAM I

Where a two coat SAM or SAM I is required by the Contract, the second coat shall be applied within 90 days of the first coat.

28.3.7 Geotextiie Placement

For bitumen impregnated geotextiie, the requirements of Clause 703.4.4 shall apply.

28.4 Opening to Traffic

Traffic may be permitted over a SAM or SAMI 2 hours after rolling, but the speed shall be limited to 20 km/h, until the following day. Speed control measures are to be approved by the Engineer, prior to laying. Traffic shall not be allowed on the bitumen impregnated geotextiie layer unless it is overlaid.

28.5 QUALITY CONTROL OF WORK

The type and grade of bitumen; the quality, grade and percentage of coarse and fine aggregates and filler, the temperature control for heating the materials / mix. laying, floating and compacting, hardness number of the bitumen mastic etc. should be strictly followed as indicated in the various Clauses of this Specification or as directed by the Engineer.

The quality control tests for coarse and fine aggregates shall be exercised by the Engineer in accordance with IRC specifications. For mineral filler, one test for each property for every 5 tonnes, subject to a minimum of one test for each consignment shall be carried out. The surface of the bitumen mastic. tested with a straight edge 3.0 m long, placed parallel to the centre line of the carriageway shall have no depression greater than 4 mm. The same limit shall also apply in case of transverse profile when tested with a camber template

28.6 ARRANGEMENT FOR TRAFFIC

During the period of construction, arrangement of traffic shall be done as per direction of the Engineer-in-Charge

Technical Specification-part-1

1.0 General: All materials to be used in works shall conform to the Indian Standard Specifications as published by I.S.I from time to time and in the absence thereof as approved by the Engineer-in-Charge.

A. Bricks: All bricks shall be of approved quality of standard specifications, made of goods brick, earth, uniform deep red, cherry or copper colour, thoroughly burnt in kiln(machine made)without being verified ,regular in shape and size, sound, hard, homogenous in texture, true to shape and of standard dimensions and shall be free from cracks, flaws, stones, or humps of any kind and shall not show appreciable signs of effloresce either dry or subsequent to soaking in water. The size of bricks shall be 23.9cm x 11.9cm x 6.9cm.The bricks shall emit a clear ringing sound of being struck and have a minimum crushing strength of 105kg x sq.cm. All the bricks which absorbs water 20% if their own dry weight after 24 immersion in cold water, shall be rejected.

B. Coarse Aggregates for Cement Concrete Works:

i)stone chips of stone ballast for cement concrete (plain or reinforced)shall be hard, or uniform or fine texture, trap quality, free from faults or planes of weakness and free from weathered faces. The ballast of chips must be free from loam, clay or any surface coating, free from organic matter or other impurities and screened free of dust. Stone of black and hard variety as is generally available from queries in pukur or chandil areas will be normally used. Stone aggregates from other sources may also be used provided the same is found suitable in the opinion of the engineer in charge. The opinion of Engineer — in — charge must be recorded in writing. The ballast or chips shall be obtained by breaking from large blocks and must be more or less cubical in shape.

1.1. Size of Course aggregates:

For any of the following nominal sizes a graded Coarse aggregates, grading shall be in conformity with requirements laid down in Indian standard specifications I. S. 383 – 1970 as shown below in table 1.

TABLE NO. – 1

I. S. Sieve	Percentage Passing for Graded Aggregate Nominal Size			
	40 mm.	20 mm.	16 mm.	12.5 mm.
1	2	3	4	5
80 mm.	100			
63 mm.				
40 mm.	95 -100	100		
20 mm.	30 -70	95 -10	100	100
16 mm.			90 – 100	
12.5 mm.				10 – 100
10 mm.	10 - 35	25 - 55	30 - 70	40 - 85
4.75 mm.				
2.36 mm.				

When coarse aggregates brought to the site is ungraded, single size coarse aggregates of different nominal sizes. Conforming to the requirement vide Table No. – 2 given below shall be mixed at site with the other ingredients of concrete either directly in the mixture or in the proportion indicated in Table No. – 3.

TABLE NO – 2

I. S. Sieve Designation	Percentage Passing for Graded Aggregate Nominal Size					
	60 mm.	40 mm.	20 mm.	16 mm.	12.5 mm	10 mm.
1	2	3	4	5	6	7
80 mm.	100					
63 mm.	85 – 100	100				
40 mm.	0 – 30	85 – 100	100			
20 mm.	0 – 5	0- 20	85 – 100	100		
16 mm.				85 – 100	100	
12.5 mm.					85– 100	100
10 mm.		0 – 5	0 – 20	0 – 30	0– 45	85 – 100
4.75 mm.		0 – 5	0 – 5	0 – 5	0– 10	0 – 20
2.36 mm.						0 – 5

TABLE NO. – 3

Sl. No.	Cement Concrete Mix	Nominal Size of Aggregate	Parts of Aggregate of Size 50 mm.	Parts of Aggregate of Size 40 mm.	Parts of Aggregate of Size 20 mm.	Parts of Aggregate of Size 12.5 mm.	Parts of Aggregate of Size 10 mm.
1	2	3	4	5	6	7	8
1	C. C 1 : 6 : 12	63 mm.	9		3		
2	C. C 1 : 6 : 12	40 mm.		9	3		
3	C. C 1 :	63 mm.	7 ½		2 ½		

	5 : 10						
4	C. C 1 : 5 : 10	40 mm.		7 ½	2 ½		
5	C. C 1 : 4 : 8	63 mm.	6		2		
6	C. C 1 : 4 : 8	40 mm.		6	2		
7	C. C 1 : 3 : 6	63 mm.	4 ½		1 ½		
8	C. C 1 : 3 : 6	40 mm.		4 ½	1 ½		
9	C. C 1 : 3 : 6	63 mm.			4 ½		1 ½
10	C. C 1 : 2 : 4	40 mm.		2 ½	1		½
11	C. C 1 : 2 : 4	20 mm.		3			1
12	C. C 1 : 2 : 4	12.5 mm.				3	1
13	C. C 1 : 1 ½ : 3	20 mm.			2		1

NOTE: The proportion indicated in table – 3 above are by volume. These proportions may be varied somewhat by the Engineer – in – Charge after making sieve analysis of the aggregates brought to the site, when considered necessary, for obtaining better density and strength of concrete, vide ratio in the tune of 0.25.

ALL – IN – AGGREGATE: If combined aggregates are available, they need not be separated into fine and coarse, but necessary adjustments may be made in the grading by the additional of single sized aggregate. The grading of the

all – in – charge, when analyzed, as described in IS – 2386 (Part – I) shall be in accordance with Table – 4.

TABLE NO. – 4

I. S. Sieve Designation	Percentage Passing for All – in – One Aggregate	
	40 mm. Nominal Size	20 mm. Nominal Size
80 mm.	100	
40 mm.	95 – 100	100
20 mm.	45 – 75	95 – 100
4.75 mm.	25 – 45	30 – 50
600 micron.	8 – 30	15 – 35
150 micron.	0 – 6	0 – 6

- i) Gravel, if specified for use as coarse aggregates in cement concrete works, must be hard absolutely free from surface and on being broken, the fractured surface must indicate a uniform and fine texture free from lamination or planes of weakness. It shall be thoroughly washed and free from any foreign elements.
- ii) Jhama chips for cement concrete work shall be obtained by breaking good quality jhama bats, must not be spongy or with any coating of foreign materials and homogenous in texture. The chips shall be of more or less cubical in shape.

All coarse aggregate for concrete works must be well graded. These shall be screened for removal of dust, and if so necessary in the opinion of the Engineer — in — charge, shall be washed at cost and expenses of the contractor.

C. COARSE AGGREGATE FOR LIME CONCRETE WORKS:

- (i) Brick aggregate for concrete and in foundation or flooring shall consist of approved, clean, hard and well burnt jhama khoa. The khoa must be well graded and unless otherwise specified shall pass through 32 mm. ring.
- (ii) Brick aggregate for LIME TERRACING WORK on roof shall of khoa broken from 1st class brick bats and unless otherwise specified shall pass through 25 mm. ring and be suitably graded.

D. SAND:

All sand shall be clean, sharp and free from clay, loam, organic or any other foreign matter and shall be obtained from approved source. The contractor shall get the samples of sand to be used in different kinds of work approved by the Engineer — in — Charge before using the same in work. Sand, which in the opinion of the Engineer — in — Charge or his representative is dirty, must be washed to his satisfaction at the cost and expenses of the contractor.

- (i) Sand for all cement concrete work must be coarse. The sand shall pass through a mesh, 4.75 mm. square measured in the clear. Sand shall not be used for concrete works if it contains more than 10% of fine grains passing through a 76 mesh sieve as used for cement test, nor should the fineness modulus be less than 2.00 unless specific permission is obtained from the Engineer — in — Charge.
- (ii) Medium sand may be used for cement mortar for masonry, plaster, etc. and also for bituminous works of road. Fineness modulus shall be between 2.0 to 1.8. Sand filling in plinth, where specified may be done with fine sand, fineness modulus shall be between 1.8 to 1.5. Contractor shall obtain the approval of the Engineer — in — Charge regarding the source from which fine aggregate is obtained. Unless otherwise specified it shall be obtained from Mogra, preferably.

G. CEMENT:

- (a) Cement shall conform to I. S. 269 – 1989, I. S. 455 – 1976, I. S. 8112 – 1989.
- (b) Cement at site shall be stored in dry weather proof godowns (shed) built at the cost of the contractor in stacks which are not higher than 10 bags. Sufficient space shall be provided for circulation and ratio of bags in order to minimize the time of storage of any of the bags. The floor of the godown shall consist of wooden planks raised at least 45 Cm. from ground and joints fluted with cement mortar.
- (c) Contractor should arrange for all type of testing of the quality of cement, the same shall be tested at his own expenses and make sure that the cement is of approved quality conforming to I. S. specifications, cement which is partially set or which is lumpy or cracked is to be treated as damaged and shall be removed from site immediately.

H. STEEL:

All steel shall be made clean and free from loose mill scales, dust, loose rust and coats of paints, oil or other coatings, any scale or loose rust shall be removed before use without any claim for extra charge for the same..

- (a) Where deformed high strength reinforcement bars are specified. The contractor shall use Tor steel conforming to the latest edition of I. S. 1786 and I. S.1139.

Execution of Foundation and Filling up of Trenches

- 1.1 Foundation when excavated to the level shown in the drawing shall be shown to the Engineer — in — Charge and, if on account of bad ground or for any reason whatsoever, he decides to go deeper with the foundation, the contractor shall excavate further to the depths required by the Engineer — in — Charge. In no case shall the foundation soling or concrete be laid prior to receiving orders to that effect from the Engineer — in — Charge or his authorized representative.
- 1.2 Excavation shall include throwing the excavated earth at least one meter or half the depth of excavation, whichever is more, clear of the edge.
- 1.3 The excavated areas around the foundations of structures are to be filled up properly to the required levels with the earth obtained from excavation or other materials as directed, well rammed after watering and consolidated in layers not exceeding 15 Cm. at a time.

Consolidated thickness of such layer shall not exceed 1.5 Cm. Joints where necessary shall be staggered in different layers. Ramming shall be done by heavy iron hammers 4.5 kg. to 5.5 kg. and the area of the hammer shall not be more than 300 Cm² each and it shall be continued till skin of mortar covers the surface completely.

Concrete laid on the particular day shall be consolidated thoroughly on the same day before the work is topped. Ramming on the following day shall not be done.

After the concrete has begun to harden i.e. about 24 hours after its layering, the curing shall be done by keeping the concrete damp with moist gunny bags, sand, or any other material approved by the Engineer — in — Charge for minimum period of 7 (seven) days. Till then, masonry and flooring work over the foundation or base concrete shall not be started.

2 CEMENT CONCRETE WORK (PLAIN OR REINFORCED) :

2.1 GENERAL:

P. C. C. shall mean plain cement concrete R. C. C. shall mean reinforced cement concrete.

2.1.1 All concrete work, plain or reinforced shall be carried out strictly in accordance with this specification and any working, drawing or instructions given from time to time to the contractor. The relevant clauses of I. S. 456 – 2000 shall also to be followed.

2.1.2. ALLOW IN RATES FOR CONCRETE ITEMS:

Apart from various factors mentioned elsewhere in the tender, rates quoted for all concrete items shall include for:

- a) All labour, materials, use of equipment, tools and plants etc.
- b) All necessary operations for the proper volume batching, mixing, handling, transporting, placing, mechanical vibration, consolidation, curing of concrete as directed, hacking of concrete surfaces where they harden to receive plaster (but the plaster on concrete surface shall be measured and paid separately under respective plaster items) etc.
- c) Pouring concrete around reinforcement for reinforced concrete work but reinforcement shall be measured and paid for separately, unless otherwise stated in the tender.
- d) Rates quoted for all concrete items shall include for concreting of structural members of any shape and sections as per drawings including providing slopes to slabs, beams, chajjas, canopies, etc. wherever required from work shall be measured and paid separately.
- e) Allowing work of another agencies being carried out by then like laying conduits, boxes, pipes, clamps, etc. as directed before laying concrete and coordinating with other agencies viz. Electrical, Air – conditioning, ventilation, fire contractors and other agencies working on site.
- f) Filing the bolt holes (of the shuttering) on concrete surface with cement mortar 1.3 and finishing the same as directed by the Engineer — in — Charge.
- g) The contractor's rate shall allow for wastage in all materials as well as tests of materials and concrete.

2.1.3 No concrete shall be cast in the absence of the Engineer – in- Charge or his authorized representatives. The contractor's engineer shall personally check that both the form work and reinforcement have been correctly placed and fixed, and shall satisfy himself that all work preparatory to the casting is completely ready, before intimating Engineer for final inspection and approval and for which purpose at least 24 hours notice shall be given by the contractor.

3.1 MATERIALS:

3.1.1 CEMENT:

Cement shall be strictly according to the Technical Specification.

3.1.2 FINE AGGREGATE:

Fine aggregates for cement work shall be sand conforming to the the Technical Specification.

3.2.1 COARSE AGGREGATES:

3.2.1.1 Coarse aggregates unless otherwise specified, shall consist of hard, dense, tough, durable, clean and uncoated crushed rock of pakur variety.

3.2.1.2 The aggregates shall be more or less cubical. Elongated and flaky chips shall be avoided. Aggregates shall be free from injurious amounts of alkali, organic matter and other deleterious materials. The maximum amount of deleterious materials shall not exceed the amount specified in the relevant I. S. Specification.

3.2.1.3 Aggregates may be 'Graded Aggregated' or 'Single Size Aggregates' combined to the proportions as per Technical Specifications. Choice of aggregate shall be entirely the discretion of the Engineer — in — Charge.

3.2.1.4 Where so directed by the Engineer — in — Charge aggregates shall be washed by approved methods at contractor's own cost.

3.2.1.5 The sample of coarse aggregates for concrete work shall be produced before the Engineer — in — Charge for his approval and the whole work shall be done with the coarse aggregates conforming to the approved sample.

3.2.1.6 MATERIALS:

Maximum size of aggregate shall be restricted to 5 mm. less than the minimum clear distance between the main bars in case of reinforced concrete work.

3.2.1.7 WATER:

Water used for both mixing and curing shall be portable and free from injurious amounts of deleterious materials which are likely to affect the strength or durability of concrete. Water containing any sugar shall not be allowed for use. Also, water which fails to satisfy the following requirements shall not be used.

- a) To neutralize 200 ml. sample of water, it should not require more than 10 ml. of 0.1 normal HCl.
- b) To neutralize 200 ml. sample of water, it should not require more than 2 ml. of 0.1 normal NaOH.

c) Water should not contain solids in exceeds of the following :

Organic	200 mg. / liters
Inorganic	3000 mg. / liters
Sulphate (as SO ₄)	500 mg. / liters
Chloride (as Cl)	2000 mg. / liters for P. C. C.
Chloride (as Cl)	1000 mg. / liters for R. C. C.
Suspended matter	2000 mg. / liters

The pH value of water shall be between 6 to 8.

3.3 PROPORTIONING OF INGREDIENTS:

3.3.1 Aggregates and cement shall be mixed in the proportion laid down in the schedule. No concrete leaner than 1: 2: 4 nominal mix shall be used for reinforced concrete work. In case, strength instead of mix of concrete is specified in the item the mix to be adopted and the slump to be allowed to give the specified strength and proper workability shall be determined previously by experiments with representative samples of the materials to be used and under conditions similar to those to be adopted in the actual job. These experiments are to be done by the contractors at their own cost under the direction and supervision of the Engineer — in — Charge. When the mix to be adopted is decided upon it shall in no case be altered without specific written permission from the Engineer — in — Charge. The contractors shall, however, remain fully responsible for producing concrete of specified strength in the actual job.

3.3.2 The minimum compressive strength for different grades of concrete with nominal mix shall be as follows while tested on 15 Cm. cubes at 28 days after mixing, test being conducted in accordance with I. S. 516 – 1989.

1: 1 ½: 3 mix concrete	200 kg. / Cm ²
1: 2: 4 mix concrete	150 kg. / Cm ²
1: 3: 6 mix concrete	100 kg. / Cm ²

The above minimum strengths of different grades of concrete should be obtained On Works Test as defined in I. S. 456 – 2000.

3.3.3 For the purposes of ensuring the above strengths during actual construction the contractors shall carry out, if so desired by the Engineer — in — Charge, Preliminary tests as defined in I. S. 456 on 15 Cm. cubes at 28 days after mixing in which case the minimum compressive strength shall be as follows :-

1: 1 ½: 3 mix concrete	200 kg. / Cm ²
1: 2: 4 mix concrete	150 kg. / Cm ²
1: 3: 6 mix concrete	135 kg. / Cm ²

3.3.4 The cost of carrying out such Works Tests and Preliminary Tests shall be entirely borne by the contractors and no extra claim whatsoever shall be entertained on this account. This point shall be taken into consideration while quoting rates.

3.3.5 In case of fine aggregate, allowance will have to be made for bulking. As the bulking of sand may vary from day to day and at different parts of the day on account of varying moisture contents, frequent tested for bulking shall be carried out with the sand to be used and the amount of bulking allowed for in the field mix so as to keep the actual properties constant throughout. Cost of all such tests shall be borne by the contractors.

3.4 **MIXING OF CONCRETE:**

Concrete shall be mixed in a Mechanical mixer. Mixing shall be continued until there is a uniform distribution of materials and the mass is uniform in colour and consistency. The mixing time from the time of adding water shall be in accordance with I. S. 1971 – 1968, but in no case mixing shall be done in less than two minutes.

3.4.1 Hand mixing shall not be permitted except in unavoidable circumstances, but the same shall be purely at the discretion of the Engineer — in — Charge. When hand mixing is permitted by the Engineer — in — Charge it shall be ensured that the mixing shall continue until the mass is uniform in colour and consistency. The contractor shall also use 10% extra cement over the design requirement for hand mixing for which no extra payment shall be made to the contractor.

3.4.2 The mixed concrete shall have slump as decided by the Engineer — in — Charge for a particular job or a part of a job. All arrangement for frequent test of slump of concrete is to be made by the contractor at his own cost.

3.5 **PLACING AND COMPACTION OF CONCRETE:**

3.5.1 Before placing the concrete, the forms shall be cleaned of all loose materials. When concrete is deposited against stone work, brick work or other surface likely to absorb moisture, such surface must be thoroughly wetted immediately prior to deposition of concrete. Depositing concrete under water shall not be allowed without specific permission of the Engineer — in — Charge and in the case the concrete shall contain at least 10% more cement than that required for the same mix placed in the dry, for which no extra payment will be made to the contractor.

3.5.2 All concrete shall be placed in position as rapidly as possible before initial set commences. Concrete shall not be dropped into position from a height of more than 1 meter. The concrete shall be deposited as nearly as practicable in its final position to avoid re – handling. Care shall be taken to avoid segregation of cement and displacement of reinforcement.

- 3.5.3 During placing and also immediately after deposition, the concrete shall be thoroughly compacted by the use of approved mechanical vibrators until the concrete has been made to penetrate and fill all the spaces between and around the steel reinforcements and other embodied fixtures and in the corners of form work in such manner as to ensure a solid mass entirely free from voids. While vibrating the concrete care should be exercised to ensure that there is no segregation of aggregates of mortar. Sufficient number (of concreting of 1.5 Cum. per hour) of adequate capacities shall be used for compaction of concrete. In special cases where mechanical vibrators cannot be used the concrete may be thoroughly compacted by ramming, packing etc., with prior permission of the Engineer — in — Charge. The workability of the mix shall be controlled to suit such mode of compaction.
- 3.5.4 Concrete after being placed and compacted shall not be jarred, walked on or otherwise disturbed during initial setting.

3.6 CONSTRUCTION JOINTS AND EXPANSION JOINTS:

- 3.6.1 Concreting shall be carried out continuously upto construction joints the position and arrangement of which shall be predetermined in consultations with the Engineer — in — Charge. Rest, recess for meals etc., shall be subject to the approval of the Engineer — in — Charge. All joints in beams and other horizontal members are to be formed by inserting temporary vertical boards against which the concrete to be deposited can be properly rammed, In the case of horizontal joints any excess water shall be removed from the surface after the concrete is deposited and before it has set.
- 3.6.2 When the work has to be resumed on a surface which has partly or wholly set such surface shall be well roughened and all loose materials removed. The surface shall then be swept clean thoroughly wetted and covered with a 19 mm. layer of mortar composed of equal parts of cement and sand. Such works shall be held to be covered by the rates quoted for concrete works. No separate claim for such works shall be entertained.
- 3.6.3 Expansion joints shall be provided where required. Details of the joints and filler to be used shall be as per relevant specification and shall be approved by the Engineer — in — Charge. Contractor must submit the details well in advance for approval.
- 3.6.4 All concreting work should be so programmed as not to necessitate work at night. If for any reason this becomes imperative the contractor shall obtain previous permission of the Engineer — in — Charge and take proper precautions to ensure satisfactory execution of work. No extra charges will be paid on this account.

3.7 PROTECTION AND CURING:

- 3.7.1 The contractor shall adequately protect freshly laid concrete from rapid drying at the top due to strong sunshine, drying winds, etc. and also from running of

surface water and shocks.

- 3.7.2 The contractor shall make satisfactory arrangements to protect freshly laid concrete during showers by providing the tarpaulins on top and sides at their cost failing which the casting of concrete shall be stopped at the risk and cost of the contractor.
- 3.7.3 All concrete shall be cured with fresh water for a minimum period of 14 (fourteen) days after concreting or as advised by the Engineer — in — Charge. Horizontal surfaces shall be kept covered with water pruned by means of bundhs and vertical surface by burlaps kept constantly wet with water sprays. Mere sprinkling of water on vertical surfaces without sacks and burlap will not be allowed.
- 3.7.4 The rates quoted by the contractor for concrete shall include all cost of protection and curing of concrete.

3.8 **TESTS FOR CONCRETE:**

Tests shall be conducted accordance with I. S. Code of practice.

- a) The contractor shall provide all labour, materials and appliances required for making test specimens for experiments and for testing the quality of concrete going into the job. All costs in connection with carrying out Works Tests and Preliminary and any other related tests in the Central Laboratory, KMDA or National Test House or any other laboratory approved by the Engineer-in-Charge / appointed consultant shall be entirely borne by the contractor and no extra claim whatsoever shall be entertained on this account.
- b) Work test cubes shall represent the quality of concrete incorporated in the work. The concrete for preparation of one set of cubes shall be taken from one batch of mixed concrete discharge from mixer. Each set of specimens shall generally consist of 4 nos. 15 Cm. size cubical specimens. Occasionally set of specimens will however be made as per direction of the Engineer — in — Charge / appointed consultant for provision of testing of 2 specimens for 7 (seven) days strength. The specimens shall be moulded in accordance with the relevant Indian Standard Code of Practice.
- c) The minimum of one set of 4 specimens (occasionally 6 nos. as mentioned in (b) above) shall be taken for every 20 Cum. or part thereof of concrete poured and they shall be considered and representative for said quantity.
- d) The specimens shall be cured as per I. S. Code of practice. Out of four specimens (occasionally six as stated in (b) above) in each set of Engineer — in — Charge will arrange to have any two tested in the Central Laboratory, KMDA, or any the laboratory approved by the

Engineer — in — Charge in case of deficiency in strength after 28 days curing, if however the contractor so desires, the Engineer — in — Charge may send the remaining two specimens for testing of strength at the National Test House, Alipore whose report shall be binding on all parties concerned. Two specimens out of six specimens, occasionally made may, however, be tested for 7 (seven) days strength if the Engineer — in — Charge so desires. If a set passes the 7 (seven) days strength requirement but fails in the 28 (twenty eight) days' strength requirement, the acceptance of the concrete, represented by the set shall be determined on the basis of 28 (twenty eight) days strength only. 7 (seven) days' strength result may be used as a guide to adjust the design of the mix for future concreting.

- e) The test specimens will be initialed numbered and dated jointly by the contractor's engineer and the Engineer — in — Charge of his authorized representative.
- f) A proper register of test specimens shall be maintained showing all relevant details viz. reference to structural member receiving the batch of concrete from which the specimens are cast, mark on specimens, mix of concrete, date and time of casting, water cement ratio, slump, crushing strength required for 7 (seven) days and 28 (twenty eight) days, crushing strength obtained after 7 (seven) days (if conducted) and 28 (twenty eight) days, laboratory in which tested, reference to test certificate and any other information.

3.9 ACCEPTANCE CRITERIA FOR ACCEPTANCE OF CONCRETE OF A SPECIFIED GRADE SHALL BE IN ACCORDANCE WITH I. S. 456 – 2000.

- 3.9.1 If any one out of 10 consecutive test cubes shows a deficiency in strength upto a limit of 10% but the average strength of all test module equals the stipulated strength, the concrete will be deemed to be satisfactory, but if the average fails to reach the stipulated strength the concrete will be deemed less satisfactory and a deduction of 1% shall be made from the cost of such volume of concrete as will be determined by the Engineer — in — Charge to be represented by 10 test moulds. If two of the 10 consecutive test cubes show a deficiency in strength upto a limit of 10% deduction of 2% will be made on the cost of such concrete. If out of consecutive test cubes three are deficient in strength upto a limit of 10%, 5% deduction on cost of such concrete will be made. If more than three test specimens prove deficient in strength up to a limit of 10% the concrete will be rejected and shall be replaced by concrete of stipulated strength at the entire cost of the contractor. The Engineer — in — Charge, may however, allow such concrete to remain in position but in that event a deduction of 10% from the cost of such concrete will be made.
- 3.9.2 If only one out of 10 consecutive test cubes fail deficient in strength by more

than 10% but not more than 205, 2% deduction in cost of such volume of concrete as will be determined by the Engineer — in — Charge to be represented by the 10 test moulds shall be made. If two out of 10 specimens show similar deficiency, a deduction of 10% on cost of such concrete may be accepted by the Engineer — in — Charge after a deduction of 205 from cost of such concrete. If more than three test cubes cross the limit of 10% deficiency in strength the concrete will be rejected, dismantled and replaced by the concrete of specified strength. The entire cost of such replacement will have to be borne by the contractor.

- 3.9.3 In no cases, however, any test mould should register strength less than 30% of the stipulated strength. If any one of the group of 10 shows such results the entire concrete will be rejected and this will have to be replaced by concrete of stipulated strength at the cost of the contractor. In all cases of concrete of deficient strength, the volume of concrete on which reduction in rate will apply or which will be replaced by good concrete of adequate strength will be determined by the Engineer — in — Charge and his decision of in such matters will be final.
- 3.9.4 When any rejected concrete shall have to be dismantled and replaced and replaced to the satisfaction of the Engineer — in — Charge by the contractor free of cost to the employer, it shall be carried out carefully to not disturb the adjoining portion of the structure. If any damage is done to the embedded items or adjacent structures, the same shall also be made good free of charge by the contractor to the satisfaction of the Engineer — in — Charge.
- 3.9.5 In no case, any extra rate shall be paid for any concrete showing strength higher than specified strength.

4. STEEL REINFORCEMENT:

- 4.1 Mild steel rounds alternatively Tor steel bars issued by the KMDA shall be used for reinforcement in reinforced cement concrete work.
- 4.2 Before the reinforcement bars are cut, the contractor shall study the lengths of bars required as per drawings and shall carry out cutting only to suit the sizes required as per drawings. The contractor's rate shall include the cost of initial straightening of the bars whenever necessary and removing oil, paint, grease, mud and any loose rust scales and other incidental works in this connection.
- 4.3 Reinforcement shall securely placed in position and frilly supported and wedged by precast concrete blocks of suitable thickness at sufficiently close intervals so as to ensure the desired cover at every place. Where necessary, separator bars and chairs of suitable dimensions are to be provided by the contractor.
- 4.4 Bends, cracks, hooks, etc., or steel reinforcements shall be carefully formed and shall be maintained according to the stipulations of the relevant I. S. Code.

Heating of reinforcement to facilitate bending will not be permitted. If any bend shows signs of brittleness or cracking, the rod shall be removed from the site. The reinforcement shall be securely bound at every intersection of bars with 16 gauge black annealed wire.

If bars of exact required length are not available, these shall be cut from such lengths of available bars as will involve minimum wastage in cut pieces. Number of laps in reinforcement shall be kept to the minimum. The position, staggering, etc. of laps shall be subject to the approval of the Engineer — in — Charge, Laps occurring in bars in tension and compression shall have a minimum length as stipulated in I. S. Code (40 times the diameter of bars in the case of tension and 25 times the diameter of bars in the case of compression).

4.5 If desired by the contractor, welding by gas or electricity may be permitted by the Engineer — in — Charge in lieu of laps of reinforcement under suitable conditions and with suitable safeguards. No extra payment shall be made to the contractor if he opts for welding.

4.6 Payment for the reinforcement work shall be made on the calculated weight of steel reinforcement as will be obtained from drawing excluding the weight of binding wires. Only such laps, dowels, chairs and pins in reinforcements as approved by the Engineer — in — Charge or shown on drawings shall be paid for. The contractor shall allow in his quoted rates for all wastage's which will not be paid for separately.

5. SHUTTERING AND STAGING:

5.1 GENERAL:

The contractor shall be responsible for the preparation and for the design of shuttering, propping and staging required for all R. C. C. works. They shall supply the drawings for above well in advance before the proposed date of concreting of any particulars unit and get approval to the same by the Engineer — in — Charge. The contractor shall be very careful for design and erecting of staging so as not to cause any damage to the structure or to the workmen and supervisory staff, and they shall be very careful regarding the safety of such staging. The contractor shall remain entirely responsible for the safety of shuttering and staging.

5.2 Materials:

5.2.1 Sufficiently rigid steel shuttering must be used for retaining walls, beams, columns, slabs, lift walls etc. In other cases like chajjas, lintels, shelves etc. timber shutter may be used. In cases of columns ply board shuttering (12 mm.) may be used subject to the approval of Engineer — in — Charge. In other cases 25 mm. to 30 mm. thick wooden shuttering with hard wood or 9 mm. to 12 mm.

thick approved quality ply board shuttering may be used approved by Engineer — in — Charge. All form works must be made reasonably tight against leakage of liquid from concrete. It is the contractor's responsibility to ensure that the forms are checked for water tightness just before concreting operations starts and to make good any deficiencies. If instructed by the Engineer — in — Charge tarred building papers or polythene sheets shall have to be used by the contractor without by extra charge for the same.

5.2.2 Staging shall be made of steel pipes (Acro Bars) approved by the Engineer — in — Charge. Salbullah props may be used in some cases like lintels, Tins, chajjas etc. subject to the approval of Engineer — in — Charge. Bamboo props shall never be used unless it is specifically permitted by the Engineer — in — Charge.

5.3 **WORKMANSHIP :**

5.3.1 The form shall conform to the shapes, lines and dimensions to suit the R. C. C. members as shown on drawings. Form works shall be adequately designed to support the full weight of workers, staff, freshly laid concrete and reinforcements without yielding settlement or deflection and to ensure good and truly aligned concrete finished in accordance with the construction drawings.

5.3.2 The scaffolding shall be carried out to afford adequate and shall remain in position until the newly constructed work is able to support itself. Props shall be securely braced against lateral deflection. The spacing of struts shall be designed to carry loads imposed on it without undue deflection of the members supported by the props. The spacing of props shall be approved by the Engineer — in — Charge and any alteration suggested by him shall be carried out at the contractor's expenses. Bracing shall be provided without extra cost. Splicing of staging may be permitted by the Engineer — in — Charge under specific circumstances.

5.3.3 All rubbish, particularly chipping, shavings and saw dust must be removed from the interior of the form before the concrete is placed and the form work in contact with the concrete shall be cleaned and thoroughly wetted before the concrete is placed. Oiling shall not be permitted when the surface are intended to receive plaster.

5.4 **STRIPPING OF SHUTTERING:**

In normal circumstances and where ordinary Portland cement is used forms of vertical sides shall be struck after expiry of the periods as per I. S. 456 – 1978, unless otherwise directed at site by the Engineer — in — Charge.

All forms work shall be removed without such shock or vibrations as would damage the concrete. Proper precaution shall be taken to all for the decrease in the rate of hardening that occurs with all cements in cold weather.

5.5 **TOUCHING UP:**

Surfaces which become exposed on removal of shuttering shall be carefully examined by the Engineer — in — Charge. If any shape projections are detected, those shall be removed under the instructions from the Engineer — in

— Charge. After the examinations by the Engineer — in — Charge all holes and honey combs shall be made good with the process suggested by the Engineer — in — Charge and for this purpose nothing will be paid extra to the contractor. The contractor shall not touch surface of the concrete until and unless specifically directed by the Engineer — in — Charge.

6. BRICK WORK:

6.1 All brick works shall be carried out with 1st class bricks of approved quality. Cement Mortar shall be prepared by mixing sand and cement in specified proportion. Sand shall be measured on the basis of its dry volume. In case of damp sand, its quality shall be increased suitably to allow for blockage. Water used for preparation of mortar shall be potable and free from deleterious organic materials.

7. CEMENT PLASTER:

The proportion for mortar for exterior or interior plaster shall be as specified in the item of work. The plaster shall be of thickness as specified and the surface shall be similarly cured as for cement concrete. The moulding shall be carried out as shown in the drawing and shall be separately measured in overall lengths unless otherwise specified in the items. Interior corners and edges of openings if so directed by the Engineer — in — Charge shall be rounded off or chamfered with the same mortar for which no extra payment will be allowed. All cement concrete surface should be chipped off properly before taking up the plastering work. The walls to receive plaster shall be thoroughly cleaned off moss and blisters before the commencement of work. **PROTECTIVE MEASURE:**

Surfaces of doors, windows, floors, articles of furniture, beams, burghers etc. and such other parts of the buildings not to be white washed or colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white or colour wash splashes, if any.

8. PAINTING:

All surfaces for painting shall be properly sand papered and cleaned and where necessary good quality putty shall be used to hide all holes, cracks, open joints etc. The rate for painting shall include all such works. Paint shall be applied with approved brushes and surfaces shall be sand papered after every coat. All work when completed shall present a smooth, clean, solid and uniform surface, to the satisfaction of the Engineer — in — Charge.

8.1 SYNTHETIC ENAMEL PAINT:

Synthetic enamel paint of approved brand and manufacturer and of the required shade be used for the top coat and an undercoat of shade to match the top coat as recommended by the manufacturer shall be used. Under coat of the specified paints of shade suited to the shade of the top coat shall be applied and not allowed to dry overnight. It shall be rubbed next day with the finest grade of wet abrasive paper to ensure a smooth and even surface free from brush marks and all loose particles dusted off. Top coats of specified paint of the desired shade shall be applied the under coat is thoroughly dry. Additional finishing coats shall be applied if found necessary to ensure uniform surface.

9) **NP3 SEWER :**

GENERAL SPECIFICATION

i) **MATERIALS**

All materials to be used in works shall conform to the specification laid down in above mentioned schedule. For other materials, the specification as published by I. S. I. and in absence thereof as approved by the Engineer – in – Charge shall be followed.

ii) **REINFORCED CONCRETE PIPES & COLLARS**

The design of reinforced spun concrete pipe shall conform to I. S. 458 – 1998. The method of manufacture shall be such that the form and the dimension of the finished pipe are accurate within the limits specified in I. S. 458 – 1998. The surface and edges of the pipes shall be well defined and true and their ends shall be square with the longitudinal axis. The ends of the pipes shall be further reinforced by an extra ring of reinforcement to avoid breakage during transportation. The manufacturing of the pipes shall conform to I. S. 458 – 1988.

Non – pressure pipes are used for construction of sewers, storm drains and culverts.

Normally the following classes of pipes are to be used.

- a. Class NP – 3 : reinforced concrete heavy duty pipe for sewers and for storm drains where necessary. (Modified NP – 3)

The design of modified NP – 3 pipes should be such that the same volume of reinforcement as that of class NP – 3 is placed in single layer at a distance of 5/8” of barrel thickness from inside surface of the pipe.

The dimensions of modified NP – 3 pipes should conform to class NP – 3 of I. S. 458 – 1988 in their respective sizes. The standard dimensions of the pipes should conform either to I. S. 458 – 1988 or to this schedule.

The workmanship, finish, tests, sampling and inspection should conform I. S. 458 – 1988 or as approved by the Engineer – in – Charge. Inspection may be made at the place of manufacture or on the work site after delivery or at both – places and at any time. On account of failure to meet any of the specified requirements even though samples pipe units may have been accepted as satisfactory at the place of manufacture such pipes shall be rejected.

The contractor / supplier shall submit certified copies of test results for the materials and finished pipe units before acceptance of the same. In spite of submission of the certified copies of test result, the Engineer – in – Charge reserves the right to test any of the materials and pipe units at Contractor’s / Supplier’s cost.

10EXECUTION

10.1PRELIMINARY WORKS

The contractor shall remove all shrubs, bushes and all necessary materials from the site and make the site accessible for the movement of labour, materials and equipments and fit for satisfactory execution of the work at his own cost. The contractor shall uproot trees and cut their branches necessary for carrying out the work as directed by the Engineer – in – Charge. Prior written permission should be obtained from the Engineer – in – Charge before execution of such jobs.

All materials collected in course of cleaning shall be the property of the authority. When the work in a section is taken up, the contractor shall erect temporary barricades not less than 1.2 M. high on the either side of the trenches along the trenches line. The barricades shall be made of stout Salbullahs of not less than 125 mm. dia. at the narrowest section driven onto the ground at a spacing not more than 3 M. and the runners shall be of timber planks in three rows of size not less than 150 mm. size. The Engineer – in – Charge shall have authority to direct the contractor to provide barricades made of G. C. I. Sheet depending upon the site conditions and cost for erection of G. C. I. sheet shall be paid separately. Night lanterns shall be provided along the barricades at a space of 6 M. apart of each lantern. The cost for erection of barricades and provision of night lanterns is deemed to be included in the over – all rates of works and shall not be paid separately.

B EXCAVATION AND PICKING UP HARD CRUST

Unless otherwise specified or instructed by the Engineer – in – Charge, all excavation shall be open cut and the side of trenches shall be kept vertical. Before taking up excavation, the width of excavation shall clearly be marked on the ground surface and damage to the existing pavements beyond those limits should be avoided. A minimum of 100 Cm. berm shall be provided on either side of the trench which should be kept free from spoils and materials, where the excavation will be through an existing pavement of water bound macadam, bituminous or

The Engineer – in – Charge shall have the power to direct the contractor to take up any section of the work in preference to another and to limit the extent of any excavation to be made at one time and the contractor shall comply with the same and expedite the completion of any such particular section / component of work as per direction of the Engineer

– in – Charge. Any excavation made below the level or grade indicated on the plans should be refilled to specified level or grade at the contractor's expense with sand or jhama khoa cement concrete (1: 3: 6) as may be directed by the Engineer – in – Charge and to his satisfaction. With progress of excavation, if any pipe, conduit electric cable, telephone cable, gas main or other underground structure is encountered, digging by general equipment shall be discontinued and the excavation shall be done with the help of hand tools be special equipment for such excavation for which no extra payment will be made.

The contractor shall have no ownership right for any excavated material. The rate of excavation shall be deemed to be included of all costs of excavation and stacking of spoil for backfill. The removal of surplus spoils will be paid for separately. In case any

dewatering is required to be done for excavation (beyond 1.5 M. depths) this will be paid for separately under the subhead „Dewatering“.

10.3DEWATERING

The contractor shall provide, install and operate all the necessary pumping machinery, pumping appliances and equipments and supply fuel, lubricants etc. to keep trench reasonably free from water during executions. He should have sufficient equipments and machinery in good working condition to meet all situations and shall make available at all times competent mechanics / operators for operation. Water should be disposed off in such a manner as will not cause any injury to public or private property nor be a nuisance or menace to the public or any other public utilities. The contractors shall make all arrangements for dewatering to keep the trench reasonably free from water from all sources, i.e. either due to seepage or percolation or rain water or due to leakage / breakage in the existing drains / sewer, water main / pipes or connection there to whether outside or inside of the trench. The trench will also have to be kept reasonably free from water during execution of all stages of works, e.g. excavation, soling, foundation concrete, pipe laying and joining, brick work, plastering etc. where the work involves, replacement / diversion of existing sewer / water main, the contractor will also have to make arrangements for pumping out and disposal of existing flow including arrangements for diversion / plugging of the existing system as per direction of the Engineer – in – Charge. The payment of all such dewatering shall be made only once per metre length of sewer / drain during the whole period of work. No other consideration shall be made for any extra payment for dewatering at any stage of the work. If any ponds are required to be dewatered adjacent to the sewer trenches, no separate payment will be made other than payment per metre length of sewer as stated above.

When it will be necessary to pump out waste water from the sewers / drains where the newly laid sewer / drain is intended to be connected or the waste water is require to pump out from the closed area e.g. sump, lagoon or section of channel etc. the payment of such dewatering to make the area reasonably free from water will be made on the basis of Hp. Hr. of the pump under relevant item of „Pumping“. No extra payment for dewatering shall be allowed in the gully pit line unless specifically instructed by the Engineer – in – Charge.

10.4EARTHWORK IN FILLING

In general and unless other materials are indicated on the tender documents materials used for filling trenches and excavations around structure shall be suitable materials which were removed in the course of making excavation. These materials shall consist of clean earth and shall be free from large clod or stone above than 75 mm. ashes, putrescible refuse and other injurious materials. After completion of laying pipes, mains etc. the trenches should be filled up with excavated materials as directed in layers of 150 mm. depth and rammed properly, with necessary watering, either by hand rammers or compactors. The filling up the trench and consolidation should be done as per direction of the Engineer – in – Charge.

All unauthorised excavation made by the contractor shall be immediately backfilled at the contractor's expense. The contractor shall not place backfill materials against or on structures until they have attained sufficient strength to support the loads to which they will be subjected without distortion, cracking or other damage.

Measurement of all underground structural works shall be taken before filling as directed by the Engineer – in – Charge and if any of excavation trench is covered without authorization shall be uncovered by the contractor at his own expense.

Trenches shall not be filled at the pipe joints, till that section of the pipe line has successfully passed any specified test required and the joints have acquired a suitable degree of hardness. The earth filling around the conduit and the sides between the shoring and conduit shall be done carefully with approved materials in layers not exceeding 100 mm. thick and thoroughly compacted as stipulated. If the excavated materials be considered unsatisfactory for filling, the contractor shall remove and dispose off unsatisfactory materials as per direction of the Engineer – in – Charge and the contractor shall procure and substitute suitable approved material for filling, payment for which will be made separately. The special filling material will be measured for payment as compacted in the trench within specified width and determined length and determined depth.

10.5 SAND / CINDER FILLING

If the excavated materials be considered unsatisfactory for filling in trenches, sand / cinder filling should be done as per direction and upto the full satisfaction of the Engineer – in – Charge. The sand should be of local variety and free from clay / clayey materials and filling with sand / cinder should be done in layer of 15 Cm. each layer being thoroughly saturated with water and compacted with rammer. The measurement of sand / cinder filling will be made on compacted fill within the specified length, width and depth of trench.

10.6 SHORING

Shoring works shall be of timber and steel. Timber shoring shall be of well seasoned hard wood of requisite strength, good – quality, free from knots and cracks and preferably treated with preservatives. The shoring work shall include providing bracings and struts and it should be strong enough to support the sides of excavation and to prevent any movement of soil. The planks should be sufficiently long, and fixed continuously as directed by the Engineer – in – Charge. Shoring materials shall be provided by the contractor. Shoring materials furnished by the contractor shall be removed from the site immediately on completion of work. If the Engineer – in – Charge is of opinion that at any place, sufficient or proper shoring has not been provided, he may order for additional shoring and further strengthening at the contractor's expense. The contractor shall bring to site sufficient quality of shoring materials ahead of starting the excavation depending on the volume of works involved and the speed to be attained to complete the work within the stipulated time. As far as practicable, shoring shall be driven ahead of excavation and finally to a depth sufficiently below the bottom of the trench not less than 15 Cm. in any case. The height of the shoring planks shall not be less than 35 Cm. above the existing G. L. to

facilitate proper withdrawal of planks and as well as barricading of the trench etc.

10.7 RETAINING SHORING

Whenever so directed by the Engineer – in – Charge, the contractor shall leave in place the shoring to be embedded in the filled up trench with runner, cross struts etc. The projected portion of the shoring shall be cut at 30 Cm. below the established street level or the existing surface of the street as directed by the Engineer – in – Charge. All shoring not be left in place shall so carefully be taken out as not to endanger the construction or any other adjacent structure. The shoring shall be lifted gradually as filling in trenches with proper compaction by filling materials with necessary watering. At the time of final withdrawal of shoring after complete filling, the voids caused by the withdrawal of the shoring shall be filled up with dry sand properly tamped with rod and watering.

The timber shoring may be reused so long as it shape and adequate structural strength.

Technical Specification-part-2

SEWAGE NETWORK SPECIFICATION GUIDELINES

1. FIELD LAYOUT AND INSTALLATION

The straight line and slope of a sewer has to be carried out meticulously as per design. The horizontal layout determines the location as well as direction of the sewer line, while slope of the line provides the necessary hydraulic carrying capacity of the sewerage system. The location of the trench is generally laid out first as an offset line running parallel to the proposed sewer centre line. This offset line is demarcated by wooden stakes driven into the ground surface at intervals of, say, 15 m. The offset line, as is clear, is quite away from the sewer centre line with a view not to allow it being disturbed during construction; however, it has to be proximate enough so that the transfer of measurements to the actual trench can readily be done. The wooden stakes are set with their tops at a specific height above the designed trench bottom (horizontal slope line) thus, the checking of the trench depth during excavation, etc., can be done with ease. Two procedures are available to lay pipe sections in the open trench, namely, by batter boards, and by laser beams. Batter boards are placed across the trench at uniform intervals. The tops of these boards can be set at even height above the designed sewer invert elevation. The centre line of the sewer is traced on the boards by extending a line of sight with a transit level or a theodolite and a string is stretched from board to board along this very line. Later on, this line is transferred onto the trench bed by means of a plumb bob for the invert levels. Invert levels and characteristics indicated by vertical rods are marked off in even increments and the lower end of each rod is placed on the pipe invert bedding plane, and the string over the batter boards helps to check if it matches with the proper elevation mark on the rod, by appropriate adjustment of the pipe placement. In the laser method, advantage is taken of an intense, narrow beam of light that is projected by the laser instrument, over a long distance. This beam is aligned through a sewer pipe to strike a target held at the other end of the pipe. A transit that is placed above a manhole helps establish the alignment of the sewer with reference to field survey points, and transfer it down to the laser instrument that is mounted inside the manhole. Lasers can achieve an accuracy up to 0.01 per cent over a distance of up to 300 m.

2. CROSS DRAINAGE WORKS

Cross drainage, works arise when a sewer has to cross another service like electricity, water line, gas piping, telecommunication cable, river course, nalah, etc. The following shall be mandatorily implemented without fail. In regard to the electric power cables, the sewer shall be laid above the electric power cable and horizontally away from the power cable with clearances of minimum 30 cm all round as per IS: 1255. In regard to water lines, the sewer shall always travel below the water line. With regard to gas lines, the sewer has to travel above the gas line so that sewer gases, if they escape, need not accidentally set off an ignition of the gas line. With regard to telecommunication cables, lateral separation of at least 30 cm shall be followed. In cases of river crossing and nalah crossing, each situation shall be decided on its site conditions. Gravity sewers, if possible, may be converted to pumped sewer lines by a low lift dedicated pumping station, before the crossing discharging into the gravity section after crossing the water course; this will help in keeping the pumped sewer visible to the eye or close to the ground at all times.

3. PREVENTION OF CROSS CONNECTION

Visual Separation

A cross connection between water main and sewer main seldom occurs because of the sizes of these mains. However, where the location is complicated, the water mains shall be either blue coloured pipes or shall be painted with blue florescent coloured paint.

Protection of Water Mains

A minimum offset of equal to half the width of the manhole plus 30 cm shall be the lateral offset between water mains and sewer lines. It is advisable to encase the sewer than the water mains.

Relation to Waterworks Structures

Gravity sewers shall not be laid closer to water retaining structures and the effort should be to detour as far as possible. In case of leakages in sewer joints, the leakage may gain access to the sidewalls of the water retaining structures. A simpler precaution if possible will be to use CI or DI pipes for that length of sewer that runs close to the water retaining structure

4. TRENCH

Dimensions

The width of trench should be the minimum necessary for the proper installation of the sewer with the due consideration to its bedding. It depends on the type of shoring (single stage or two stage), working space required in the lower part of the trench and the type of ground below the surface. The width of the trench at different levels from the top of the sewer to the ground surface is primarily related to its effect upon the adjoining services and nearby structures. In undeveloped areas or open country, excavation with side slope shall be permissible from the top of the sewer to the ground surface instead of vertical excavation with proper shoring. In developed areas, however, it is essential to restrict the trench width to protect the existing facilities and

properties and to reduce the cost of restoring the surface. Increase in width over the minimum required would unduly increase the load on the pipe.

Excavation

Excavation for sewer trenches for laying sewers shall be in straight lines and to the correct depths and gradients required for the pipes as specified in the drawings. The material excavated from the trench shall not be deposited very close to the trench to prevent the weight of the materials from causing the sides of the trench to slip or fail. The sides of the trench shall, however, be supported by shoring where necessary to ensure proper and speedy excavation. In case, the width of the road or lane where the work of excavation is to be carried out is so narrow as to warrant the stacking of materials near the trench, the same shall be taken away to a place to be decided by the Engineer-in-Charge. This excavated material shall be brought back to the site of work for filling the trench. In case the presence of water is likely to create unstable soil conditions, a well point system erected on both sides of the trench shall be employed to drain the immediate area of the sewer trench prior to excavation operation. A well point system consists of a series of perforated pipes driven into the water bearing strata on both sides of a sewer trench and connected with a header pipe and vacuum pump. If excavation is deeper than necessary, the same shall be fitted and stabilized before laying the sewer.

Shoring

The shoring shall be adequate to prevent caving in of the trench walls by subsidence of soil adjacent to the trench. In narrow trenches of limited depth, a simple form of shoring shall consist of a pair of 40 to 50 mm thick and 30 cm wide planks set vertically at intervals and firmly fixed with struts. For wider and deeper trenches, a system of wall plates (Wales) and struts of heavy timber section is commonly used. Continuous sheeting shall be provided outside the wall plates to maintain the stability of the trench walls. The number and the size of the wall plates shall be fixed considering the depth of trench and type of soil. The cross struts shall be fixed in a manner to maintain pressure against the wall plates, which in turn shall be kept pressed against the timber sheeting by means of timber wedges or dog spikes. In non-cohesive soils combined with considerable ground water, it may be necessary to use continuous interlocking steel sheet piling to prevent excessive soil movements by ground water percolation and extend the piling at least 1.5 m below the trench bed. In case of deep trenches, excavation and shoring may be done in stages.

Underground Services/Utilities

All other services like pipes, ducts, cables, mains and other services exposed due to the excavation shall be effectively supported.

Dewatering

Trenches for sewer construction shall be dewatered for the placement of concrete and laying of pipe sewer or construction of concrete or brick sewer and kept dewatered until the concrete foundations, pipe joints or brick work or concrete have cured. The pumped-out water from the trenches shall be disposed off in existing storm water drainage arrangement nearby. In the absence of any such arrangement, the pumped water may be drained through completed portion of sewer to a permanent place of disposal. Where a trench is to be retained dry for a sufficient period to facilitate the placement of forms for sewer construction, an under drain shall be laid of granular material leading to a sump for further disposal. Precautions are to be taken to arrest potential floating of the laid sewers, arising out of induced buoyancy during rainy season.

Foundation and Bedding

Where a sewer has to be laid in a soft underground stratum or in a reclaimed land, the trench shall be excavated deeper than what is ordinarily required. The trench bottom shall be stabilized by the addition of coarse gravel or rock. In case of very bad soil, the trench bottom shall be filled in with cement concrete of appropriate grade. In the areas subject to subsidence, the pipe sewer should be laid on suitable supports or concrete cradle supported on piles. In the case of cast-in-situ sewers, an RCC section with both transverse and longitudinal steel reinforcement shall be provided when intermittent variations in soil bearing capacity are encountered. In case of long stretches of very soft trench bottom, soil stabilization shall be done either by rubble, concrete or wooden crib.

5. LAYING OF PIPE SEWERS

In laying sewers, the centre of each manhole shall be marked by a peg. Two wooden posts 100 mm x 100 mm and 1,800 mm high shall be fixed on either side at nearly equal distance from the peg or sufficiently clear of all intended excavation. The sight rail when fixed on these posts shall cross the centre of manhole. The sight rails made from 250 mm wide x 40 mm thick wooden planks and screwed with the top edge against the level marks and shall be fixed at distances more than 30 m apart along the sewer alignment. The centre line of the sewer shall be marked on the sight rail. These vertical posts and the sight rails shall be perfectly square and planed smooth on all sides and edges. The sight rails shall be painted half-white and half-black alternately on both the sides and the tee heads and cross pieces of the boning rods shall be

painted black. When the sewers converging to a manhole come in at various levels, there shall be a rail fixed for every different level. The boning rods with cross section 75 mm x 50 mm of various lengths shall be prepared from wood. Each length shall be a certain number of metres and shall have a fixed tee head and fixed intermediate cross pieces, each about 300 mm long. The top edge of the cross pieces shall be fixed at a distance below the top edge equal to, the outside diameter of the pipe, the thickness of the concrete bedding or the bottom of excavation, as the case may be. The boning staff shall be marked on both sides to indicate its full length. The posts and the sight rails shall not be removed in any case until the trench is excavated, the pipes are laid, jointed and the filling is started. When large sewer lines are to be laid or where sloped trench walls result in top-of-trench widths too great for practical use of sight rails or where soils are unstable, stakes set in the trench bottom itself on the sewer line, as rough grade for the sewer is completed, would serve the purpose.

RCC Pipes

The RCC pipes shall be laid in position over proper bedding, the type of which may be determined in advance, the abutting faces of the pipes being coated by means of a brush with bitumen in liquid condition. The wedge shaped groove in the end of the pipe shall be filled with sufficient quantity of either special bituminous compound or sufficient quantity of cement mortar of 1:3. The collar shall then be slipped over the end of the pipe and the next pipe butted well against the "O" ring by appliances to compress roughly the "O" ring or cement mortar into the grooves. Care being taken

to see that concentricity of the pipes and the levels are not disturbed during the operation. Spigot and socket RCC pipes shall be laid in a manner similar to stoneware spigot and socket pipes. The structural requirements conforming to IS 783is to be followed.

6. JOINTING OF SEWERS

Joints of pipe sewers may generally be any of the following types:

- i) Spigot and socket joint (rigid and semi flexible)
- ii) Collar Joint (rigid and semi flexible)
- iii) Cast Iron detachable joint (semi flexible)
- iv) Coupling joint (semi flexible)

Cement joints are rigid and even a slight settlement of pipes can cause cracks and hence leakage. To avoid this problem it is recommended that semi flexible joints be used.

Stoneware Pipes

All the pipe joints shall be caulked with tarred gasket in one length for each joint and sufficiently long to entirely surround the spigot end of the pipe. The gasket shall be caulked lightly home but not so to occupy more than a quarter of the socket depth. The socket shall then be filled with a mixture of one part of cement and one part of clean fine sand mixed with just sufficient quantity of water to have a consistency of semi-dry condition. A fillet shall be formed round the pint with a trowel forming an angle of 45 degrees with the barrel of the pipe IS 4127. Rubber gaskets may also be used for jointing. A method of relatively easier checking of the grade of SW pipe sewer line is followed by the CMWSSB. In this method, two tight strings connected to the crown and one horizontal diameter edge as shown in Figure 3-51 (overleaf) are used to judge and adjust the grade, which is much faster and more precise than the boning rod method which becomes cumbersome.

Concrete Pipes

Concrete spigot and socket pipes are laid and jointed as described above for glazed stoneware spigot and socket pipes with yarn or rubber gasket and cement. Large size concrete sewers have 'ogee' joints in which the pipe has mortise at one end and a tendon to suit at the other end. They are jointed with cement or asphalt. A concrete collar sufficiently wide to cover and overlap the joint is fixed on it. The collars shall be placed symmetrically over the end of two pipes and the annular space between the inside of the collar and the outside of the pipe shall be filled with hemp yarn soaked in tar or cement slurry tamped with just sufficient quantity of water to have a consistency of semi dry condition. This is well packed and thoroughly rammed with caulking tools and then filled with cement mortar (1:2) prop. The joints shall be finished off with a fillet sloping at 45 degrees to the surface of the pipe. The finished joints shall be protected and cured for at least 24 hours. Any plastic solution or cement mortar that may have squeezed in shall be removed to leave the inside of the pipe perfectly clean. For more details of jointing procedure, reference may be made to IS 783.

7. TESTING OF SEWER LINES

Water Test

Each section of sewer shall be tested for water tightness preferably between manholes. To prevent change in alignment and disturbance after the pipes have been laid, it is desirable to backfill the pipes up to the top, keeping at least 90 cm length of the pipe open at the joints. However, this may not be feasible in the case of pipes of shorter length, such as stoneware and RCC pipes. With concrete encasement or concrete grade, partial covering of the pipe is not necessary. In case of concrete and stoneware pipes with cement mortar joints, pipes shall be tested three days after the cement mortar joints have been made. It is necessary that the pipelines be filled with water for about a week before commencing the application of pressure to allow for the absorption by pipe wall. The sewers are tested by plugging the ends with a provision for an air outlet pipe with stop-cock in the upper end. The water is filled through a funnel connected at the lower end provided with a plug. After the air has been expelled through the air outlet, the stop-cock is closed and water level in the funnel is raised to 2.5 m above the invert at the upper end. Water level in the funnel is noted after 30 minutes and the quantity of water required to restore the original water level in the funnel is determined. The pipe line under pressure is then inspected while the funnel is still in position. There shall not be any leaks in the pipe or the joints (small sweating on the pipe surface is permitted). Any sewer or part thereof not meeting the test shall be emptied and repaired or re-laid as required and tested again.

The leakage or quantity of water to be supplied to maintain the test pressure during the period of 10 minutes shall not exceed 0.2 litres/mm dia. of pipes per kilometre length per day. For non-pressure pipes, it is better to observe the leakage for a period of 24 hours if feasible. The test for exfiltration for detection of leakage shall be carried out at a time when the groundwater table is low. For concrete, RCC and asbestos cement pipes of more than 800 mm dia. the quantity of water inflow can be increased by 10% for each additional 100 mm of pipe dia.

Air Testing

Air testing becomes necessary particularly in large diameter pipes when the required quantity of water is not available for testing. As per the ASTM C28-80, vitrified clay pipes testing is specified as applying air pressure to 2.8 m water column and held for 2 to 5 minutes when all plugs are checked and the exact point of leakage can be detected by applying soap solution to all the joints in the line and looking for air bubbles. Thereafter, the air supply is disconnected

and the time taken to drop from 2.5 m to 1.7 m water column for every 30 m is noted to be in conformity with Table below:

Diameter, mm	minutes	Diameter, mm	minutes	Diameter, mm	minutes
100	0.3	400	2.1	750	4.8
150	0.7	450	2.4	800	5.4
200	1.2	500	3.0	900	6.0
250	1.5	600	3.6	950	6.6
300	1.8	700	4.2	1,070	7.3

The longer lengths and hence fewer joints of sewer pipelines when laid with RCC and double walled HDPE pipes must be able to easily withstand the above testing and hence, the same test conditions are retained for these sewers also.

8.CHECK FOR OBSTRUCTION

As soon as a stretch of sewer is laid and tested, a double disc or solid or closed cylinder, 75 mm less in dimension than the internal dimension of the sewer shall be run through the stretch of the sewer to ensure that it is free from any obstruction.

9. BACKFILLING OF THE TRENCHES

Backfilling of the sewer trench is a very important consideration in sewer construction. The method of backfilling to be used varies with the width of the trench, the character of the material excavated, the method of excavation and the degree of compaction required. In developed streets, a high degree of compaction is required to minimize the load while in less important streets, a more moderate specification for back fill may be justified. In open country, it may be sufficient to mound the trench and after natural settlement, return to re-grade the areas. No trench shall be filled in unless the sewer stretches have been tested and approved for water tightness of the joints. However, partial filling may be done keeping the joints open to avoid any disturbance. The refilling shall proceed around and above the pipes. Soft material screened free from

stones or hard substances shall first be used and hand pressed under and around the pipes to half their height. Similar soft material shall then be put up to a height of 30 cm above the top of the pipe and this will be moistened with water and well rammed. The remainder of the trench can be filled with hard material, in stages, each not exceeding 60 cm. At each stage, the filling shall be well rammed, consolidated and completely saturated with water and then only further filling shall be continued. Before and during the backfilling of a trench, precautions shall be taken against the floatation of the

pipeline due to entry of large quantities of water into the trench causing an uplift of the empty or the partly filled pipeline. Reference may be made to section 3.46 for more details in this

regard. Upon completion of the backfill, the surface shall be restored fully to the level that existed prior to the construction of the sewer.

10. CONSTRUCTION OF BRICKWORK MANHOLES

a) If the sewer is constructed in a tunnel, the manhole should be located at the access or working shafts and the manhole chamber may be constructed of a size to suit the working shaft or vice-versa. The width/diameter of the manhole should not be less than internal diameter of the sewer + 150 mm benching on both sides (150 mm + 150 mm).

b) The opening for entry into the manhole (without cover) should be of such minimum dimensions as to allow a work with the cleaning equipment to get access into the interior of the manhole without difficulty. A circular opening is generally preferred. A minimum clear opening of 60 cm is recommended. Suitable steps, usually of malleable cast iron shall be provided for entry.

c) Access shaft shall be circular in shape and shall have a minimum internal diameter of 750 mm; where the depth of the shaft exceeds 3 m suitable dimensions shall be provided to facilitate cleaning and maintenance. Access shaft where built of brickwork, should be corbelled on three sides to reduce it to the size of the opening in the cover frame, and to provide easy access on the fourth side to step irons or ladder. In determining the sizes, the dimensions of the maintenance equipment likely to be used in the sewers, shall be kept in view.

d) The manhole base slab shall be 150 mm for manholes up to 1 m depth, 200 mm for manholes from 1 to 2 m depth and 300 mm for greater depths. In all cases, the thickness shall be counter checked for uplift conditions based on maximum ground water elevations at the site on the soilside by considering empty manhole conditions.

e) Where subsoil water condition exists, a rich mix may be used and it shall further be waterproofed with addition of approved water proofing compound in a quantity as per manufacturer's specifications.

f) The brickwork manholes shall be first constructed to the required invert and with circular openings to facilitate the laying of sewer pipes later on. These manholes facilitate the judgement in the field when trenches are dug up and sewer pipes are to be laid to give the levels using a levelling instrument or with boning rods.

g) All brickwork shaft shall be in English bond and the jointing faces being well buttered with cement mortar before laying, so as to ensure a full joint and brickwork shall be in accordance with IS 2212 code of practice for brickwork. The cement mortar used shall not be weaker than 1:3 and in accordance with IS 2250 code of practice for preparation and use of masonry mortars and its revisions.

h) The thickness of walls shall be typically one brick (23 cm) for up to 1.5 m deep manholes and one and a half brick (35 mm) for depths greater than 1.5 m. The actual thickness in any case shall be verified on the basis of engineering design in difficult soil conditions.

i) The jointing of brickwork and plastering on both sides (20 mm) shall be in a mix of cement mortar 1:3. Admixtures for water proofing if desired shall be cement based.

j) Salt glazed or concrete half channel pipes of the required size and curve shall be laid and embedded in cement concrete base to the same line and fall as the sewer. These can also be finished as semi-circular channels with cement mortar 1:2 and of diameter equal to that of the sewer. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be sloped up at 1:10 towards the wall and suitably rounded off. The branch channels shall also be similar.

k) Bricks on edge shall be cut to a proper form and laid around the upper half of all the pipes entering or leaving the manhole, to form an arch.

l) All around the pipe there shall be a joint of cement mortar 12 mm thick between the pipe and the bricks. The ends of the pipes shall be built in and neatly finished off with cement mortar.

m) The entire height of the manhole shall be tested for water-tightness by closing both the incoming and outgoing ends of the sewer and filling the manhole with water. A drop in water level not more than 50 mm per 24 hours shall be permitted.

n) It should be ensured that there is no leakage of ground water into the manhole by observing the manhole for 24 hours after emptying it.

o) The top of the manhole shall be flush with the finished road level as per IS 4111 Part I.

COVERS AND FRAMES

The size of manhole covers should be such that there should be clear opening of not less than 560 mm diameter for manholes exceeding 0.9 m depth. When cast iron manhole covers and frames are used they shall conform to IS 1726. The frames of manhole shall be firmly embedded to correct alignment and level in plain concrete on the top of masonry. The precast frame and cover can also be of steel fibre reinforced concrete (SFRC) conforming to IS 12592 and shall be of approved make. The frame and cover shall be of LD/ MD/ HD/ EHD grade, size and thickness as mentioned in the description of the item. The standard for DI manhole covers is EN 123.

Annexure-1
APPLICATION FOR TENDER

To
The Superintending Engineer
Planning Circle, SD&SWM SECTOR, KMDA

Tender No.

Serial No. of Work applied for:

Amount put to tender:

Dear Sir,

Having examined the Statutory, Non statutory & NIT documents, I/We hereby like to state that I/we wilfully accept all your conditions and offer to execute the works as per Tender no and Serial no. stand above. I/We also agree to remedy the defects after/during execution of the above work in conformity with the conditions of contract, specifications, drawings, bill of quantities and addenda.

Dated this _____ day of _____ 202__

Full name of applicant: _____

Signature: _____

In the capacity of: _____

Duly authorized to sign bids
For & on behalf of (Name of Firm): _____
(In block capitals or typed)

Office address:

Telephone no(s) (office): _____

Mobile No. _____

Fax No. _____

E-mail ID: _____

Annexure-2

Affidavit Format

One Affidavit before Notary will have to be submitted mentioning the correctness of the documents and Declaration of penalty, debarment etc. faced by the declaring under any Govt / Semi- Govt / Autonomous body / Institution / local body in hard copy along with Form no 1 above within stipulated date & time.

Points/Declaration to be furnished in the AFFIDAVIT

- i) I (Name), Son of (Father's Name), residing at (Residential Address) having office at (Business Address) do hereby solemnly affirm and declare as follows:
- ii) Partnership Details:
- iii) Reference NIT No, Sl. No.
- iv) All Documents submitted by me are genuine, authentic, true and valid.
- v) All information furnished is true to the best of my knowledge & behalf. Department has got full right to cancel the same with penal measure, if any, in case any of the statements is proved to be false.
- vi) Neither any penalty nor debarment was made against me or against the firm in any way at any Govt. /Autonomous Body/Institution.
- vii) That I am a citizen of India.

All above statements are true to the best of my Knowledge and belief.

Annexure 3:

**Power of Attorney for Signing of Bid
(if required)**

(To be executed on Non-Judicial Stamp Paper of appropriate value)

POWER OF ATTORNEY

Know all men by these presents, We, _____ (name of Firm/Company) incorporated under the laws of India and having its registered office at _____

_____ do hereby constitute, nominate, appoint and authorize Mr./Ms. _____ (name), son/daughter/wife of _____ and presently residing at _____ who

is presently employed with/retained by us and holding the position of _____ as our true and lawful attorney (hereinafter referred to as the "Attorney"/"Authorized Representative") to do in our name and on our behalf, all such acts, deeds, matters and things as are necessary or required in connection with or incidental to submission of our bid titled "**NAME OF THE WORK**", a Notice Inviting Tender (NIT) issued by the Kolkata Metropolitan Development Authority (the "KMDA") and subsequently for our selection as successful bidder including but not limited to signing of proposals and other documents and writings, participating in pre-bid meeting and other conferences and providing information/responses to the Authority, representing us in all matters before the Authority, signing and execution of all contracts including the Authorisation Agreement and undertaking consequent to acceptance of our proposal and generally dealing with the Authority in all matters in connection with or relating to or arising out of us Proposal for the said consultancy job and/or upon award thereof to us till the entering of the Agreement with the Authority.

AND, we do hereby agree to ratify and confirm all acts, deeds and things lawfully done or caused to be done by our said Authorized Representative pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Authorized Representative in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE, _____ THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS _____ DAY OF _____, 2022.

For (Signature, Name, Designation and Address)

Witnesses:

- 1) _____
- 2) _____

Notarized

Accepted (Signature, name designation and address of the Attorney)

Instructions regarding Power of Attorney:

1. The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by

the applicable law and the charter documents of the executants(s) and when it is so required the same should be under common seal affixed in accordance with the required procedure.

2. Wherever required, the
executants(s) should submit for verification the extract of the charter documents and other documents such as a resolution/power of attorney in favor of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Applicant.

Annexure 4:
CERTIFICATE

(To be submitted on Company Letterhead)

I/We have inspected the sites of works and have made me/us fully acquainted with the local conditions in and round the sites of works. I/We shall be bound by conditions laid down in the Notice Inviting Tender, Special Conditions, Specification and also KMDA Form No. – 1. I/We have gone through the Schedule of Rates of Public Works Department, Government of West Bengal on Building Works for the year 2017, Sanitary, & Plumbing Works for the year 2017, Road & Bridge Works for the year 2018, unified Schedule of Rates of Irrigation & Waterways Department for the year 2018, Schedule of Rates for Sewerage and Drainage Works and Water Supply Works, 2018-2019, of Urban Development and Municipal Affairs Department and General Specifications, now in force in the Public Works Department, Government of West Bengal and the code of practice by ISI and shall follow them as required unreservedly. I/We shall also uniformly maintain such progress with the work, as any be directed by the Engineer-in-Charge of the work to ensure completion of the same within the target date.

(Dated & Signature of the Tenderer)

Annexure 5:

DECLARATION BY THE TENDERER

(To be submitted on Company Letterhead)

- I. I / We have inspected the site of works and have made me / us fully acquainted with local conditions on and around the site of works. I / We shall be bound by the conditions laid down in the Notice Inviting Tenders, Special Terms & Conditions, Special Specifications, General Specifications, Specific Priced Schedule and also printed Tender Form No. – I (as amended). I/We have gone through the latest amended “P. W. D. (Roads) Schedule”, “P. W. D. (Bldg.) Schedule of Rates”, B. I. S. codes of practices, relevant MoRTH specification and IRC codes of practices of the Special Terms and Conditions. My / Our tenders is offered taking due consideration of all the stipulations of contract documents. I / We shall also uniformly maintain such progress with the works as may be directed by the Engineer – in – Charge of the work to ensure completion of same within the target date.
- II. My/Our Permanent Income Tax Account No. is
- III. My/Our Goods and Services Tax Registration No. is
- IV. a) I/We declare that I have no relative working under Planning Circle, SD&SWM Sector of KMDA.
- b) I/We declare that the under noted personnel of Planning Circle, SD&SWM Sector of KMDA is related to me/us.

Name	Relationship	Designation with office address
Sri	
.....		

Postal Address with Telephone No.
& Mobile No. of the tenderer

(Dated & Signature of the Tenderer)

Annexure 6:
**FORMAT OF THE BANK GUARANTEE FOR ADDITIONAL
PERFORMANCE SECURITY DEPOSIT**
(To be executed on Non-Judicial Stamp Paper of appropriate value)

To
The Superintending Engineer (Civil)
Planning Circle
Sewerage, Drainage and Solid Waste Management Sector
Kolkata Metropolitan Development Authority

WHEREAS..... [name and address of Contractor] (hereafter called “the Contractor”) has undertaken, in pursuance of e-NIT No.:..... and Tender No.:/SE(Plng)/SD&SWM/KMDA of 2022-2023 [Tender No.], to execute the work of “**NAME OF THE WORK**” (hereinafter called “the Contract”).

AND WHEREAS it has been stipulated by you in the Said contract that the Contractor shall furnish you with a Bank Guarantee from a scheduled bank for the sum specified therein as ‘**ADDITIONAL PERFORMANCE SECURITY DEPOSIT**’ for compliance with his obligation in accordance with the Contract.

AND WHEREAS we [indicate the name of the Bank & Branch] have agreed to give the Contractor such a Bank Guarantee.

Now THEREFORE we.....[indicate the name of the Bank & Branch] hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total sum of ₹..... [amount of Guarantee]..... (amount in words). We undertake to pay you, upon your first written demand and without cavil or argument, a sum within the limit of ₹ [amount of Guarantee] as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We (indicate the name of the Bank & Branch) hereby waive the necessity of your demanding the said debt from the Contractor before presenting us with the demand.

We (indicate the name of the Bank & Branch) further agree to pay to you any money so demanded notwithstanding any dispute or disputes raised by the contractor(s) in any suite or proceeding pending before any court or Tribunal relating thereto, our liability under this Present Absolute and unequivocal.

The payment/so made by us under this bond shall be a valid discharge of our liability for payment there under and the contractor(s) shall have no claim against us for making such payment.

We (indicate the name of the Bank & Branch) further agree that no change or addition to or other modification of the terms of the Contract or of the works to be performed there under or of any of the Contract documents which maybe made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of the such change addition or modification.

We (indicate the name of the Bank & Branch) lastly undertake not to revoke this guarantee except with the previous consent of you in writing.

This Guarantee shall be valid upto [date of completion] it come into force with immediate effect and shall remain in force and valid for a period upto the time of completion of the work under the stated contract plus claim period of six months for the Bank Guarantee. Notwithstanding, anything mentioned above, our liability against this guarantee is restricted to Rs. (Rupees in words) and unless a claim in writing is lodged with us within the validity period, i.e. upto of this guarantee all our liabilities under this guarantee shall cease to exist.

Signed and sealed this day of 2022 at

SIGNED, SEALED AND DELIVERED

For and on behalf of the BANK by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

NOTES:

- I. The Bank guarantee should contain the name, designation and code number of the officer(s) signing the Guarantee.
- II. The address, telephone number and other details of the Head office of the bank as well of issuing Branch Should be mentioned on the Covering letter of issuing Branch

