



CORPORATION OF CHENNAI

CONTRACT

TENDER, AGREEMENT SPECIFICATION

AND SCHEDULES

PART – I

GENERAL

NAME OF WORK Construction of Cement Concrete Pavement at A.A.Scheme Road
(Stephenson Road junction to B.B. Road junction)
in Ward- 36, Zone – III

WARD : 36

ZONE :III

DEPARTMENT :Bus Route Roads Department

Signature of the tenderer

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Signature of the tenderer

**CORPORATION OF CHENNAI
BUILDINGS DEPARTMENT
TENDER NOTICE**

1-1 RECEIVING AND OPENING OF TENDERS

1-1-1 Tenders will be received at the Tender Sale Counter, Ripon Buildings, Corporation of Chennai upto 3.00 p.m. on **26.06.2009 Construction of Cement Concrete Pavement at A.A. Scheme Road (Stephenson Road junction to B.B. Road junction) in Ward- 36, Zone - III**

The tender should be in the prescribed form obtainable From the Executive Engineer, Zone or at Tender Sale Counter Ripon Buildings on all working days from **11.00 a.m to 3.00pm**

Tender Documents can also be obtained by Registered Post or Courier by sending a requisition letter enclosing a Demand Draft for the value of the Tender Document plus Rs.155/- if required by Registered Post and Rs.50/- if required by Courier at the risk and responsibility of the prospective tenderer, as per rule 16.4 of the Tamil Nadu Transparency in Tender Rules.

The tenders will be opened by the, SE / Bus Route Roads Department at his office at **3.15p.m on 26.06.2009 in the presence of EE/BRR and CAO**

1-1-2 The tenderers or their authorized agents are expected to be present at the time of opening tenders. The tender receiving Officer will on opening each tender prepare a statement of attested and unattested corrections therein and hand it over to the tenderer Concerned and initial all such Corrections in the presence of the tenderer. If any of the tenderers or their agent find it inconvenient to be present at the time, then in such a case, the tender receiving Officer corrections and communicate it to him. The absentee tenderer shall then accept the statement of corrections without any question whatsoever.

1.2 SUBMISSION OF TENDERS

1-2-1 Tenders must be submitted in sealed covers, and should be addressed to the SE / BRR Department Corporation of Chennai, the name of the tenderer and the name of the work being noted on the cover.

1-2-2 The tenders can also be sent by Post or courier and the Tender Inviting Authority shall not be responsible for any delay in transit in such case as per rule 18-3 of the Tamil Nadu Transparency in Tender Rules.

All the Tenders, irrespective of zone works or Department works will be received ONLY at Tender Sale Counter at Ripon Buildings, and to be placed in the Tender Boxes designated for the Department / Zone.

1-2-3 If the tender is made by an individual, it shall be signed with his full name and his name and address shall be given in block capitals. If it is made by a firm it shall be signed with the Co-partnership name by a member of the firm who shall also sign his own name and the name and address of each member of the firm shall be given. If the tender is made by a Corporation it shall be signed by a duly authorized officer who shall produce with his tender, satisfactory evidence of his authorization. Such tendering Corporation may be required before the contract is executed to furnish evidence of this corporate existence.

The Tenderer should submit the tender in wax sealed cover and should affix his own emblem with metal seal on the wax seal besides putting his signature below the wax seal in the cover in which the tender is submitted. Tenders not complying with this will be liable to be rejected.

1-3 FURNISHING OF CERTIFICATE WITH TENDER

1-3-1 Successful tenderer should submit sales Tax Clearance / Verification Certificate while execution of agreement. The sales Tax clearance / Verification certificate should be in the form prescribed by the appropriate sales tax Authorities.

In the case of proprietary or partnership firm it will be necessary to produce the certificate aforementioned for the proprietor or proprietors and for each of the partners as the case may be. If the tenderer is a registered Corporation Contractor and if a certificate for the current year had already been produced by him during the calendar year in which tender is made, it will be sufficient if particulars regarding the previous the previous occasion on which the said certificate was produced are given.

1-3-2 The Tenderer must also enclose Photostat copy of his/her registration certificate of respective class and nature of work along with tender or must produce the copy to the tender opening officer for further processing of the tenders.

Signature of the tenderer

1-4 **EARNEST MONEY DEPOSIT**

Each tenderer must pay, as Earnest Money a sum of **Rs 87000/- (Rupees eighty seven thousand only)** by Bank draft from Nationalized Bank towards the Payment of EMD only assigned in favor of the Commissioner, Corporation of Chennai or in cash into the Corporation Treasury to the credit of deposits and enclose with his tender the challan or Bank Draft. This earnest money will be refunded to the unsuccessful tenderer on application after intimation is sent of the rejection of the tender or at the expiration of three months from the date of tender whichever is earlier. The refund will be authorized by the Bus Route Roads Department, by suitable endorsement on the chalans. The earnest money will not be received in cash or currency notes or cheques or in the shape of National Savings Certificates or Government Bonds Tenders not accompanied by the treasury chalan or Bank Draft are liable for rejection.

The earnest money of the successful tenderer will be returned to him only after he has deposited the Security Deposit.

1-5 **SECURITY DEPOSIT**

1-5-1 The Security Deposit will be 2% of the contract amount in the form of National Savings Certificate/ Small savings scrips /deposits/Accounts pledged in favour of Commissioner, Corporation of Chennai. However it is open to the Commissioner to insist on higher deposit as per rules in force.

1-5-2 When a tender is to be accepted the tenderer whose tender is under consideration shall attend the S.E.'s/E.E.'s office on the date fixed by written intimation to him. He shall forthwith upon intimation being given to him by the Superintending Engineer of acceptance of his tender, deposit with the Corporation of Chennai the security deposit and sign an agreement in the proper departmental form for the due fulfillment of the contract. The security deposit will not bear interest.

1-5-3 On receipt of written communication of acceptance of tender if the tenderer fails to pay the requisite security deposit within the period specified in the written communication or backs out from the tenderer or withdraws his tender, the earnest money deposit shall be forfeited to the Corporation of Chennai.

If the contractor fails to carry out the contract; after paying the requisite deposits, then he will be liable for the excess expenditure if any incurred to complete the work as contemplated in the General conditions of the contract.

As per the Council Resolution No. 584/86 dt. 21.5.86 the percentage of security deposit to be fixed for various percentage of rebates are as follows:

Percentage of rebate	Percentage of security Deposit to be fixed
Up to 10%	2%
10 to 20%	3%
20 to 30%	4%
Above 30%	5%

1-5-4 **CONTRACT EMERGES ON RECEIPT OF LETTER OF ACCEPTANCE OF THE TENDERER:**

It shall be expressly understood by the tenderer, that on receipt of written communication of acceptance of tender from the accepting authority, there emerges a valid contract between the Commissioner, corporation of Chennai and the tenderer, for execution of the work without any separate written agreement. Hence for this purpose, the tender document, i.e. tender offered by the contractor, General conditions to the contract, special conditions of the contract, negotiation, correspondences, written communications of acceptance of tender etc.: shall constitute a valid contract and that will be the foundation of the rights of both the parties of the contract.

Provided that, if shall be open to the accepting authority to insist execution of any written agreement by the tenderer, if administratively considered necessary or expedient.

Signature of the tenderer

The form of agreement will have to be stamped at the stamp office at the cost of the tenderer. The written agreement to be entered into between the contractor and the commissioner, Corporation of Chennai, shall be the foundation of the rights of both the parties and the contract shall not be deemed to be completed until the agreement has first been signed by the contractor and then by the Commissioner, Corporation of Chennai.

1-5-5 TENDER CLAUSE

Additional Security Deposit

As per Council Resolution N. 456/2002, Dt:28-11-2002 the amount of Additional Security Deposit to

Percentage of rebate	Amount of Additional Security Deposit payable in the form of Demand Draft
5 to less than 15%	2%
15% to 20%	50% of Difference between Office value of work and Tender amount.
above 20%	Same as above

be paid by the Contractor along with the tender for various percentage of rebate are as follows:

The Contractors should pay the Additional Security Deposit in the form of Demand Draft drawn in favour of Commissioner while submitting the tender documents.

If any of the Contractor has not enclosed Additional Security Deposit for the appropriate value in . the form of Demand Draft while submitting tender documents, the tenders of such tenderers will be summarily rejected.

The Demand Draft enclosed for the Additional Security Deposit by the unsuccessful Tenders will . be returned after obtaining proper acknowledgement.

If percentage of rebate is above 20% tenderer should furnish the break up details, cost analysis and documents to show previous experience and work on hand with performance certificate showing the satisfactory completion of works entrusted.

1-6 TENDERER TO EXAMINE SSRB/TNBP

The tenderer shall examine closely" SSRB/TNBP, General conditions to the contract" and also the Standard, preliminary Specifications Contained therein, and sign the SE's / EE's Office copy of the SSRB/TNBP and its addenda volume in token of such study before submitting his tender unit rates, which shall be for finished work in Situ. He shall also carefully study the drawings and additional specifications and all the documents which form part of the agreement to be entered in to by the accepted tenderer. The SSRB/TNBP and other documents connected with the contract such as specifications, plans, descriptive specification sheet regarding materials, etc., can be seen at any time between 10-00 a.m. & 5-45 p.m. on office days, in the office of the SE / Buildings Corporation of Chennai.

1-7 The Tenderer's attention is directed to the requirements for materials under the clause "Materials . and Workmanship. in the "preliminary Specification". Materials conforming to the IRC/ISI shall be used on the work, and the tenderer shall quote his rates accordingly.

1-8 TENDERER TO INSPECT THE SITE BEFORE QUOTING THE RATES

Every tenderer is expected, before quoting his rates, to inspect the site of the proposed work. He should also inspect the quarries and satisfy himself about the quality and availability of materials. The best class of materials to be obtained from the quarries or other source shall be used on the work. In every case the materials must comply with the relevant specifications. Samples of materials as called for in the standard. specifications Of in this tender notice or as required by the SE/ BRR DEPT / EE (zone) in any case shall be submitted for the SE / BRR DEPT / EE (zone) approval before the supply to site of work is begun.

The Commissioner, Corporation of Chennai, will not however, after acceptance of contract pay any extra charges for lead or for any other reason, in case the contractor is found later on to have misjudged the quality or quantity of materials available. Attention of the contractor is directed to the preliminary specifications herein regarding payments of seigniorage, tolls, etc. (The successful tenderer will not be exempted from the payment of any Municipal duty or taxes in consequences of being contractor for the Corporation).

Signature of the tenderer

1-9 TENDERER TO FOLLOW PRELIMINARY SPECIFICATION

The tenderer's particular attention is drawn to the sections and clause in the "Preliminary Specification herein" dealing with:

- (1) Test, inspection and rejection of defective materials and work.
- (2) Carriage.
- (3) Construction plant.
- (4) Water and lighting.
- (5) Clearing up during progress and for delivery
- (6) Accidents.
- (7) Delays
- (8) Particulars of payment.

The tenderer should closely peruse all the specification clauses which govern the rates which he is tendering.

- 1-10** A schedule of quantities accompanies this tender notice. It shall be definitely understood that the Commissioner, Corporation of Chennai, does not accept any responsibility for the correctness or completeness of the schedule and that this schedule is liable to alterations by omissions, deductions, or additions at the discretion of the SE / BRR, EE (Zone.....) Corporation of Chennai or as set-forth in the conditions of contract. The Tender will, however, base his lumpsum tender on this schedule of quantities. He should quote specific rate, for each item in the schedule and the rates should be in Rupees, and paise. The rates should be written both in words and figures and the units in words. The tenderer should also show the totals of each item and the grand total of the whole contract, and quote in the tender a lumpsum for which he will undertake to do the whole work subject to the conditions of contract such lumpsum agreeing with the total amount of Schedule A. This Schedule accompanying the lumpsum tender shall be written legibly and free from erasures over writings of conversions of figures, corrections, where unavoidable should be made by crossing out, initialing dating and rewriting. No questions or tenders will be considered unless the rates are furnished both in figures and in words. If there is any corrections in the rate, it should be attested by the contractor and also by the officer concerned at the time of opening the quotation or tenders.

In case of any discrepancy between prices quoted in words and figures, lower of the two shall be considered.

- 1-11** Tenders not submitted in proper form or in due time will be rejected. Tenders offering a percentage deduction from or increase on the estimate amount and those not submitted in proper form or in due time will be rejected. Rates of lumpsum amounts for items not called for shall not be included in the tender. No alterations which is made by the tenderer in the contract form, the conditions of contract, the drawings, specifications, or quantities accompanying the same will be recognised, and if any such alteration are made the tender will be void. Any remarks should be set out separately in a covering letter.
- 1-12** A set of schedule of rates for various works accompanies this tender notice in schedule 'A' it shall be definitely understood that the Commissioner, Corporation of Chennai, does not accept any responsibility of the correctness or completeness of this schedule and that this schedule is liable to alterations by omissions, or deductions or additions at the discretion of the Executive Engineer, Corporation of Chennai, or as setforth in the conditions of contract. The tenderer shall carefully scrutinise these rates and tender one single percentage less or higher on the whole of the schedule of rates contained in Schedule A. The percentage tendered should be written both in words and figures and also written legibly and free from erasures, over writings or conversions of figures. Corrections, where unavoidable, should be made by crossing out initiating, dating and rewriting.. Tenders not submitted in proper form or in due time will be rejected.
- 1-13** The contractors should commence the work within 10 days from the date on which notice that the site is thereby handed over to him is served on the contractor and should complete the work within the time limit specified therein.
- 1-14** The tenderer should work out his own rates, without references being made to the Department's current schedule of rates or to the estimate rates which are not open for inspection by tenders.
- 1-15** The prices at which and the source from which certain particular materials shall be obtained by the contractor are given under schedule A - part 11'. Tenderers must accept the materials at these prices, and shall quote their price for finished work accordingly. Notwithstanding any subsequent change in the market value for these materials, the charge to the contractor will remain as originally entered in the contract. No cartage or incidental charges will be borne by Corporation in connection with this supply.

Signature of the tenderer

1-16 **RATE OF PROGRESS**

The Attention of the tenderers. is directed to the contract requirements as to the time of beginning work, the rate of progress and the dates for the completion of the whole work and its several parts. The following rate of progress and proportionate value of work done from time to time, as will be indicated by the Exe. Engineer certificate of the value of work done, will be required. Date of commencement of these programmes will be the date on which the site (or premises) is handed over to the contractor.

Period after date of commencement (1)	Percentage of work completed (based on contract Lumpsum amount) (2)
1 st month	10%
2 nd month	20 %
3 rd month	30 %
4 th month	40 %
5 th month	50 %
6 th month	60 %
7 th month	70 %
8 th month	80 %
9 th month	90 %
10 th month	100%
	The work should be completed in all respects within the period of ten Months.

Note : The period to be entered in column (1) for the purpose of defining the rate of progress may be fixed by the Executive Engineer to suit each case.

1-17 No part of the contract shall be sublet without written permission of the SE/ BRR / EE (zone.....) nor shall transfer be made by power of attorney authorising others to receive payment on contractor's behalf.

1-18 If further necessary information is required the SE / BRR / EE (zone.....) will furnish such, but it must be clearly understood that the tenders must be received in order, and according to instructions.

1-19 **POWERS FOR REJECTION OF TENDER**

The Tender Accepting Authority reserves the right to reject any tender or all renders in exercise of the power conferred by section 12(1) and (2) of TNIT Act subject to the provisions of sub section (1) and (2) of section 12 of TNIT Act 1998.

1-20 **TENDERER TO EMPLOY QUALIFIED TECHNICAL STAFF**

The tenderers who are themselves not professionally qualified, shall undertake to employ qualified technical man at their cost to look after the work.

*Preference in the selection from among the tenderers will be given other things being equal to those who are themselves professionally qualified or who undertake to employ qualified men at their cost to look after the work,

* Note: This paragraph should be scored out if the cost of the work involved is less than Rs. 1.00 lakh.

Signature of the tenderer

The tenderers should therefore state in clear terms whether they are professionally qualified or whether they undertake to employ technical staff and if so give their professional qualifications or of the staff to be employed.

The Contractors shall employ at their cost technically qualified men with sufficient practical experience in major R.C.C, Bridges/Sub-way Works and allied works to supervise the works who shall always be at site of the work during working hours, personally checking all items of works and paying extra attention to such works as may demand special attention. The scale and qualification for the employment of the technical staff and the rate of the penalty for failure on the part of the contractor to employ the technical staff for the work shall be as indicated below:

Tenderer when submitting tenders should certify in the tender that they have actually inspected the site of work and have based their tenders on such inspection i.e. examining the nature and extent of various soil at various depths and in density of sub soil water etc.

No alternate tenders based on their designs will be accepted.

1-21 TENDERER TO FURNISH FOR EXPERIENCE & CAPACITY

Tenderers shall furnish evidence of their good record and capacity to do the work.

1-22 ELIGIBILITY FOR SUBMISSION OF TENDERS:

Tenderers who have registered in Corporation of Chennai can only submit Tender documents enclosing the Registration certificate for the appropriate class.

1-23 PENALTY FOR INSUFFICIENT KNOWLEDGE OF CURRENT PRICES

A tenderer submitting a quotation which the tender accepting authority considers excessive and/or indicative of the insufficient knowledge of current prices of definite attempt at profiteering will render himself liable to be debarred permanently from tendering or for such period as the tender accepting authority may decide for work costing above Rs.10.00 lakhs and will be liable for forfeiture of Earnest Money Deposit for works costing Rs.10.00 lakhs. The tender rates should be based on the controlled price for materials-price permissible for the tenderer to charge a private purchaser under the provision of clause 8 of Hoarding and profiteering prevention ordinance 1943 as amended from time to time and of similar principles in regard to labour and supervision in the construction.

1-24 Should any tenderer withdraw his tender after 3 P.M. on the said day of **26.06.2009** he shall forfeit the earnest money deposited by him to the Corporation and the tender will in such case be considered as having been rejected or abandoned.

1-25 VALIDITY PERIOD OF TENDER

1-25-1 No tenderer shall withdraw his tender in whole or in part during the time that will be required for Information of acceptance or non-acceptance of tender or until the expiry of a period of 3 months from the date of opening of the tenders. Tenders withdrawing their tenders before the time stipulated above shall forfeit their Earnest Money Deposits. If the successful tenderer fails to furnish such Security Deposit and execute the agreement within 14 days from date of receipt of intimation of acceptance of the tender he shall forfeit his Earnest Money Deposit to the Corporation of Chennai.

The tender will remain valid for a period of three calendar months from the last date for receipt of tender. The validity period can be extended further if the Contractor gives his consent in writing, specifying the period of extension.

1-25-2 1. The Tender accepting authority shall cause an objective evaluation of the tenders taking into consideration the schedule of rates as mentioned in the tender document and the prevailing market rates for procurement and comparison of the tenders in accordance with the procedure and criteria specified in the tender document.

2. After evaluation and comparison of tenders as specified above in (1) the tender accepting authority shall accept the lower tender ascertained on the basis of objective and quantifiable factors specified in the tender document and giving relative weights is among them.

~ 3. Notwithstanding anything contained above in (2) if the Tender accepting authority decides that the price of the lowest tenderer is higher with reference to the prevailing market rate or the schedule of rates he may negotiate for a reduction of price with that tenderer.

4. If at any time before the acceptance of tender, the tender accepting authority receives information that a tenderer who has submitted tender has been banned by any procuring entity, he shall not accept the tender of that tenderer even if it may be the lowest tender.

5. In case where two or more tenderers quoted the same price, the Tender accepting authority shall split the procurement among such Tenderers taking into consideration the experience and credentials of such tenderers. Where such splitting is not possible or could not be done equally, he shall record reasons for the same.

Signature of the tenderer

- 1-26** In the case of proprietary and partnership firms also, the income- Tax and Sales Tax certificates for the Proprietor or the Proprietors and for each of the partners as the case may be, shall accompany tenders.

Successful tenderer should submit sales tax clearance / verification certificate while execution of agreement. The sales tax clearance / verification certificate should be in the prescribed form approved by the appropriate sales authority.

In the event of a tenderer being a non-assessee of Sales Tax, a certificate to the effect that he is not a Sales Tax assessee should be enclosed along with the tender.

1-27 RATES TO INCLUDE

The tendered rates for the items should be inclusive of all items of works required for the proper execution of the items (viz) watering, barricading, lighting, watching, safety arrangements in the interest of traffic, safeguarding the underground services etc, and no claim for extra payment on any score will be entertained. The rates to be tendered should be inclusive of sales tax and other taxes in force.

- 1-28** Preliminary specification etc, in SSRB/TNBP will form part of the Agreement.

1-29 PAYMENT OF TAXES

The tenderer should note that he is liable to make payment towards Sales Tax as applicable to works contract as and when claimed by the Commercial Tax Department.

1-29-1 OPENING FUNCTION EXPENSES

The tenderer should note that the opening function expenses of the newly constructed building by Corporation of Chennai including the Tablet Stone shall be borne by the Contractor concerned.

1-30 EQUIPMENTS & ORGANISATIONS

A statement giving brief particulars of equipment and resources that will be put at the disposal of the work under the following classification should accompany the tender.

(a) Equipment :-

Transport for materials, viz., lorries and carts, concrete mixers compressor vibrators, winches, cranes, diving sets, pump sets, etc.

(b) Organisation :- 1) Technical (2) Unskilled.

(c) Methods that will be adopted to speed up the work to ensure completion within the prescribed time.

- 1-31** The contractors shall make their own arrangements for all the tools and plants required for the execution of the work. Road rollers and any other equipment if available with the Department may be hired out by the contractor at rates and conditions that may be fixed by the competent authorities, from time to time.

- 1-32** The Contractor has to make in consultation with the Superintending Engineer his own arrangements for forming and maintaining diversion roads for traffic during the execution of work and for which no extra payment will be made by this Department.

- 1-33** The levels furnished in the plan are based upon the investigations done by the Department. If any change in level, water levels, etc. are found during actual execution, the Contractors are bound to accept them and they are not eligible for any extra claim for such change in levels or otherwise.

- 1-34** As soon as the Contract is accepted, the Contractor should give a programme of work which he proposes to adopt for execution. The progress of work should be in conformity with the rate of progress specified under condition No. 1-16 of Tender Notice.

1-35 CONTRACTOR BARRED FROM TAKING UP WORKS IN DEPARTMENTS/ZONE WHERE RELATIVE IS EMPLOYED

The contractor shall not be permitted to tender for works in the BRR Dept./Zone (responsible for award and execution of contract) in which his near relative is posted as Accountant or as an officer in any capacity between the grades of Superintending Engineer and Junior Engineer (both inclusive). He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any Junior Engineer or officer in the Corporation of Chennai.

Any breach of this condition by the contractor would render him liable to be removed from the approved list of contractors of this Department.

1-36 CONTRACTOR TO ENGAGE APPRENTICES

Signature of the tenderer

The contractor shall preferably comply with the provision of the Apprentices Act, 1961 and the rules and orders issued there under from time to time. If he fails to do so, his failure will be a breach of the contract and the competent authority, may at his discretion, cancel the contractor or invoke any of the penalties for the breach of contract provided in the agreement. The contractor shall also be liable to any pecundary liability arising on account of any violation by him of the provisions of the Act.

"Contractor shall, during the currency of the contract, ensure engagement of the apprentices in the categories mentioned below who may be assigned to him by the Director of Employment and Training/State Apprenticeship Adviser, Tamil Nadu. The Contractor shall train them as required under the Apprentices Act, 1961 and rules made there under, and shall be responsible for all obligations of the employer under the said Act including the liability to make payments to the apprentices as required under the said Act.

Value to contract		Category	No. to be Appointed
Rs. 1 lakhs and Upto 3 lakhs	1.	Building Constructor	1
	2.	Brick layer	1
Above Rs. 3 lakhs and Upto Rs. 10 lakhs	1.	Building Constructor	1
	2.	Brick layer	1
	3.	Diploma Holder in Civil Engineering	1
Above Rs. 10 lakhs and Upto Rs. 50 lakhs	1.	Building Constructor	1
	2.	Brick layer	1
	3.	B.E. (civil) or equivalent degree	1

"Unless the contractor has been exempted from engagement of apprentices by the Director of Employment Training/State Apprenticeship Adviser, a certificate to the effect that the contractor had discharged his obligation under the said Act, "satisfactorily" should be obtained from the Director of Employment Training/State Apprenticeship adviser and the same should be produced by the Contractor for final payment in the settlement of the contract".

1-37 CONTRACT TO EMPLOY I.T.I. TRAINED MASONS / ELECTRICIANS :

The Contractor should employ one I.T.I. Trained Masons/electrician for every ten masons or parts thereof. In case of non availability of I.T.I. trained masons/electricians the contractor should obtain the prior approval of the Executive Engineer concerned before proceeding with the contract with the other. kinds of masons/electricians.

The opening Function expenses of the newly constructed building / bridges by Corporation of Chennai including the Tablet Stone shall be borne by the Contractor concerned.

BUS ROUTE ROADS DEPARTMENT / ZONE S.E / BRR DEPARTMENT., / E.E. ZONE

CORPORATION OF CHENNAI

DATED.....

Signature of the tenderer

CORPORATION OF CHENNAI

2. LETTER OF TENDER

To
The Commissioner
Corporation of Chennai,
Chennai.

Date.....2007

Sir,

2.1 I/We do hereby tender and if this tender be accepted undertake to execute the following works;
viz.,

described as shown in the drawings and in the specifications deposited in the office of the SE Dept / E.E (zone) Corporation of Chennai, with Such variations by way of alterations of, additions to and omissions from the said works and method of payment as are provided for in the conditions of contracts for the sum of Rupees'

or such other sum as may be arrived at under the clause. of the Standard Preliminary Specifications relating to "payment on lumpsum basis or by final measurement at unit prices"

2-2 I/We have also completed the price list of items in Schedule 'A' and 'B' annexed in words and figures for which I/We agree to execute the work When the lumpsum payment under the terms of the agreement is varied by payment on measured quantities.

2-3 I/We, hereby distinctly and expressly declare and acknowledge that before the submission of my/ our tender I/We have carefully followed the instructions in the tender .notice and have read the SSRBI TNBP and the Preliminary Specification therein; and that 'I/We have made such examination of the contract document and of the plans, specifications and quantities, and of the location where the said work is to be done and such investigation of the work required to be done, and in regard to the material required to be furnished as to enable me/us to thoroughly understand the intention of same and the requirements, covenants, agreements, stipulations and restrictions contained in the contract and in the said plans and specifications and distinctly agree that (I/We will not hereafter make any claim demand upon the Corporation, based upon or arising out of any alleged misunderstanding or misconceptions or mistake on my/our part of the said requirements, covenants, agreements, stipulations, restrictions and conditions.

Signature of the tenderer

2-4 ! I/We enclose herewith Income Tax clearance certificate and Sales Tax clearance certificate for the current year obtained from the appropriate authorities.

2-4-1 I/We enclose herewith Photostat copy of the class of registration certificate for contractor (to be included)

2.5 I/We enclose herewith a challan for the payment of the sum of Rupees'.....) into the Corporation treasury as earnest money not to bear interest. If my/our tender is not accepted this sum shall be returned to me/us after the final disposal of the tenders. If my/our tender accepted, the earnest money shall be retained by the Commissioner, Corporation of Chennai as security for the "" due fulfillment of the contract. If upon written intimation to me/us by the S.E E.E. Office. I/We fail to attend the said office on the date therein fixed or if upon intimation being given to me / us by theS.E. / E.E.....

of acceptance of my / our tender / We fail to make the additional security deposit or to enter into the required 'agreements. as defined in paragraph 4 of the tender notice, then I (We agree to the forfeiture of the earnest money. Any notice required to be served on me / us hereunder shall be sufficiently served on me / us if delivered to me/us personally or forwarded to me / us by post be deemed to have been served on me / us at the time when in due course of post it would be delivered at the address to which it is sent

2.6 I/We agree that I/We will not withdraw this tender in whole or anyone or more of the items of it during the time that will be required for intimation of the acceptance of non-acceptance of the tender being given to me/us or until the expiration of a period of 3 months whichever is earlier and I/We do so withdraw the tender, then I am/we are liable to forfeit the tender deposit.

* To be entered in words and figures.

2-7 I/We fully understand that the written agreement to be entered into between me/us and the Commissioner, Corporation of Chennai shall be the foundation of the rights of both the parties and the contract shall not be deemed to be complete until the agreement has first been signed by me/us and then by the Commissioner, Corporation of Chennai.

2-8 I am / we are professionally qualified and my/our qualification are given below:

Name	Qualifications

2-9 I/We will employ the following technical staff supervising the work, and will see that one is always at site during working hours personally checking all items of work and paying extra attention to such works as require special attention. (e.g.) Reinforced concrete works.

Name of members of technical staff proposed to be employed	Qualifications

--	--

Note

- (a) The last clauses should be scored out, if the cost of the work involved is less than Rs. 1,00,000
- (b) The tenderers should score out, the last clause or the penultimate according as they are themselves professionally qualified or undertake to employ technical staff under them.

2-10 I/We agree that the arbitrator for fulfilling the duties set forth in the arbitration clause of the General conditions to the contract shall be

(I) The superintending Engineer of the @
..... Dept in case the value of claim up to Rs. 50,000 and

ii) I/we agree that in case value of claim is Rs. 50,001 and above, the remedy will be through the competent Civil Court only.

- @ Buildings Department for Bridges Department.
- Bridges Department for Buildings Department.
- Storm water Drain Department for Bus Route Roads Department
- Bus Route Roads Department for Storm Water Drain Department
- City Engineer for Zones.
- Buildings Department for Works Department,
- (All the above arbitrators shall be Superintending Engineers of the Corporation of Chennai.)

3.TENDERER'S LETTER AFTER NEGOTIATIONS

In pursuance of negotiation with the Exe. Engineer/! Superintending Engineer of.....
.....Dept /Zone.....'

I/We agree to reduce the rates for the items in the schedule as follows'

Serial Number	Item Number	Schedule	Reduces rate per unit
---------------	-------------	----------	-----------------------

Signature of the tenderer

[illegible]

DATE _____

4. ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT MADE THIS _____ day of _____
200 . between the Commissioner, Corporation of Chennai (hereinafter called the
"Commissioner" which expression shall where the context so admits include his successors in office
and assigns) of the one part *

of @

Signature of the tenderer

(hereinafter called the Contractor- which expressions shall where the context so admits include his heirs, executors, administrators and legal representatives) of the other part.
WHEREAS the Commissioner is desirous of #

and has caused estimate of probably quantities contained in Schedule A, drawings and specifications describing the work to be done to be prepared.

AND WHEREAS the said Schedule A, drawings numbered serially 1 to..... inclusive –(Schedule B) – the preliminary Specifications and Schedule C have been signed signed by or on behalf of the parties hereto

AND WHEREAS the contractor has agreed to the retention by the Corporation of the earnest money of Rupees.....paid.
by him when he submitted his tender as security for the due fulfillment of the contract to the satisfaction of the S.E..... DEPT.' E.E..... (zone) Corporation of Chennai (hereinafter referred to as the S.E.....Dept./E.E (Zone.....) or in the alternative S.E. DEPT./EE(Zone.....) may direct, to deposit as security for the aforesaid purpose cash or currency notes of the value Rs..... to perfect such security.

AND WHEREAS the contractor has also signed the copy of the SSRB/TNBP and addenda volume thereto maintained in the.....DEPT/Zone of the Corporation of Chennai acknowledgement of being bound by all the conditions of the clauses of the Standard Preliminary Specification and all the Specifications for items of works described by a Standard Specification Number in Schedule 'A'.

AND WHEREAS the contractor has agreed to execute upon and subject to the conditions set- forth in the General conditions of contract of T .N.B.P, such other conditions as are contained in all the specifications forming part of this contract (hereinafter referred to as "the said condition") the works as shown upon the drawings and described in the said specifications and set forth in Schedule A as the "Probable quantities" and comply with the rate of progress noted at the end of the Articles of Agreement for a sum of Rupees.

or such other sum as may be arrived at under the clause of the standard preliminary specification relating to "payment on lumpsum basis or by final measurement at unit prices."

Now it is hereby agreed as follows:

- 4-1** In consideration of the payment of the said sum of Rupees. or such other sum as may be arrived at under the clause of the Standard preliminary specification of relating "payment on lumpsum basis or by final measurement at unit prices" the Contractor will, upon and subject to the said conditions, execute and complete the works shown upon the said drawings and described in the said specification and to the extent of probable quantities shown in schedule A with such variation, by way of alterations or additions, to or deductions from the said work and method of payment therefore as are provided for in the said conditions.

*

Contractor's name. '
@ Contractor's Legal address for registered letter and others. # Name of work and locality.
\$ -To be entered in words and figures.

- 4-2** The terms S.E. BRR/ E.E. (zone) in the said conditions shall mean the Officer in charge of the BRR DEPT. / Zone... of the Corporation who shall be competent to exercise all the powers and privileges reserved herein, in favor of the Corporation with the previous sanction of the + +

Signature of the tenderer

4-3 The arbitrator for fulfilling the duties set forth in the Arbitration clause of the General conditions of contract shall be Superintending Engineer SWD Dept. of Corporation of Chennai

4-4 Time shall be considered as of the essence of the agreement and the contractor here by agrees to commence the work as soon as this agreement is accepted by competent authority as defined by the Chennai City Municipal Act and the site (of premises) is handed over to him as provided for in the said conditions and agrees to complete the work within ten months from date of such handing over of the site (or premises) and to show progress as defined in the tabular statement "Rate of Progress" below subject nevertheless to the provision, for extension of time contained in clause 56 of General conditions of contract of T.N.B.P.

4-4-1 RATE OF PROGRESS:

The following rate of progress and proportionate value of work done from time to time, as will be , indicated by the Exe. Engineer's () certificate of the value of work done will be required.

Date of Commencement of this programme will be the date on which the site (or premises) is handed over to the contractor.

Period after date of commencement (1)	Percentage of work completed (based on contract Lumpsum amount (2)
1 st month	10 %
2 nd month	20%
3 rd month	30 %
4 th month	40%
5 th month	50%
6 th month	60 %
7 th month	70%
8 th month	80 %
9 th month	90%
10 th month	100 % The work should be completed in all respects with in the Period of TEN months.

NOTE: - The periods to be entered in column (1) for the purpose defining the rate of progress may be fixed by the Exe. Engineer to suit each case.

4-4-2 TIME SCHEDULE:

The time schedule will commence from the date of service of the work order on the contractor.

\$\$ Reset of sentence to be struck off, If the Buildings Engineer can himself enter into the contract without reference to any higher authority

Signature of the tenderer

+ + Authority competent to approve of the contract under the Chennai Corporation Municipal Act.

The time schedule fixed for various categories of work of deferent values are furnished below:

TIME SCHEDULE FOR COMPLETION OF WORKS

SI No	Department	Below Rs. 5.00 lks	Rs. 5.00 to 10.00 lks	Above Rs. 10.00 lks
1.	Interior roads	3 months	4 months	5 months
2.	Private streets	4 months	6 months	6 months
3.	Bus route roads	2 months	3 months	4 months
4.	Bridges & Buildings	6 months	8 months	10 months
5.	Storm Water Drains	3 months	4 months	6 months
6.	Foot path works	3 months	4 months	6 months
7.	Electrical turn Key projects	3 months	4 months	5 months
8.	Electrical cable laying	2 months	3 months	3 months

4-5 DAMAGE FOR DELAYS AND NON-COMPLETION

If the contractor fails to complete the works within the period named in clause 4-4 or within any extended time allowed by the S.E. / E.E. under these presents the contractor shall pay or allow to Corporation the sum of Rs500/- , as liquidated and ascertained damages for every day beyond the said date or extended time as the case may be during which the works shall remain un finish except as provided in clause 4-4 and such damages may be deducted by Corporation from any money due to the contractor.

Liquidated and ascertained damages will be levied as detailed below:

LIQUIDATED AND ASCERTAINED DAMAGED

	Below Rs. 5.00 lks	Rs. 5.00 to 10.00 lks	Above Rs. 10.00 lks
Liquidated & Ascertained Per day	Rs. 125/-	Rs. 250/-	Rs.500/-

The liquidated and ascertained damages will be levied upto a maximum of 5% of the value of the contract and if the contractor fails to complete the work even then, action will be taken to terminate the contract and execute the work at his risk and cost as per provisions of the general conditions of contract of T.N.B.P.

4-6 NON-TENDERED ITEMS: In case of items of works for which supplement agreement is to be entered into the following procedure will be adopted :-

For items of work for which the rates can be derived from the rates for the items in the original agreement, the rates will be derived by applying the overall tender premium or discount to the rates for the new item by applying the prorata excess or discount for the item of work, from which the rate is derived; the lesser rate of these two will be adopted for making payment to the contractor.

For items of work for which the rates cannot be derived from the rates for the items in the original agreement, the rates for payment will be as follows:

When the schedule of rates has not changed during the period from the date of execution of the original agreement to the date of supplemental agreement the rates for the supplemental agreements shall be the prevailing schedule of rates with the tender premium applied.

- (ii) When the schedule of rates has changed during the intervening period, the rates prevailing as per the schedule of rates at time of execution of supplemental agreements will be adopted with no tender premium or discount applied to this rate.

Signature of the tenderer

- 4-7** Fraction of a rupee in the total of bills will be rounded off to the nearest Rupee. Fraction below half paise are to be rounded off to the paise below, while fractions above half paise are to be rounded off to the paise. above.
- 4-8** The said conditions shall be read and constructed as forming part of this agreement and the parties hereto will respectively abide by and submit themselves to the conditions and stipulations and perform the agreement on their parts, respectively.

- 4-9** Upon the terms and conditions of this agreement being fulfilled and performed to the satisfaction of the S.E./ E.E. the security deposited by the contractors as herein before received or such portion thereof as he may be entitled to under the said conditions shall be returned to the contractor.

4-10 PAYMENTS AND CERTIFICATES

Payment will be made to the contractor under the certificates to be issued at reasonably frequent intervals by the S.E. / E.E. within fourteen days of the date of each Certificate an intermediate payment will be made of a sum equal to 95 percent of the value of the work, as so certified and the balance of 5 percent will be withheld and retained as a security for the due fulfillment of the contract. Under the certificate to be issued by the S.E./ E.E. on the completion of the entire works the contractor will receive the final payment of the money due or payable to him under or by virtue of the contract as per condition 11 provided there is no recovery from or for-feiture by the contractor to be made under clause 57 of general conditions of contract of T.N.BP.

4-11 MAINTENANCE PERIOD

- (i) The contractor shall maintain the works executed by him in proper repair for a period as specified below:

(a) CEMENT CONCRETE ROADS:

The Contractor shall maintain the works executed by him in proper repair for a period of 5 years from the date of completion of work, in satisfactory condition at his own cost. 2½% of the total value of work should be retained for a period of 5 years from the date of completion of work, in order to enable the department officers to watch the effect of all seasons on the work. During the maintenance period of 5 years the contract shall undertake rectification of any defect noticed due to the faulty workmanship by the contractor or substandard materials used by the contractor in the execution of the work at his own cost.

(b) BUILDINGS, BRIDGES & STORM WATER DRAINS :-

The Contractor shall maintain the works executed by him in proper repair for a period of two years from the date of completion of work in satisfactory condition at his own cost. 2½ % the total value of work should be retained for a period of 2 years from the date of completion of work, in order to enable the department officers to watch the effect of all seasons on the work.

An indemnity bond for a further period of 3 years should be obtained from the contractors in the form approved by the Government. in G.O.Ms.NO.654 dt.15-4-88 of P.W.D. so that the contractor shall make good the loss or damage that may be caused to the Corporation of Chennai in respect of rectification of any defect noticed due to the faulty workmanship by the contractor, or substandard materials used by the contractor in the execution of the work.

4-11C UP- GRADING AND/OR STRENGTHENING BUS ROUTE ROADS AND INTERIOR ROADS, PRIVATE STREETS, LAYOUT ROADS & TRAFFIC IMPROVEMENTS:-

The contractor shall maintain the works executed by him in proper repair for a period of **3 (Three)** years from the date of completion of work in satisfactory condition at his own cost. **2½ %** of total value of work shall be retained for a period of **1 (one)** year from the date of completion of work in order to enable the department officers to watch the effect of all seasons on the work. As per the Council resolution no 94/2007/dt 24.04.2007 an indemnity bond for the further period of **2 (Two)** years should be obtained from the contractors in the form approved by the Government so that the contractor shall make good the loss or damage that may be caused to the Corporation of Chennai in respect of rectification of any defect noticed due to the faulty workmanship by the contractor, or substandard materials used by the contractor in the execution of the work at his own cost.

4-11D LAYING/RELAYING OF WEARING COURSE FOR BUS ROUTE ROADS , INTERIOR ROADS, PRIVATE STREETS & LAYOUT ROADS:

The contractor shall maintain the works executed by him in proper repair for a period of **3 (Three)** years from the date of completion of work in satisfactory condition at his own cost. **2½ %** of total value of work shall be retained for a period of **1 (one)** year from the date of completion of work in order to enable the department officers to watch the effect of all seasons on the work. As per the Council resolution no 94/2007/dt 24.04.2007, an indemnity bond for the further period of **2 (Two)** years should be obtained from the contractors in the form approved by the Government so that the contractor shall make good the loss or damage that may be caused to the Corporation of Chennai in respect of rectification of any defect noticed due to the faulty workmanship by the contractor, or substandard materials used by the contractor in the execution of the work at his own cost.

Signature of the tenderer

The Retention amount will be refunded only after the satisfactory performance during the maintenance period and the same to be certified by the Corporation Engineers.

In all above 4 categories of works, the security deposit will however be refunded after the expiry of 6 months from the date of completion of the work.

(e) GUARANTEE PERIOD OF VEHICLES/MATERIALS FOR MECHANICAL DEPARTMENT :.

The tender/supplier shall furnish specific guarantee for the vehicles/materials supplied which is applicable and acceptable by all State Government Departments of TamilNadu Government.

In addition to specific guarantee period a maintenance period beyond of minimum 6 months for vehicles supplied beyond the guarantee period shall be responsibilities of supplier.

Any failure defective performance noticed within the guarantee period as well as within the maintenance period, the company shall replace the materials repairs free of cost

For any delay in *effecting* the supply beyond the delivery period a penalty of minimum Rs.100/-per day of delay shall be imposed. .

In case of advance payment made if delay noticed beyond delivery period, in addition to penalty Rs. 100/- per day, interest will be levied as fixed by Corporation of Chennai depending on the current rate of interest prevailing at that time.

(f) GUARANTEE PERIOD FOR ELECTRICAL DEPARTMENT :-

The entire installation bearing the fitting and lamp shall be guaranteed for 1 year. During this period any fault developed due to effective workmanship of *effects* in the material supplied shall be attended and rectified by the contractor within 48 hours of receiving such intimations. Failing which the security deposit and retention amount will be forfeited by the Corporation and action will be taken to black list the contractor.

The rate shall be quoted as per the enclosed schedule. The percentage of excise duty sales tax, surcharge on S T. for the item offered if any extra shall be mentioned clearly in the offer. Any defects in the works noticed within the said period of maintenance from the date of final super check measurements shall be made good at the expenses of the contractors.

Signature of the tenderer

In witness whereof the contractor *
.....has hereunto set his hand and #
.....

the Commissioner has hereunto set his hand the day and year first above written.

Signed by the Contractor ;

Full Address :

In the presence of witness.

Signed by the Commissioner.

The Common Seal of the Corporation of .
Chennai hereunto affixed in presence of :

* Contractor's name

Name and designation

SCHEDULE A

SCHEDULE OF RATES AND APPROXIMATE QUANTITIES

(a) The quantities here given are those upon which the lump-sum tender cost of work is based, but they are subject to alterations, omissions, deductions as or additions as provided for in the conditions of this contract and do not necessarily show the actual quantities of work to be done. The unit rates noted below are those governing payment for extras or deductions for omissions according to the conditions of the contract, as setforth in the Preliminary specification of the S.S.R.B/.N.B.p and other conditions or specifications of this contract.

(b) It is to be expressly understood that measured work is to be taken nett (notwithstanding any custom or practice to the contrary) according to the actual quantities when in place and finished according to the drawing as may be ordered from time to time by the

the Engineer and the cost calculated by measurement or weight, at the respective prices, without any additional charges for any necessary or

or contingent works connected therewith. The rates quoted are for works in site and complete in every respect.

Item No.	Probable Quantity		Description of work	SSRB/ TNBP No	Rate		Unit Words	Amount
	Figures				Words	Figures Rs. P.		Figures Rs. P.
Separate sheet enclosed								

Date ;

Signature of the tenderer

(Signature of Contractor)

Note ; The second subdivision of this column (i.e . column 3) is for entering description in words such
as numbers, metre, kg, etc

SCHEDULE - B

List of Drawings			Supplemental List			
Note : All Drawing to be signed by the Contractor as As the officer entering into the contract			As referred in the specifications (including the Preliminary specifications of the T.N.B.P./ S.S.R.B			
Serial Number	Drawing Number	Description	Serial Number	Drawing Number	Description	Date on which the drawing was supplied

Signature of the tenderer

--	--	--	--	--	--	--

SCHEDULE - C

List of specification for the various items of works supplementing those described in Schedule "A' by Standard Specification Numbers.

Signature of the tenderer

5. INDEMNITY BOND

This deed of indemnity executed at (place) on this day of (month)
.....(year).....by Thiru/Tmt/Selvi.
.....

(Name) Widow / Son / Daughter of Thiru.....

Residing . at.....(full address) (hereinafter called Contractor which expression shall unless
excluded by or repugnant to the context include his/her heirs, executors, administrators and legal
representatives) to and in favor of the Commissioner, Corporation of Chennai, (hereinafter called the
"Commissioner" which expression shall unless excluded by or repugnant to the context include his
successors and assigns)

Whereas the contractors has submitted the tender for Description of work (place of work of supply)
and such tender has been accepted subject to the general conditions to contract apended to the preliminary
specification of the T.N.B.P/S.S.R.B and such other conditions issued along with tender documents.

And whereas in pursuance of the terms of contract, that a sum equal to 21/2% of the total value of
work done, have been retained with the Corporation of Chennai for a period of years reckoned from the
date of completion of the work in order to enable the departmental officers to watch the effect of all seasons
on the work and the structural stability of the work executed by the contractors;

And whereas it was decided to refund the said sum equal to 21/2% of the total value of the work done
retained with the Commissioner, Corporation of Chennai on the expiry of period of years reckoned from the
date of completion of work provided that the contractor executes an indemnity bond for a period of years
indemnifying the Commissioner, Corporation of Chennai against any loss of expenditure incurred to rectify
any defect noticed due to the faulty workmanship by the contractor or substandard materials used by the
contractor in the execution of the work or during the period of years.

Now, this deed of indemnity witness that in consideration of the contract entrusted to the contractor by
the Commissioner, Corporation of .Chennai, the contractor has agreed to the following terms and conditions
and executed this indemnity bond in conformation of all and undertakes to comply with the terms herein
below mentioned.

The contractor doth hereby indemnify the Commissioner, Corporation of Chennai against any loss or
damage that may be caused in the Commissioner, Corporation of Chennai in respect of rectification of any
defect noticed due on the faulty workmanship, by the contractor, or substandard materials used by the
contractor in the execution of work entrusted to the contractor during the period of..... Years

i.e from

Upto(dates to be specified).

In witness thereof Thiru / Tmt / Selvi.the contractor has signed
this deed in the presence of the.....

First Witness

Signature of the tenderer

6. FORM OF DECLARATION TO BE FURNISHED BY PERSONS OR FIRMS GIVING TENDERS / APPL YING FOR CONTRA FOR SUPPLY OF ARTICLES TO LOCAL BODIES ETC.

1. Name of the Tenderer/ Contractor -	
2. Full address - (a) Residence (b) Place of Business if any	
3. Constitution i.e. whether individual, HUF, Firm, Association or company -	
4. Name and address of partners if any -	
5. Whether the applicant was at any time a registered dealer or assessed under T.N.G.S.T/ C.S.T. -	
6. (a) No. of Registration Certificate TNGST Act/CST Act - (b) Name of Registering Authority (c) Year from which the applicant ceased to be a registered dealer Year Nature of commodity	Turnover
7. Particulars of tender / certificates - now proposed to be taken up (a) Value of tender / contract	

DECLARATION ~

1. I / We..... (Name) declare the above information is correct and complete to the best of my knowledge and belief. to the best of my knowledge and belief.
3. I / We..... declare that for the current year I am not liable to be registered or assessed under the Tamil Nadu

Signature of the tenderer

7. PRELIMINARY SPECIFICATIONS

7-1 Definitions

Wherever in these specifications, or in any documents or instruments where these specifications . govern the following terms or pronouns in place of them are used, the intent and meaning shall be interpreted as follows:

7-1-1 Corporation:

A statutory, body constituted under Chennai Act IV of 1919 as modified in 1936 and in 1961 having its office at the Ripon Buildings Chennai

7 -1-2 Commissioner:

The Commissioner is the executive authority for the purposes of carrying out the provisions of the Chennai City Municipal Act, who shall also perform all the duties and exercise all the powers specifically imposed or conferred on him.

7-1-3 Superintending Engineer:

The Superintending Engineer who is, incharge of the Department, Corporation of Chennai or his authorised representative limited by the particular duties entrusted to him.

. 7-1-4 Tender or Bidder:

or Any person firm or Corporation submitting a tender for the work contemplated, acting directly through a duly authorised representative,

7 -1-5 Contractor:

The person, firm or Corporation undertaking the execution of the work under the terms of the contract, and acting directly or through a duly authorised representative.

7-1-6 Plans:

All official drawings or reproductions of drawing pertaining to the work provided for in the contract.

7-1-7 Specification:

The body of directions, provisions and requirements contained in these specifications, pertaining to the method and manner or performing the work and the quantities or quality of materials to be furnished under the contract.

7-1-8 Tender Notice:

The official notice inviting tender proposals for the work contemplated.

7-1-9 Tender Documents (or Tender forms) :

The official document which is supplied to prospective bidders for preparing and submitting their tender and consisting of the tender notice, tender form, schedule of approximate quantities, plans and specifications and the Descriptive Specification sheet.

7-1-10 Contract:

The written agreement covering the performance of the work of the proposed construction. The contract shall include the tender documents, tender proposals, articles of agreement, specifications, plans notice of handing over site, documents authorising alterations and supplemental agreements.

7-1-11 Work:

7-1-12 Earnest money:

The security designated in the tender notice to be furnished by the bidder as a guarantee of good faith to enter into a contract for the work contemplated if it be awarded to him.

7-1-13 Security Deposit :

The approved form of security furnished by the contractor as a guarantee of good faith and ability on the part of the contractor to execute the work in accordance with the terms of contract.

7-2 CONDITIONS

7-2-1 All documents bound with or attached to the tender forms shall be considered a part thereof and shall not be detached or altered.

7-2-2 Interpretation of Estimates:

An estimate of quantities of work to be *done* or materials to be furnished under the specification is given in Schedule 'A' These quantities are to be considered as approximate and are prepared for the comparison of bids only. The department does not expressly nor by implication agree that the actual quantities involved will correspond exactly therewith, nor shall the bidder plead misunderstanding or deception because of such estimate of quantities, or of the character, location or other conditions pertaining to the work. The unit prices to be tendered by the bidder are to be tendered expressly for the scheduled items of work and the quantities thereof may be increased or decreased in accordance with clause 7-3-2 below. Payment to the contractor will be made for the actual quantities only of the work . performed or materials furnished in accordance with contract, and it is understood that the schedule quantities of work to be done or materials to be furnished may each be increased or decreased as hereinafter provided, without in any way invalidating the bid price. .

7-2-3 Examination of Plans, Specifications, Special Provisions and site of work:

Tenders must satisfy themselves by a personal examination of the site of the proposed work by examination of plans and specifications and by other means as they prefer as to the accuracy and sufficiency of the statement of quantities and all conditions affecting the work and shall not at any time after the submission of their tender, dispute or complain of such statement of quantities nor assert that apply for extension of time for completion beyond the agreement date.

7-2-4 Approximate, not to mean Deviation from Drawings Specifications and Specifications:- The declaration of the approximate nature of the statement of quantities in Schedule 'A' does not, however in any way imply that the quantities will be increased for departure by the contractor from strict compliance with sanctioned drawings and specifications to suit. his own convenience or reduce his costs.

7-2-5 The Contract Unit Prices: The contract unit prices entered in schedule 'A' shall be for finished work in situ or for articles or materials delivered at designated points and shall include all contingent expenses . whether direct or construction expenses or those imposed by an outside authority such a as import duties - tolls, octroi, seigniorage sales tax, quarry fees, etc.

The Contractor shall be solely responsible for the payment of sales tax under the provisions of the . Chennai General Sales Tax Act, 1939 (Chennai Act IX of 1939) as on force for the time being and rates for the various items of work shall remain unaffected by any charge that may be made from time to time in the rate at which such tax is payable. Further the contractor is liable to pay Sales tax (as applicable to works contract) etc., for this work to the commercial tax department as and when claimed.

7-2-6 Carriage:-

(a) Rates for finished work shall always include the cost of conveyance and all leads, lifts, loading unloading and stacking in a manner and at the place ordered by the Superintending Engineer. When materials are supplied by department, the place of supply will be specified In the

specifications and no extra payment will be made for conveyance, lead, lifts, loading, unloading or stacking, etc.

(b) Wherever the term "Carriage" or "Conveyance" is used it shall be taken to include all leads, lifts loading, unloading and strong to the satisfaction of the Superintending Engineer.

7-2-7 Construction Plant:

The Contractor shall include in his tendered price, and shall provide and install necessary construction plant and shall use such methods and appliances for the performance of all the operations connected with the work embraced under the contract as will secure a satisfactory quality of work and rate of progress which will ensure the completion of the work within the time specified. If at any time *before* the commencement, or during the progress of work or any part of it, such methods or appliances appear to the Superintending Engineer to be insufficient or inappropriate for securing the quality of the work required, or the said rate of progress, he may order the contractor to increase their efficiency, or to improve their character, and the contractor shall comply with such orders; but the failure of the S.E. to demand such increase of efficiency or improvement shall not relieve the contractor from his obligation to secure the quality of work and the rate of progress required by the contract and the contractor alone shall be responsible for the efficiency and safety of his plant, appliances and methods.

All requisite staging, shutting, etc., be provided at the contractor's expense in sufficient quantity proper quality to ensure progress in conformity with the contract.

7-2-8 Temporary Structures:-

The contractor shall erect and maintain at his own cost temporary weather-proof sheds at such places and in manner approved by the Superintending Engineer for keeping materials under cover. The contractor shall also provide and maintain his own expenses such temporary fences, guards, etc., as may be necessary for the execution of his contract work or for safe guarding or accommodating the public. If the Superintending Engineer shall order any departure from any arrangements made by the contractor the contractor shall comply with such orders as the Superintending Engineer may issue to safeguard or accommodate the public.

7-2-9 Water and lighting:

The contractor shall pay for all fees and provide water and light as required from M.M.W.S.S. Board mains or other sources, and shall pay all charges therefore for the use of the works and workmen. The Water for the works shall be free from earthy, vegetable or organic matter, and from salts or other substances likely to interfere with the setting of mortar or otherwise prove harmful to the work.

7-2-10 Latrines for work People:

The contractor shall provide and erect, prior to the commencement of work, sufficient latrines for the use of work people, male and female, and shall keep the same disinfected and clean at all times during the progress of the works and shall remove the same, disinfect the ground and make good all damages on the completion of the works.

7-2-11 Sun Protection, Keeping Day and Pumping:

The contractor shall at his own expense arrange all requisite protection of the work and materials against sun and rain effects and shall keep all portions of the work free from water to the satisfaction of the Superintending Engineer for the purpose.

7-2-12 Setting out of Works:

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The contractor shall be responsible for the current setting out of all works, providing at his own cost all labour, materials and staff required for so doing.

7-2-13 Cleaning up during Progress and for Delivery :

All rubbish shall be burnt or removed from the site as it accumulates. All works shall be cleaned and put in a thoroughly complete, clean, sound and workmanlike state to the satisfaction of the Superintending Engineer *before* the work is finally handed over, all rubbish and surplus materials not required by S.E. having first been removed by the contractor. The contractor shall give notice in writing to the Superintending Engineer when the work is so ready to be handed over, and shall be responsible for its maintenance until it is taken over by the Superintending Engineer.

7-3 PLANS AND SPECIFICATIONS

7-3-1 Intent of the Plans and Specifications :

The contractor drawings together with the contract, specifications, are intended to show and explain the manner of executing the work and to indicate the type and class of materials to be used

7-3-2 Conformance:

The contractor shall perform all work in a substantial and acceptance manner in accordance with the plans and specifications and in accordance with such further explanatory drawing details and instructions as may from time to time be given by the Superintending Engineer.

If the work shown on any such further drawings or details, or other work necessary to comply with any such instructions, directions, or explanations, be in the opinion of the contractor, of a nature which the Schedule 'A' in the contract does not legitimately cover, he shall before proceeding with such work give notice in writing to this effect to the Superintending Engineer. In the event of the Superintending Engineer and Contractor failing to agree as to whether or not there is any excess rate to be fixed and the Superintending Engineer deciding that the contractor is to carry out the said work, the contractor shall accordingly, do so, and the question whether or not there is any excess, and if so the amount thereof shall failing agreement, be settled by an Arbitration as provided in the arbitration clause, unless the subject is one which is left to the sole discretion of the Superintending Engineer under Clauses of these Specifications and the contractor shall be paid accordingly.

It shall be responsibility of the contractor to give timely notice to the Superintending Engineer regarding anything shown on the drawings and not mentioned in the specifications, or mentioned in the specifications and not shown on the drawings, or any error or discrepancy in drawings or specifications and obtain his orders there on. Figured dimensions are to be taken and not those obtained by scaling out. In any discrepancy between drawings and specifications the latter shall prevail. In any such case or in contractor shall forthwith apply to the Superintending Engineer for such further instructions, drawings or specifications as he requires, it being understood that the subject is to be dealt with under the building procedure of best modern practice. The Superintending Engineer will furnish the further instructions, drawings, or specifications, of in his opinion, they are required by competent workmen, for the proper execution of the work.

7 -3-3 Increased or decreased Quantities:

The right is reserved at any time during which the contract is in force, to make such alterations in the plans on the quantities of work as may be necessary including the extension or shortening of the length of the project. Such alterations shall, in so far as practical, be ordered in writing before standing work on such alterations, and no sign drawings shall be taken as in itself as order for variation unless accompanied by a covering letter from the Superintending Engineer confirming that the drawings is an authority for variation further, the quantities of any items of work may vary from the quantities in Schedule 'A' due to unforeseen or other conditions.

Alterations in quantities shall not be considered as a waiver of any conditions of the contractor invalidate any of the provisions thereof. A supplemental Agreement with the contractor for the items or . items involved will be necessary when the alterations involved the following:

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An increase or decrease only up to 25% shall be permitted in the quantity of any item due to variation from the factors used in original design or in the preparation of tender within the originally contemplated scope of work or due to addition or reduction from or changes in design of such contract item. Adjustment of compensation satisfactory to both parties shall have been executed.

Supplemental Agreements for minor items, which have been increased to become major items, will be required for shall cover only the quantity having contract value, determined from the contract unit price, in excess of 6% percent of the total original contract cost. (A major contract items shall be construed to be any Item the total cost of which equal 10 or *greater* than 5 percent of the total contract cost.)

The contractor shall not start work on any alterations requiring a supplemental agreement until the agreement setting forth an equitable adjustment of compensation, satisfactory to both the parties, shall have been executed.

The contractor shall perform the work as increased or decreased.

7-3-4 Copies of Drawings and Specifications:

Two copies of the available drawings and specifications shall be furnished free of cost to the contractor for his own use. Such copies and copies of Supplementary details furnished by the Superintending Engineer shall be kept on the work until the completion and the Superintending Engineer shall at all times have access to them.

7 -3-5 Omitted items:

The right reserved to cancel the portion of the contract relating to any items or portions thereof in any stage of execution if found unnecessary to the work and such omission shall not be a waiver of any condition of the contractor or invalidate any of the provisions thereof.

7-3-6 Extra Work:

In connection with the work covered by the contract the Superintending Engineer may, at any time during its progress, order for other works or materials incidental thereto. All such work and materials as do not appear in the proposal or contract as a specific item accompanied by unit price and which are not include under the price bid for other item in the contract shall be designated as Extra Work.

Extra work may also consist of additions to or charges in design in contract items or portions thereof when such additions are wholly disassociated from or outside the scope of the work of evidence by the plans, special provisions and specifications and when the work caused by such additions or charges in design must be performed under conditioned or in a manner that is materially and inherently different from the conditions and manner existent for such contract items as contemplated in original scope of the work.

The contractor hereby agrees to and he shall perform extra work whenever it is deemed necessary or desirable by the Superintending Engineer to complete fully the work as contemplated, and it shall be
. done in accordance with the requirements herein set forth.

The contractor shall not perform any extra works until a Supplemental Agreement setting forth a basis of payment satisfactory to both parties as herein after provided, has been executed, claims for compensation for extra works performed which has not been authorized and not covered by Supplemental Agreement may be rejected.

The Supplemental Agreement for extra work may provide for payment on an agreed unit price basis for the units of such extra work performed in and agreed lumpsum for the work described, or on the basis of actuals in conformity with clause.

7-3-7 If Extra Work is to be performed on the basis of actuals the Supplemental Agreement shall specify the agreed rates of wages and allowances to be paid for foreman, labour and terms, and the agreed rental rate to be paid for each piece of equipment other than small tools, which rental rate shall include fuel, lubricants, moving, and other costs incidental to the use of such equipment.

7-4 MATERIALS AND WORKMANSHIP

7-4-1 Quality of Materials: It is the intent of these specifications that first class materials shall be used throughout the work, . and that they shall be incorporated in such a manner as to produce completed construction which is workmanlike and acceptable to the Superintending Engineer in

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every detail. Only materials which conform to the requirements of these specification shall be furnished or incorporated in the work. The contract shall upon the request of the Superintending Engineer furnish him with the vouchers to prove that the materials are such as specified.

Samples of materials with test certificate have to be furnished at the contractors expenses for the approval of the SE. / E.E. prior to the execution of any work.

7-4-2 Source of Materials

All such materials be obtained from the source designated in the contract. If sources previously approved are found to be unacceptable at any time and fail to produce materials satisfactory to the Superintending Engineer the contractor shall furnish materials from other approved sources. The contractor will not be reimbursed for any expenses in developing the new source.

If the contractor decides to investigate, new source of supply, he shall furnish without charge such preliminary samples as the Superintending Engineer may require. Tests must be made on these samples by the contractor at his expenses under the directions of Superintending Engineer/and report rendered, but it is understood that such tests are for informatory purposes only. Only materials actually delivered for use will be considered and their acceptance will be based solely upon the results of the tests made on these materials. The change to the new source initiated by the contractor shall not be a ground for his demanding any compensation or extensions of time.

7-4-3 Corporation Furnished Materials:

The contractor shall furnish all materials required to complete the work, except such materials as are designated to be furnished by the department.

Upon written request of the contractor such materials will be delivered to him with a reasonable time at the points designated in the contract. They shall be unload and hauled to the site for the work by the contractor at his expense. The cost of handling and placing all materials after they are delivered to the contractor shall be considered as included in the contract unit prices for the items in connection with they are used.

The contractor shall be responsible for all materials delivered to him, and shall use them only for the purpose of the contract. Deductions will be made from any amount due to him to make good any damage shortage or decency, from any cause whatsoever which may occur after such delivery or for any demurrage charges sue to delinquency in unloading.

If the materials are furnished by the department the Corporation shall have a lieu upon the surplus . quantities of each materials and the contractor shall deliver them as directed by the Superintending Engineer and at the contractor's expenses.

7-4-4 Tests:

All test of materials furnished by the contractor shall be done in accordance with commonly recognized methods of Indian or of other National Organizations or such other methods and test as are prescribed in the specifications or are in use in conformity with the standard practices of the department and the charge therefore will be borne by the Department.

Field tests of materials will be made by the Superintending Engineer when deemed necessary and these tests shall be made in accordance with the standard practice. The cost of labour involved in all such field tests will be borne by the contractor.

The contractor shall upon demand, forward for the Superintending Engineer's inspection test certificates by the suppliers for all materials furnished by the contractor.

7 -4-5 Inspection of Materials:

The contractor shall provide proper facilities at all times for the inspection and testing of materials, and the Superintending Engineer shall have access at all times to the place of storage or manufacture. The contractor shall give sufficient advance notice of placing orders so as to permit tests to be completed before the materials are Incorporated in tl1e work and he shall afford such facilities as the Superintending Engineer may require for collecting and forwarding samples and making inspection. The contractor shall . not make use of or incorporate in t he work the materials represented by the samples until tests have been made and the materials found to be in accordable with the requirements of the specifications.

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All stored materials shall be inspected at the time of use in the work even though they may have been inspected and approved before being placed in storage or during storage.

Materials may be inspected and tested at any time during the progress of the work and defective materials rejected

7-4.6 Defective Materials:

All materials not confirming to the requirements of these specifications shall be considered as defective and all such materials, whether in place or not shall be rejected. They shall be removed immediately by the contractor at his expense and replaced with acceptable material. No rejected material, the defects of which have been subsequently corrected, shall be used on the work until approved in writing has been given by the Superintending Engineer. Upon failure on the part of the

contractor to comply with any order of the Superintending Engineer made under the provisions of this article within the time stipulated by the Superintending Engineer, the Superintending Engineer shall have authority to remove and replace the defective material and recover the cost of removal and replacement from the contractor. Further, all such defective material lying at site not removed and replaced within 30 days after issue of notice by the Superintending Engineer if the Superintending Engineer so decides, shall become the property of the Corporation and the Superintending Engineer shall dispose of such material in any manner without any further written notice to the Contractor.

7-4-7 Storage of Materials:

The contractor shall deposit materials in such parts only of the ground as may be approved by the Superintending Engineer. He shall submit for the approval of the Superintending Engineer before starting the work, a detailed site survey clearly indicating the locations where materials shall be stored and sheds built. Such of the land, as is vested in the Corporation around the site, shall be given to the contractor. A monthly land rent of Rs.2 per ground will be charged. If any extra space is required the contractor should make his own arrangement with private parties. Storage sites be vacated immediately upon completion cleared of all surplus materials and debris and restored as neatly as possible to their original condition by the contractor at his expense.

Materials shall be stored as to insure the preservation of their quality and fitness for the work. When considered necessary by the Superintending Engineer they shall be placed on wooden platforms or other hard, clean surfaces and not on the ground. They shall be placed under cover when so directed and the contractor shall erect and maintain at his own cost temporary weather proof sheds for the purpose. Stored materials shall be so located as to facilitate prompt inspection.

7-4-8 Measurement and Mixing:

In the case of loose materials such as sand, broken stone, mortar, etc. the proportions demanded by the specifications must be measured in properly constructed measuring boxes, or in such other manner as shall be instructed by the Superintending Engineer. Measurement is not to be done in loose heaps when intimate mixtures such as mortar, concrete etc. are to be formed. The mixing must always be done on closely constructed platforms so that there will be no leakage of any of the materials through the floor of the platform and also so that no foreign materials can be incorporated during mixing. These platforms must be approved by the Superintending Engineer. The cost of such measuring boxes and platforms and all the work referred to here in shall be borne by the contractor.

7-4-9 Authority of Superintending Engineer: All works shall be done under the supervision of the Superintending Engineer and to his satisfaction. He shall decide all questions which arise as to the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of plan and specifications, and acceptance fulfillment of the contract. He shall determine the amount and quality of work performed and materials furnished and his decision and measurement shall be final. In all such matters and in any technical question which may arise touching the contract, the Superintending Engineer decision shall be final and binding on the contractor.

The Superintending Engineer shall have power to enforce such decision and orders of the contractor fails to carry them out promptly. In case of failure on the part of the contractor to execute work ordered by the Superintending Engineer the Superintending Engineer may give notice in writing to the contractor, and at the expiration of the reasonable period specified in the notice

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proceed to execute such work as may be deemed necessary and the cost thereof shall be recovered from the contractor.

7-4-10 Departmental Representatives:

The Superintending Engineer during his absence of the work shall be represented by one of his subordinates whose duties in relation to the contractor shall be confined to ensuring that the work is performed in conformity with the plans and specification in all respects. He shall communicate to the contractor the instructions and directions of the Superintending Engineer on all questions relating to the work and the contract or shall comply with such instructions and directions. He shall request the contractor in writing to suspend the performance of any part of the work if, in his judgment the contractor is deviating from the plans and specifications inspite of his constructions and the contractor shall comply.

7 -4-11 Co-operation by Contractor:

The contractor shall give the work his constant attention to facilitate the progress thereof, and shall co-operate with the department in every way possible. He shall have on the work at all times a competent representative who can speak the local language, authorized to receive orders and act for him.

The contractor shall provide all staff that is necessary for proper setting out, supervision, execution and measurement of work in full compliance with the contract. Persons employed to supervise the work shall have adequate qualifications and experience of similar works and shall be able to supervise the work to the satisfaction of the Superintending Engineer.

The contractor shall, on request from the Superintending Engineer promptly cease to employ in connection with the contract and replace any person whose continued employment in connection therewith is in the opinion of the Superintending Engineer undesirable. He shall not be re-employed in connection with the contract without the written permission of the Superintending Engineer. The decision of the Superintending Engineer upon any matter arising under this condition

7-4-12 Detailed Setting Out:

The contractor shall be responsible for the correct time and proper setting out of the work and for the correctness of the positions, levels, dimensions and alignments of all parts of the works and for the provisions of all necessary instruments, appliances and labour in connection therewith. If at any time during the progress of the works any error shall appear or arise in the position, levels, dimensions or alignment . of any part of the works the contractor on being required to do so by the Superintending Engineer shall at his own expenses rectify such error to the satisfaction of the Superintending Engineer. The checking of any setting out by the Superintending Engineer shall not in any way relieve the contractor of his . responsibility for the correctness thereof and the contractor shall carefully protect and preserve and bench marks, constructions stake and other thinks used in setting out the work.

7-4-13 Inspection and Works:

All materials and each part or detail of the work shall be subject at all times to inspection by the Superintending Engineer and the contractor will be held strictly to the true intent of the specifications in regard to quality of materials, workmanship and the diligent execution of the contract. The Superintending Engineer shall be allowed access at all times to all parts of the work and to places of storage or manufacture, and shall be furnished with such information and assistance by the contractor as required to make a complete and detailed inspection.

7-4-14 Uncovering for Inspection:

No additional compensation shall be mad~ for removing, uncovering and replacing any portion of the work in connection with routine inspection.

The contractor shall, if the Superintending Engineer requests, remove or uncover such portio:1s of the finished work as the Superintending Engineer may direct before the final acceptance of the same. After such special examination, the contractor shall restore them to the standard

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required by the specifications. If no instructions of the Superintending Engineer were contravened in covering up the work, and if the work on being exposed and examined proves acceptable, the cost of uncovering and of restoration shall be paid as extra work but if the work proves unacceptable, the cost shall be borne by the contractor.

If the contractor fails to uncover or having uncovered fails to restore within the time stipulated by the Superintending Engineer he may employ other workmen for these operations, and debit the contractor with the cost of uncovering and restoration if the work proves unacceptable.

7-4-15 Removal of defective and unauthorized work:

The superintending Engineer may reject at any stage before final acceptance any work that he considers to be not in conformity with the plans and specifications, or any extra Works done without authority and such work will not be measured and paid for.

All work which has been rejected shall be remedied or removed and replaced promptly in an acceptance manner by the contractor at his own expense. Upon failure on the part of the contractor to comply with any order of the Superintending Engineer under the provisions of these articles a written notice shall be issued by the Superintending Engineer to the Contractor demanding compliance with a stipulated time. If the contractor continues to default till the expiry of the period of notice the Superintending Engineer shall have authority to cause defective work to be remedied, or removed and replaced, or to cause unauthorized work to be removed, and to recover the cost thereof from the contractor.

In Lieu of rejecting work done or materials furnished not in conformity with the contract, the Superintending Engineer may allow such work or materials to remain, provided the Superintending Engineer is satisfied with the quality of the materials or the strength and structural safety of the work, and in that case shall make such deductions for the difference in value as in his opinion may be reasonable on the written certificate of the Superintending Engineer.

7-4-16 Penalty for poor quality of work:

Notwithstanding the provisions as contained in clause 7-4-15, the contractor is also liable for a penalty of 5% of the value of the poor quality of work done which is rejected by the Exe. Engineer which penalty will be deducted from any amount to be paid to the contractor by the Corporation of the contractor will be required to remit the amount in the Corporation treasury immediately before proceeding with further work as per directions of the Exe. Engineer.

7-5 RESPONSIBILITIES AND LIABILITIES OF THE CONTRACTOR

7-5-1 Laws to be observed:

The contractor shall at all times observe and comply with all Union and State Laws, local laws, ordinances and regulations which in any manner affect the conduct of the works and all such orders as exist at the present and which may be enacted in the future by legislative bodies or tribunals having legal jurisdiction or authority over the work and no plea of misunderstanding or ignorance thereof will be considered. He shall indemnify and save harmless the Corporation and all its officers, agents, employees and servants against and claim or liability arising from or based on the violation of any such law, ordinance, regulation, order or decree whether by himself or by his employees.

He shall also assure that no attachments are made against materials on works forming part of or for the use of the contract.

All scaffolding runways, hoists and other temporary construction shall comply with all pertinent requirements of Union and state Laws, local law ordinances and regulations.

7.5.2 Public Safety:

This article defines the contractor's responsibility with regard to providing for the safety of the public during constructions.

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The contractor shall furnish, erect and maintain such fences, barricades lights and signs as are necessary to give adequate warning to the public at all times that bridge is under construction and of any dangerous conditions to be encountered as a result thereof in accordance with any departmental type designs or as directed by the Superintending Engineer.

At any and all points along the work where the nature of construction operations in progress and the contractor's equipment and machinery in use is of such character as to endanger passing traffic the contractor shall provide such lights and signs and station such guards as may appear necessary to prevent accidents and avoid damage or injury to passing traffic.

No material or equipment shall be stored where it will interfere with the free and safe passage of traffic. At the end of each day's work and another items when construction operations are suspended for 3rd reason, the contractor shall remove all equipment and other obstruction from that portion of the road open for use by traffic '

Full compensation for the work involved in carrying out the precautionary and safety measure above specified shall be considered as included in the prices paid for the various contract items of work and no additional allowance will be made therefore.

7-5-3 Accidents:

It shall be the contractor's sole responsibility to protect the public and his employees against accident from any cause and he shall indemnify the Corporation against any claims for damages for injury to person or property, resulting from any such accidents, and shall, where the provisions of the Workmen's Compensation Act apply, take steps to properly insure against any claims there under.

The contractor shall take out the insurance against any accidents at work site as mentioned above before the commencement of the work and produce the insurance policy before the payment of first part bill.

Within 24 hours of the occurrence of an accident which results in the death or which is so serious as in all probability to result in the death of any workman employed by the contractor, he shall intimate in writing to Superintending Engineer the fact of such accident. The contractor shall indemnify the Corporation against all loss or damage sustained by it resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines if any payable by the Corporation as a consequence of its failure to give notice under the Workmen's Compensation Act or otherwise conform to the provisions of the said Act in regard to such accident.

7-5-4 Responsibility for Damage claims:

The contractor shall indemnify and save harmless the Corporation, its officer and employees from all suits actions or claims of any character brought because of any injuries or damages received or sustained by any person, persons or property on account of the operations of the said contractor or on account or in consequence of any neglect in safeguarding the work, or through use of unacceptable materials in constructing the work or because of any act or omission, neglect or misconduct of said contractor, or because of any claims or amounts recovered for any infringement of patent, trade mark or copy right, or from any claims or amounts arising or recovered under the Workmen's Compensation Act, or any other law, ordinance, order or decree; and so much of the money due to the Contractor under and by virtue of his contract as shall be considered necessary by the Superintending Engineer for such purposes may be retained for the use of the Corporation.

The Corporation shall not be liable to the contractor for damages or delays resulting from work by third parties or by injunctions or other restraining orders obtained by the third parties.

7-5-5 Protection and Restoration of Property:

If corporate or private property interfere with the work the contractor shall notify in writing the owners of such property advising them of the nature of the interference and shall arrange with them for the disposition of such property. The contractor shall furnish the Superintending Engineer with copies of such notified and final agreements.

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The contractor shall use every precaution to prevent the damage or destruction of corporate or private property including building, etc., He shall protect or carefully preserve all official survey monuments, bench marks, boundary stones, etc., until the owner or an authorized agent has witnessed or otherwise ~ referenced their location or re-location. The contractor shall notify the Superintending Engineer of the presence of any such surveyor property monuments as soon as they are discovered.

The contractor shall be responsible for the damage or destruction of property of any character resulting from any of his acts or defaults or from defective work or materials, and such responsibility shall not be released until the work is completed and accepted.

Whenever public or private property is damaged or destroyed the Contractor shall at his own expenses restore such property to a condition similar to or equal to that existing before such damage or injury was done, or he shall otherwise make good such damage or injury in the acceptable manner. If he fails to do so, the Superintending Engineer may, after the expiration of a period of 48 hours, after giving notice to him in writing, proceed to repair, build or otherwise restore such property as may be deemed necessary. and the cost thereof shall be recovered from the contractor.

7-5-6 Contractor's Risk and Insurance:

The work executed by the contractor under the contract shall be maintained at the Contractor's Risk until the work is taken by the Superintending Engineer. The Contractor shall accordingly arrange his

own insurance against fire and other loss or damage occasioned by or arising out of acts of God in . particular unprecedented flood, volcanic eruptions earthquake or other convulsion of Nature, invasion, the act of foreign enemies, hostilities or war like operations (before and after declaration of war), rebellion Military or unswayed power of civil war.

7-5-7 Night and Holiday Work Prohibited without permission :

No work shall be done on holidays or during nights without the written permission of the Superintending Engineer and the Contractors shall comply with the provisions of the Factories Act, if and so far as they are applicable.

7- 6 PROSECUTION AND PROGRESS

7-6-1 Sub-letting or Assignment Contract:

The contractor shall not assign, transfer, convey, sell or otherwise dispose of the whole or any part of his contract, his right title, or interest therein, or his power to execute such contract, to any person, firm partnership or Corporation without written consent of the Commissioner.

If the contractor sub-lets the whole or any part of the work to be done under this contract he shall not under any circumstances be relieved of his liabilities and obligations. All transactions of the Superintending Engineer shall be with the contractor, sub-contractors shall be recognized only in the capacity of employees or workmen and shall be subject to the same requirements as to character and competence.

7-6-2 Commencement of Work:

Within 10 days from the date on which notice that the site is thereby handed over to him is served . on the contractor, he shall begin the work duly notifying the Superintending the date of such commencement. The contract time shall start on the date on which the contractor shall start construction operations as preparatory works and in any event within 10 days from the date on which the above notice is served or1 the contractor.

The contractor under no circumstances be entitled to claim any damage from the Corporation if he incurs any expense or liabilities under the contract before the date of commencement defined above. He shall have the right to withdraw from the contract and obtain only refund of the earnest money and security deposit if intimation of handing over the site is delayed for more than a period of sixty days from the date acceptance of the agreement by the competent authority.

7-6-3 Suspension of Work:

The Superintending Engineer Shall have authority to suspend the work, wholly or in part, for such period of times as he may deem necessary due to unsuitable weather or such other conditions as are considered unfavourable for the satisfactory prosecution of work, or for such time as is

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necessary by reason of failure on the part of the contractor to carry out orders given, or to perform any or all provisions of the contract: and no additional compensation shall be paid to the contractor because of such

suspension In the even of such suspension of work the contractor shall store all materials in such manner that they will not obstruct or impede the travelling public unnecessarily or become damaged in anyway, and he shall take every precaution to prevent damages or deterioration of the work performed,

provide suitable drainage of the roadway, and temporary structures where necessary. The contractor shall not suspend work without written authority

7-6-4 Delay and Extension of Contract Time of Completion:

The time for completion of the work contemplated will be specified in the proposal and contract and it is understood that the completion of the work the time specified is an essential part of this contract. If any delay in the completion of the work is alleged to be or likely to be caused by reason of any of the following circumstances, viz.,

- (a) The execution of any modified in additional work.
- (b) delay caused by any written instructions issued by the Superintending Engineer
- (c) any act or default of the Superintending Engineer including failure to issue necessary instructions upon written request from the contractor.
- (d) any of the accepted risks under Clause 7-5-6
- (e) any circumstance which are wholly beyond the control of the contractor and unavoidable.

The contractor shall upon the occurrence of the alleged cause of delay, give notice thereof in written to the Superintending Engineer within fourteen days of the commencement of the delay and he shall allowed a reasonable extension of time for completion in respect of any delays caused by any of the above mentioned circumstances. The Superintending Engineer shall assess the period of delay, at twenty five percent in excess of the actual working period so lost and extend the time of completion of the contract. . In assessing any extension of time, account shall be taken of the effect of the omission of any work. Any further extension of time under the provisions herein before contained may be allowed notwithstanding that the contractor has failed to give notice of the cause therefore or that the date for completion may have passed or that the work may have been completed.

7-6-5 Determination of Contract due to Default or failure of the Contractor:

The commissioner may without prejudice to the rights of the Corporation against the contractor in respect of any delay or inferior workmanship or otherwise, or to any claims for damage in respect of any breaches of the contract and whether the date for completion has or has not elapsed by notice in writing absolutely determine the contract in any of the following cases:-

(a) If the contractor, having been given by the Superintending Engineer a notice in writing to rectify reconstruct or replace any defective work or a notice in writing that the work is being performed in an inefficient or otherwise improper manner or that the commencement of the work is being delayed or has been suspended so that in judgment of the Superintending Engineer the contractor will be unable to secure the completion of the work by that date, for completion or he has already failed to complete the work by that date shall omit to comply with the requirements of such notice for a period of seven days thereafter. Such notice under the provisions of this Articles and must specify the act or default on the part of the contractor upon which it is based:

(b) (i) If the contractor being an individual or where the contractor is a firm or any partner in that firm shall, at any time become bankrupt, or shall have a receiving order made against him or shall make any composition or arrangement with or for the benefit of his creditors, or shall make any conveyance or assignment for the benefit of his creditors, or shall purport to do so; or

(ii) If the contractor, being a company, shall pass a resolution, or the Court shall make an order that the company be wound up, or if receiver or manager on behalf of creditor shall be appointed or if circumstances shall arise which entitle the Court or a creditor to appoint a receiver or manager entitle the court to make a winding up order.

(c) If the contractor dies, becomes insane or is imprisoned:

Provided always that such determination shall not prejudice or affect any right of action or remedy which shall have accrued or accrue thereafter to the Corporation.

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Provided further, that after the notice under condition (a) herein shall have been served on the contractor he shall not be at liberty to remove from the site of the work or from adjoining ground any plant materials and equipment belonging to him and placed thereon for the purpose of the work. and the Corporation shall have a lien upon all such items subsisting from the date of such notice until the notice ! shall have been complied with the Superintending Engineer shall have power to post watchman at the site of the work and / or the ground continuous there to prevent the removal of any plant, materials and equipment upon which the Corporation shall a lien.

7-6-6 Forfeiture and Partial Determination:

Notwithstanding the failure of the contractor to comply with the notice served on him under clause 7-6-5(a) herein, the Superintending Engineer may in his discretion permit the contractor to proceed with the work in conformity with the contract. Such permission shall carry with it the forfeiture of the sum of money not exceeding 5 percent of the total of the finished contract amount provided however that this forfeiture may be modified or revoked by Commissioner.

It shall be further right to the Commissioner under this para, to determine any part of the contract and to proceed with the execution of the relative portion of the work through any other agency in order to maintain the rate of progress stipulated in the contract. Such omission shall not be a waiver of any condition of the contract nor invalidate any of the provisions thereof. The contract shall diligently proceed with the portions of the work left to him and payment of money due or may become due shall only be made after deducting there from the extra cost as ascertained by the Superintending Engineer that . may be involved in executing parts of the work through other agency. The decision of the Commissioner in this respect shall be final adobe final and conclusive:

7-6-7 Provisions in case of Absolute Determination of Contract:

If the Commissioner sh~11 in the exercise of the powers contained in Clause 7-6-5 and the value of such as may have been executed but not paid for and al) other sums of money that may then be due or becoming due from the department to the contractor shall cease to be due or become due.

(1) (a) The earnest money, the security deposit, the total withheld under clause 7-7-7 and the value of such work as may have been executed but not paid for and all other sums of money that may then be due or becoming due from the department to the contractor shall cease to be due or become due.

(b) The Commissioner may enter upon and take possession of site and of the materials, tools, plant and equipment thereon, and may purchase materials and do all other acts requisite, for the completion of the work. i.e, may employ other contractors to complete the same, and the contractor shall have no claim whatsoever in respect of such action by the Commissioner,

(c) The contractor shall, if required by the Commissioner assign to the Corporation without further payment, the benefit of any sub-contract or sub-contracts he may have made in connection with the contract and the Corporation shall pay to such person or persons the price (or the balance thereof remaining unpaid), which the contractor may have agreed to pay there under.

(d) Upon completion of the work Superintending Engineer shall certify the cost of completion, which shall include

(i) The cost of any materials purchased and labour provided to secure completion of the work, including the making good of any defects and faulty work, together with the addition of such percentage to cover supervision and establishment charges as may be decided by the Superintending Engineer.

(ii) The cost of work, executed by other contractors to secure completion of the work, including the making good of any defects and faulty work:

(iii) The cost of maintenance of the portion of the work completed by the contractor.

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(2) If the cost of completion, after taking into account all credits from any sales of materials, plant and equipment brought on the site by the contractor prior to the date of determination, added to the actual sums paid to the contractor upto this date is less than the sums which would have been payable to the contractor for due completion, the contractor shall be paid the difference provided that the amount so payable shall not exceed the aggregate of:-

(i) the value of the work executed upto the date of determination;

(ii) the value of such of the said materials as are subsequently incorporated in the work or otherwise disposed of; and

(iii) the value of any such plant and equipment disposed of less the amount already paid under the contract. Any such materials, plant and equipment as are unsold or unused when the works are completed shall be returned to the contractor.

(3) If the cost of completion added to the sum actually paid to the contractor upto the date of completion exceeds the sum which would have been payable to the contractor for due completion and the Commissioner may apply the proceeds of the sale of plant, materials and equipment provided by the contractor on the site in reduction of such excess and any deficit shall be recoverable from the contractor, If after such excess has been met, there remains any residue of the proceeds of the sale of the plant, materials and equipment any unsold plant, materials and equipment shall be paid or returned to the contractor as the case may be.

(4) In the event of determination of the contract or account of the death, insanity, insolvency or imprisonment of the contractor, the notice of determination of contract required under Clause 7-5 shall be posted at the site of the work and advertised in one issue of the local dailies. The provisions of the preceding paragraphs (1) to (3) of this Article shall then take effect, and payment shall be made and unsold plant, materials and equipment shall be returned to the person or persons entitled to receive and give a valid discharge.

7-6-8 Special Powers of Determination:

These powers shall be exercised in the event of complete stoppage or abandonment of work under the orders of the Corporation Council or Government.

(a) The Commissioner shall, in addition to any other powers enabling him to determine the contract have power to determine the contract at any time by notice in writing to the contractor, and upon receipt by the contractor of the notice the contract shall be determined but without prejudice to the rights of the parties accrued to the date of determination and to the operation of the following provisions of these Articles.

(b) The Commissioner shall, as soon as practicable and in any case not later than the expiration - of three months from the date of such notice of the period up to the date for completion, whichever is the shorter, give directions (with which the contractor shall comply with all reasonable directions) as to all or any of the following matters. that is to say:

(i) the performance of further work in accordance with the provisions of contract.

(ii) the protection of the work executed under the contract in compliance with directions given under sub-paragraph (1) above.

(iii) the removal of all plant, temporary buildings and equipment from the site;

(iv) the removal of materials placed on the site;

(v) the clearing of the site;

(vi) any other matter arising out of the contract with regard to which the Commission decides that directions are necessary or expedient.

(c) The commissioner may at any time within the period referred to in paragraph (b) herein by notice in writing to the contractor vary any direction so given or give fresh directions as to all or any of the matters specified in the foregoing paragraph.

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(d) In the event. of the determination of the contract under this condition there shall be paid to the contractor the net amount due as ascertained in accordance with all t he applicable provisions of Clause 7-7 hereof including valuation in the same manner as increased or decreased quantities, extra work and omitted items.

These shall be deducted from any sum payable to the contractor under this sub-clause the amount of all payments previously made to the contractor in respect of the contract, and the Commissioner shall ! have the right to retain any reserve accumulated in his possession at the date of determination until the final settlement of all claims made by the contractor

(e) Any dispute of difference: which may arising between the parties as to the carrying out of those conditions shall be referred to arbitration and the provisions with regard to arbitration in Clause 7-8 thereof shall apply.

7-7 MEASUREMENT AND PAYMENT

7-7-1 Measurement of Quantities: All work to be paid for at a contract price per unit of measurement shall be measured by the Superintending Engineer in accordance with the methods set forth in the relevant specifications. Quantities of material wasted or disposed off in a manner not called for under the contract, or rejected material whether placed- or not or materials placed outside of the lines indicated on the plans or given by the: Superintending Engineering or material remaining on hand after completion of the work will not be measured or paid for. No compensation will be allowed for hauling back materials.

The contractor shall from time to time: when required on reasonable notice by the Superintending Engineer or his representative, attend at the works in order that any measurements or check measurements of the work executed that may be necessary for preparation of a bill may be taken by the Superintending Engineer representative. Any such measurements or check measurements when performed and any differences arising thereon shall be duly recorded in the manner, required by the S.E.'s representative, and the Superintending Engineer decision shall be final and conclusive. The contractor shall without extra charge provide assistance with every appliance and other tools and labour necessary for measuring the work. If the contractor falls to attend when so required, the Superintending Engineer I shall have power to proceed by himself to take such measurements or check, measurements and in that I case any decision of the Superintending Engineer shall be final and conclusive and the cost of any labour engaged for the purpose shall be recoverable from the contractor.

7-7-2 Final Payment:

It shall be accepted as a condition of the contract that. the payment of the final bill to the contractor deducting the with held amounts and his acceptance thereof shall constitute a full and absolute release of the Corporation from all further claims by the contractor under the contract.

7-7-3 Payment for increased or decreased Quantities and Extra Work:

Increased or decreased Quantities shall be paid for at the contract unit prices listed in Schedule 'A' if no Supplemental Agreements are required, and at the unit prices in the Supplemental Agreement is required in conformity with Clause 7-3-3.

Extra work shall be paid for in accordance with the Supplemental Agreement covering the extra work required in confirming with clause 7-3-6. The unit price of extra work shall be deduced from the unit price for similar items listed in Schedule 'A'.

Non- Tendered items: In case of items of works where supplement agreement is to be entered into the following procedure will be adoptt:1d.

For items of work for which the rates can be derived from the rates for the items in the original agreement: the rates will be derived by applying the overall tender premium or discount to the rate for the new item and by applying the prorate excess or discount for the item of work, from which the rate is derived, the lesser rate of these two will be adopted for making payment to the contractor.

For items of Work for which the rates cannot be derived from the rates for the items in the items in the original agreement, the rates for payment will be as follows:

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- (a) When schedule of rates has to changed during the period from the date of execution of the original agreement to the date of supplemental agreement the rates for the supplemental agreements as per the prevailing schedule of rates with the tender premium or discount applied.
- (b) When the schedule of rates has changed during the intervening period, rate arrived at as per the schedule of rates at the time of execution of supplemental agreements will be adopted with no tender premium or discount applied to this rate.
- (c)

If the Superintending Engineer and the contractor fail to agree on a rate for payment for extra work, payment will be made on the actual cost of labour, of materials including conveyance, and local supervision solely engaged on the extra work, together with 10 percent of the total of the items as certified by the Superintending Engineer. To enable the Superintending Engineer to evaluate the extra work the contractor shall furnish the Superintending Engineer with all connected books of account, vouchers, and other documents in support of the claim within seven days after such extra work is completed. Reasonable compensation shall also be allowed for the use of contractor's tools and plant on the extra work and for such materials as are used for staging, form work, curing, etc. If the Superintending Engineer considers that payment of Such work on the basis of the vouchers presented is unduly high, he shall make payment in accordance with such valuation as he considers fair and reasonable and his decision in the matter shall be final, if the amount involved in the extra payment is Rs.1,000 or less for each occasion on which such extra works are authorized. If the amount exceeds Rs.1,000 the Contractor shall have the right to submit the matter to arbitration under the provisions of Clause 7-8.

If, in the opinion of the Superintending Engineer a unit price or lumpsum compensation for the extra work cannot be arrived at prior to execution of the work, the payment thereof shall be dealt with as provided for in the preceding paragraph.

7-7-4 Unauthorized Extras :

It shall be clearly understood that no payment whatever will be made to the contractor for extra work unless it has been authorized in writing by the Superintending Engineer.

7-7-5 Accounts, Receipts and Vouchers:

The contractor shall at any time, upon the request of the Superintending Engineer furnish him with all invoices accounts receipts and other vouchers that he may required in connection with the contract.

7-7-6 Fraud, Wilful Neglect or Default:

No final or other Certificate or payment or completion, acceptance, or settlement of account shall, in any circumstances, relieve the contractor of his liabilities for any fraud or wilful neglect in the execution of the contract, or any wilful or unauthorised deviation from the plans, specifications, instructions and directions for the time being upon him.

7-7-7 Unfixed Materials:

No payment or advance will be made for unfixed materials when the rates are for finished work "in situ".

7-7-8 Payment and Certificates:

Payment will be made to the contractor under the certificates to be issued at reasonable frequent intervals by the Superintending Engineer. Within fourteen days of the date of each certificate an intermediate payment will be made of a sum equal to 95 percent of the value of the work, as so certified and the balance of 5 percent will be withheld and retained as a security for the due fulfilment of the contract. Under the certificate to be issued by the S.E. on the completion of the entire works the contractor will receive the final payment of all the moneys due or payable to him under or by virtue of the contract except security deposit, provided there is no recovery from or forfeiture by the contractor to be made under penal clause 7-6-5-, 7-6-6, 7-6-7 and 7-6-8. The security deposit will be paid as per clause 7-4-16.

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No certificate of the Superintending Engineer shall be considered conclusive evidence as to the sufficiency of any work or materials or correctness of measurements to which it relates, not shall it relieve the contractor from his liabilities to make good defects as provided by the contract. The contractor when applying for a certificate, shall prepare a sufficiency 'A' to the satisfaction of the Superintending Engineer to enable the superintending Engineer or the Executive Engineer, or the Assistant Executive Engineer to check the claim and issue the certificate.

7-7-9 Interest on money Due to the Contractor:

No omission by the Superintending Engineer to pay the amount due upon certificate shall vitiate or make void the contract; nor shall the contractor be entitled to interest upon any guarantee fund if the contractor has paid the security deposit in cash or payments, in arrear, nor upon any balance which may on final settlement of accounts, be found due to him.

Whenever the withheld amount reaches Rs.1,000 or a multiple thereof the contractor may at his option, deposit with the Commissioner an equal amount if sum of Rs.1 ,000 or a multiple thereof in any of the forms of interest bearing securities approved for the purpose by the Commissioner endorse in favor of Commissioner in which in which case the equivalent withheld amount shall be paid to him forthwith. The contractor will be permitted to exercise the option in this clause, subject only to the condition that the rate of progress maintained in the Articles of Agreement is properly maintained.

7-7-10 Acceptance of Final Measurement:

The contractor agrees that before payment of the final bill shall be made on the contract, he will sign and deliver to the Superintending Engineer either in the measurement book or otherwise as demanded, a valid release and discharge from any and all claims and demands whatsoever for all matters arising out of or connected with the contract; provided that nothing in this clause shall discharge or release the contractor from his liabilities under the contract. It is further expressly agreed that the Superintending Engineer in supplying the final measurement certificate, need not be bound by the proceeding measurements and payments. The final measurements of the Superintending Engineer shall be final conclusive and binding on the contractor.

7-7-11 Recoveries from Contractor:

In every case in which provision is made for recovery of money from the contractor, Commissioner shall be entitled to retain or deduct the amount thereof from any moneys that may be due or may become due to the contractor under these presents and / or under any other contract or contracts or any other account whatsoever.

7-8 DISPUTES AND ARBITRATION

In case of any dispute or difference between the parties to the contract either during progress or after the completion of the works or after the determination, abandonment, or breach of contract or as to any matter or thing arising there under except as to the matters left to the sole discretion of the Superintending Engineer under Articles 7-4-9, 7-4-11, 7-4-17, 7-7-1 or as to the withholding by the Superintending Engineer of payment of any bill to which the contractor may claim to be entitled then either party shall forthwith give to the other notice of such dispute or difference and such dispute or difference shall be referred to the Arbitrator mentioned in the contract and the award of such Arbitrator shall be final and binding on the parties, progress of work shall not be suspended or delayed on account of the reference of and dispute or difference to arbitration under this clause.

Either party may within a period shall be fixed by the Arbitration file before the Arbitration a statement of the case and also all documents relating to or having a bearing on the case. The Arbitrator shall not be bound to observe the ordinary rules of procedure applicable to trials before judicial tribunals nor to hear or receive formal evidence but may pass an award on the documents and statements of the case filed by the parties or personal inspection or on both. The Arbitration shall have power to view the subject matter of the dispute with or without the parties or their agents to open review and revise any certificate, opinion decision, requisition, or notice, save in regard to the matters expressly exempted and to determine all materials in dispute which shall be submitted to him, and of which notice has been given as aforesaid, in the same manner as if no such certificate, opinion, decision, requisition or notice been given.

The expenses of such reference to Arbitration shall be awarded by the Arbitrator in his discretion, subject to the condition that the amount of expenses awarded to either party shall not exceed the limits set forth below, irrespective of the actual expenses incurred by either party, The

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Arbitration may determine the amount of expenses to be awarded or direct the same to be shared as between solicitor and client or as party and party, and shall direct by whom and to whom and in what manner the same shall be borne and paid.

The limits referred to in this clause are 5 percent monetary award which does not exceeds Rs.10,000, 3 percent on the next Rs.40,000 or any part thereof, 2 percent on the next Rs.50,000 or any part thereof.

7.9 SAFETY CODE

- 7-9-1** Suitable scaffolds should be provided for workmen for all works that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladder. When a ladder is used an extra mazzdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical)
- 7-9-2** Scaffolding or staging more than 3.6m (12 feet) above the ground or floor, swung or suspended from overhead support or erected with stationary support shall have a guard rail properly attached, or bolted, braced and otherwise secured at least 90cm (3 feet) high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such opening as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
- 7-9.3** Working platform, gangways, and gangways should be so constructed that they should not sag unduly or unequally, and if the height of the platform or the gangway or the stairway is more than 3.6m (12 feet) above the ground level or floor level, they should be closely boarded, should have adequate width and should be fastened as described in 7-9-2 above.
- 7-9-4** Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90cm (3 feet).
- 7-9-5** Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9m (30 feet) in length while the width between side rails in rung ladder shall in no case be less than 28cm (11 1/2") for ladder up to and including 3m (10 feet) in length. For longer ladder this width should be increased at least 1/4" for each exceed 30cm (12"). Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites of work shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lights to protect the public from accident and shall be bound to bear the expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor, be paid to compromise and claim by any such person.
- 7-9-6 Excavation and Trenching:**
- All trenches, 1.2m (4 feet) or more in depth, shall at all times be supplied with at least one ladder for each 30m (100 feet) in length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 90cm (3 feet) above the surface of the ground. The side of the trenches which are 1.5m (5 feet) or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of sides to collapse. The excavated materials shall not be placed within 1.5m (5 feet) of the edges of the trench or half of the depth of the trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances undermining or undercutting shall be done.

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7-9-7 Demolition: .

Before any demolition work is commence and also during the process of the work:

- {a) All roads and open areas adjacent to the work site shall either be closed suitably protected.
- (b) No electric cable or apparatus which is liable to be source of danger over cable or apparatus used by the operator shall remain electrically charged.
- (c) All practical steps shall be taken to prevent danger persons employed from risk of fire or explosion or flooding, floor, roof or other part of the building shall be so over loaded with debits or materials as to render it unsafe.

7-9-8 All necessary personal safety equipments as considered adequate by the Engineer in charge should be kept available for the use of the person employed on the site and maintained in a condition suitable for immediate use, and the contractor should take adequate stops to ensure proper use of equipment by those concerned.

(a) Workers employed on mixing asphalted materials, cement, lime mortars shall be provided with protective foot wear, protective goggles.

(b) Those engaged in white washing and mixing or stacking cement bags or any materials which is injurious to the eyes shall provided with protective goggles.

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

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

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

i. No paint containing lead or lead products shall be used except in the form of paste of ready made paint

ii. Suitable face masks should be supplied for use by the workers when paint is applied in the form of spare or surface having lead dry rubbed and scraped.

iii. Overalls shall be supplied by the contractors to the workmen arid adequate facilities shall be provided to enable the working painters to wash during the cessation and work.

iv The contractor shall not employed women & men below the age 18 on the work of . painting with products containing lead, in any form. Whenever men above the age of 18 are employed on the work of lead painting, the following principles must be observed for such use:-

1.
 - a. White lead, sulphate of lead or products containing these pigments shall not be used in painting operation except in the form of paste or of paint ready for use.
 - b. Measures shall be taken whenever required in order to prevent danger arising from the application of paint in the form of spray.
 - c. Measures shall be taken wherever practicable to prevent danger arising out from dust caused by dry rubbing down and scraping.
2.
 - a. Adequate facilities shall be provided to enable working painters to wash during and cessation of work.
 - b. Overalls shall be worn by working painters during whole of the working period.
 - c. Suitable arrangements shall be made to prevent clothing put off during working hours being spoiled by painting materials.
3.
 - a. Cases of lead poisoning shall be notified and subsequently verified by a medical man appointed by the competent authorities of Corporation of Chennai.
 - b. Corporation of Chennai may require, when necessary a medical examination of workers.
 - c. Instruction with regard to the special hygienic precautions to be taken in the painting trade shall be distributed to the working painters.

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- 7-9-9** When the work is done near any place where there is risk of drowning, all necessary steps taken for prompt rescue of any person in danger and adequate provisions should be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- 7-9-10** Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following standards or conditions.
1. (a) There shall be of good mechanical construction, Sound material and adequate strength and free from patent repair and defects and shall be kept in good repairs & in good working order.
(b) Every rope used In hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength and free from patent defects.
 2. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any scaffolding winch . or give signals to operator.
 3. In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block . used in hoisting or as means of suspension the safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of hoisting machine having a variable safe work in load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in this paragraph shall be loaded beyond the safe working load excepted for the purpose of testing.
 4. In case of departmental machines the safe working load shall be notified by the Electrical Engineer-in-charge. As regards contractor's machines the contractors shall notify the safe working load of the machine to the Engineer-in-charge whenever he brings any machinery to site of work and get it verified by the Electrical Engineer concerned.
- 7-9-11** Motors, gearing, transmission, electric wiring and other dangerous parts of hoisting appliances should be provided with such means will reduce to the minimum the risk of accidental descent of the load. Adequate precautions should be taken to reduce the minimum the risk of any part of a suspended load becoming accidentally displaced. When workers employed on electrical installations which are already energized insulating mats, wearing apparel such as gloves, sleeves and, boots as may be necessary, should be provided. The workers should not wear any rings, watches and carry keys or other materials . which are the good conductor of electricity,
- 7-9-12** All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in . safe condition and no scaffold ladder or equipment shall be altered or removed while it is in use Adequate washing facilities should be provided at or near places of work,
- 7-9-13** These safety, provisions should be brought to the notice of all concerned by display on a notice boards at a prominent place at work spot, The person responsible for compliance of the safety code shall be named therein by the contractor
- 7-9-14** To ensure effective enforcement of the rules and regulations relating to safety precautions the arrangements made by the contractor shall be open to inspection by the Labour Officer / Engineer - in Charge of the department or their representatives,
- 7-9-15** Notwithstanding the above clause from 7-9-1 to 7-9-14 there is nothing in these to exempt the - contractor from the operations of any other Act or Rule in force,

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8. GENERAL CONDITIONS FOR ALL CIVIL WORKS

8-1 The Tender should enclose a list of the following machineries owned or possessed by him attested by a Gazetted Officer of the Government or an officer of the Corporation of Chennai not below the rank of a Class - II Officer. The tenderer must produce for verification the Original documents for ownership or possession of machineries whenever called for by the Commissioner or any other Officer authorised by the Commissioner to call for such information

- | | | |
|----|------------------------------------|-------------------|
| 1. | a. Hot mix batch per hour capacity | -30 / 40 Tonnes. |
| | b. Mechanical paver finisher | - 1 No. |
| | c Tippers | - 6 Nos. |
| | d Lorries (to transport materials) | - Sufficient Nos. |
| | e.Road roller 8 to 10 tonnes | - 2 Nos. |
| | f. Front end loader | - 1 No. |
| | g. Lab Unit | - 1 No. |
| 2. | a. Portable Hot mix Plant | - 1 No. |
| | b. Road Roller 8 to 10 Tonnes | - 1 No. |
| | c. Heat master Boiler | - 1 No. |

"The Contractor should specify in his tender the location of the Central Mix Plant installed by him for this work for inspection by the Engineers of the Corporation of Chennai"

The Tenders of the Contractors who do not possess the plants specified in the general condition No.1 will not be considered and will be summarily rejected".

8-2 The item of works of repairing, relaying and doing patch works and other improvements are contained in detailed schedule of rates attached.

8-3 The total approximate value of. works will be in all about **Rs 86.16 lakhs** for each contract. This is only approximate to enable the tenderer to have and idea in tendering and also for the purpose of fixing the security deposit.

8-4 The quantities of works specified are also approximate and are meant to enable the tenders to have an idea of the works while tendering.

8-5 The office schedule of rates for each item of work is noted in the attached schedule of rates and the tenderer shall carefully scrutinise these rates and tender one total single percentage less or higher on the whole of the schedule of rates for the contract he is tendering in the accompanying schedule. This less or higher percentage tendered by the tenderer shall apply for each and every item of work of schedule of rates and shall include sales tax and all other taxes in force i.e., the less or higher percentage worked out by the tenderer should cover the sales tax and all other taxes, the tenderer may have to incidentally incur in the execution of the entire work. The accepted less or higher shall be operative on all works, viz, various.....

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during the year..... The tenderer's less or higher percentage offered for each contract will be one single less or higher percentage applicable to each of the items of works in the relevant zones.

Signature of the tenderer

8-6 PROCEDURE FOR EXECUTION OF WORK AND PAYMENT

The following procedure will be adopted:

i. The accepted tenderer will be furnished with an abstract of work to be executed from time to time and straight away asked to carryout the work.

There will be only one agreement which the accepted tenderer has to execute in the beginning for the works to be executed during the year. The work ordered to be carried out shall be commenced within . three days of the receipt of the order for any particular work and completed within the time limit fixed in each individual work order and to the entire satisfaction of the Engineer or his representatives.

- ii. The Contractor's bill for each individual work in each of the zone respective divisions shall be paid on completion treating each work as separate work to facilitate regular payment of the bills.
- iii. Items of work executed and not fully covered in the accompanying schedule of rates will be paid based on schedule of rates subject to the contractor's tender percentage.

8-7 EQUIPMENTS AND PLANT

8-7-1 The Contractor shall furnish, maintain and operate at his expense all tools plants and equipments make it available always at the site viz., Machinery gauges, pyrometer a set of three camber boards, spirit levels, templates for super elevation, strings & stakes, fish line (thin cotton twine) to 60 meter length, Straight edge 3m length, 15 meter tape, Brooms, special tools and equipment for sprinkling water, sign, Barricades, red flags danger lights and other devices for protecting the green surfaces, a bitumen boiler with sprayer attached for tack coat, equipment for transport of mixture power roller 8 to 10 tonnes, etc., which are necessary for proper execution of the works on a scale that would be adequate to ensure satisfactory rate of progress in accordance with the time stipulated in the tender notice.

Hot mix plant with equipment for drying the aggregates, Batching the ingredients and preparing the bituminous mixture to the following requirements.

Means of measuring accurately the batch of stone and bitumen unless otherwise specified the measurements shall be by weight using spring less dial scales.

An efficient driver which, shall completely dry the aggregates without exceeding the stone ~ temperature.

The mixer shall be pugmill or peddle type and maintain through uniform mixing.

The mixer blades shall be adequate in number and size to produce a uniform mixing

The mixer blades shall be adequate in number and size to produce a uniform homogenous mixture,

Means for accurate control of binder temperature

A set of Is-sieves conforming to IS-460-1902 designated 50mm, 25mm, 20mm, 16mm, 12.5 mm, 10mm, 6.3mm, 4.75mm and 2.36mm must be also available at the site for testing aggregate gradation

8-7-2 Contractor to acquire PH Plant boiler & roller

The contractor who tender for road works shall possess their own pH plant boiler & roller within 3 years of their registration as contractor in Corporation of Chennai.

8-8 The tenderers shall clearly state their experience of road works, particularly about hot mix asphalt works mentioning the works carried out by them. .

8-9 The contractor shall install the plant and maintain plant site and stock-yard for keeping other equipments or storing metal and bitumen in any place suitable for the works at his cost. However if any land belonging to the Corporation of Chennai available it will be given under license on nominal license fee to be collected by the Revenue department of the Corporation of Chennai.

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- 8-10** Asphalt plant factory and other equipments shall be installed at the site approved by the Engineer in charge contractors shall maintain a laboratory for testing of asphalt mixes and the materials preparing mixes at the said site.
- 8-11** The contractor shall have a well equipped testing laboratory with competent laboratory staff. Daily tests shall be made by them in the presence of authorised Corporation staff on the asphalt mixtures produced to ensure compliance with this specification and a copy of the test results shall be submitted to the Engineer for record. Tests shall include stability, flow, filler content, grading of Aggregate, bitumen content, specific gravity, valid content etc. The contractor shall give all facilities at all times to the Engineer and his assistants to inspect the work of testings done by them
- 8-12** Each lorry leaving the plant must be weighed on weigh bridges in the presences of the Corporation representatives and a challan must be issued along with the lorry in duplicate showing the weight of the materials loaded in the lorry. As and when require, the said lorries shall be taken to some other weight bridges to check the weight of the materials stated on the challans and the charges for weighing shall be borne by the contractors.
- 8-13 MODE OF PAYMENTS**
All the items of schedule are for the furnished work in situ and the units mentioned therein will be the basis for payments, Payments will be made on the basis of measured quantities of work in accordance with the units specified in the schedule of-quantities ordinarily once in every fortnight, provided the bill am out for
the works executed is not less than Rs, ,
- 8-14 CONDITION OF HIRE OF ROAD MACHINERY IF AND WHEN AVAILABLE**
- 8-14-1** The plant hires out for work will be charged at the specified rate as per Schedule, for a day of 8 hours or part thereof.
- 8-14-2** a. No hire charges shall be levied for authorised holidays or recognized local holidays approved by the Exe. Engineer, A)so no hire charges shall be recovered for days on which the plant and crew do not work on account of break-down or heavy rain, storm or other causes for which the hirer cannot be held responsible.
b. If the plants are kept idle for reasons other than those enumerated above, full hire charges shall be, . recovered from the hirer as per schedule.
- 8-14-3** The Exe. Engineer shall be the sole judge as to the responsibility of the hirer in respect of breakdown or other causes and his decision shall be final and binding on the hirer.
- 8-14-4** In the case of consolidation of types other than those specified, hire charges for the power roller shall be recovered at the rates not lower than those provided in the departmental data for these items of work, in the case where the hired plant works for more then 8 hours in a day hire charges shall be levied for the extra hours on hortly basis, proportionate to the normal hire charges for 8 hours.
- 8-14-5** When the machinery becomes unfit for work due to mechanical break-down or heavy rain or storm, for which the hirer cannot be held responsible in the course of the day, the proportionate hire charges shall be recovered for the work turned out during the day as per schedule or for the number of hours worked, whichever is advantageous to the department.
- 8-14-6** Fuel, Oil etc., required for running the plant shall be supplied by the department, except in the case . of Heat Master Boilers, Hire charges shall be collected from the hirer from the day on which the plant is handed over at section stores till it is returned at the same section stores itself or any other specified place, and the question of transit charges connected with the movement of plant from the place where it was sent to the work site and from site to the place ordered by the departmental officer after work shall not arise.
- 8-14-7** The hirer shall be responsible for the cost of replacing or repairing any loss or damage to the plant while it is in his custody except when it is due to 'Fair wear and tear'. The Exe. Engineer shall

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be the sole judge of what is 'Far wear and tear' and his decision shall be final and binding on the hirer.

8-14-8 The hirer shall employ at his cost, necessary watchman to safeguard the plant.

8-14-9 On the hirer's failure to carryout any of the above provision it shall be open to Exe. Engineer to have the work carried our departmentally or other vise and to recover the cost therefor from the hirer's bill or from any other amount due to the hirer.

8-14-10 It shall also be open to the Exe. Engineer to withdraw the plant and to have its transport, etc. carried out departmentally and to recover the cost thereof from the contractor's bill or any other amounts due to him.

RATE FOR HIRE OR MACHINERY

(i) Road Rollers. 8-10 Tonne	Rs...../- per day of 8 hours or part there of (inclusive of fual lubricants, pay and allowances of opeing crew idle charge Rs...../- per day.
(ii) Road , rollers, 306 Tonne	Rs...../-per hour (inclusive of fuel lubricants. pay and allowances of operating crew.) idle charge Rs...../-per day.
(iii)0 Heat master Boiler	Upto 1500 litre capacity Rs...../- per day of 8hoursor part there of (exclusive of fuel, Lubricants and pay and allowances of operating crew) idle charges Rs...../-per day.
(iv)Portable Hot mix Plant of 0.283 m3 capacity of hopper	Rs...../-per hour (inclusive of fuel running the plant. lubricants and pay and allowances of operating crew but excusive of fuel for heating the aggregates) idle charges Rs...../-per day.

CONDITIONS FOR HIRING OF 8/10 TONNES CAPACITY ROAD ROLLER FOR ROAD WORKS

8/10Tonnes Capacity road roller lent on hire for consolidation works will be eligible at the rate of Rs..... /-per day of a hours or part thereof which includes fuel, lubricants pay and allowances of operating crew provided the roller is not used to give an out turn of consideration surface of more than that specified below for the respective type of consolidation.

SL No.	Type of Consolidation	Out turn
1.	Bituminous macadam 75mm	225 sq. M
2.	Bituminous macadam 50mm	300 Sq .M
3.	D.G.A.C. 40mm thick	300 Sq. M
4.	D.G.A.C. 25mm thick	400 Sq.M
5.	Premix Carpet 25mm thick	400 Sq. M
6.	Premixcarpet 20mm thick	500 Sq. M
7.	Seal Coat	1000 Sq. M
8.	Bituminous macadam 40mm thick	375 Sq. M
9.	Spreading 75mm thick W.B.M.	450 Cubic. M
10.	Spreading gravel	425 Cubic.M

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11.	Earth work	425 Cubic. M
12.	spreading 100mm thickness W.B.M.	350 Sq. M

If however, the out turn of the roller exceeds the above limits proportionate additional hire charges will be charged for each 10 Sq M or portion there in excees of the out turn mentioned.

(a) In case of consolidation of the types other than that specified above, Hire charge shall be recovered at the rates not towel than that provided in the departmental data for those items of works.

(b) In case where a roller *works* for more than 8 hours in a day with an proportionate increase in out turn hire charges shall be levied for the extra hours on hourly basis in addition to normal hire charges of Rs /- per 8 hours.

8-15 COMMENCEMENT AND COMPLETION OF WORKS

Prior to commencement of work, the engineer and the Contractor shall carryout a joint inspection of the existing surface to locate any areas where defective foundations or improperly consolidated trenches may have contributed to surface failure. During the progress of the regarding work further checks on the adequacy of the foundations by means of trial holes, plate bearing tests, etc., shall be made any defects noted shall be pointed out to the Exe. Engineer who will issue instructions for the necessary remedial action to be ensure that a satisfactory foundation is available through the area to be resurfaced. When the asphaltic concrete is to be laid at the bus stop, the flow shall not exceed 12. For Bitumen the work ordered to be carried out shall be commenced within three days from the date of acceptance of the tender and complete with in the stipulated time to the satisfactory of the Exe. Engineer or his representatives. If the rate of progress is poor as judged by the Exe. Engineer or his authorised representative a fine not exceeding Rs. /- per day shall be imposed on the contractor.

8-16 EXECUTION OF WORK-REGULATIONS TO BE FOLLOWED

The preliminary specifications to the standard specifications of the Chennai Highway Manual for road and bridge construction shall form an inseparable part of the contract in all agreements entered into by the contract for executing works for the Corporation of Chennai.

Materials used for laying of roads and footpaths should be stacked by the contractor at his own cost and precheck measure by the competent authority before the work is commenced.

For items of works in buildings and structures not covered by the above specifications relevant items from the SSRB ! TNBP as amended from time to time shall apply

The works are to be executed in accordance with the Tamil Nadu Building Practice / SSRB. Chennai Standard Specifications for Road and Bridge constructions) of the Chennai Highways Manual copies of which are available for sale at Gove. Press and or with the chief Engineer, Highways, Chennai. The preliminary specifications of the S.S.R.B. shall apply into save in (1) Clause 7-1-1 the words "Corporation of Chennai will be substituted for the word "Government" (2) of 7-1-1 "Department will be mean the Zonal Office 0 of the 7-1-3 'Engineer' means the Exe. Engineer, Corporation of Chennai or his authorised representative limited by the particular duties entrusted to him, or wherein these words occur.

8-17 RATES TO INCLUDE

The tendered rates for the items should be inclusive of all items of works required for the proper execution of the items (viz), watering, barricading, lighting, watching, safety arrangements in the interest of traffic, etc., and no claim for extra payment on any score will be entertained. The rates to be tendered should be inclusive of sales tax and other taxes in force.

8-18 LUMPSUM ITEMS

Lumpsum works to be executed which are not susceptible of measurements will be paid at the actual cost of materials used and labour engaged on the works plus 10% contractor's on the relevant items of work. The contractor shall procedure proper bills for the materials used and muster roll maintained at the work spot and duly certified by the officer of the Corporation in charge of the work for the labour employed The payment of lumpsum items of works shall be in accordance with clause No.59 of General Conditions of contract of T.N.B.P.

8-19 NON-TENDERED ITMES

Same as' clause No 4-6.

8-20 INCONVENIENCE TO PUBLIC

The contractor shall not deposit materials on *any* site which will seriously inconvenience the public. The Engineer in charge may require the contractor to remove any materials which are considered by him to be a danger or inconvenience to the public or cause them to be removed at the contractor's cost.

Any damage to work resulting from rains or from any other cause until the work is taken over by the Dept. after completion will be made good by the contractor at his own cost.

8-21 REMOVAL OF EXCAVATED EARTH, SURPLUS EARTH, DEBRIS

All materials excavated by the contractor including dismantled bricks etc (Not reusable) shall be disposed off by the contractor at his cost as directed by the Executive Engineer. Surplus earth shall be removed within 7 days from excavation by the contractor for SWD works/road widening works etc. as otherwise a penalty of Rs.500/- per day will be imposed on the contractor by the department.

8-22 WATER AND LIGHTING

The contractor shall pay for all fees and provide water and light as required from Corporation mains or other sources, and shall pay all charges therefore for the use of the work and workmen. The water for the works shall be free from earthy, vegetable or organic matter and from salts or other substances like to interfere with the setting of the mortar or otherwise prove harmful to the work.

8-23 MAINTENANCE PERIOD

Same as per Clause 4-11

8-24 DEFECTS IN BITUMINOUS PAVEMENTS

The defects in the asphalt paving which the contractor may be called upon to rectify are the following types:-

- (i) Deformation of the Asphalt pavement resulting in waves, ruts, or unevenness.
- (ii) Cracking of the Asphalt pavement resulting in admission of water to the subgrade and the deterioration of the asphalt pavement adjoining the cracks, provided that if such cracks, provided that if such cracking results from defective foundations, then Corporation will at their own cost carry out the necessary remedial work before the defects are rectified.
- (iii) Disintegration/travelling of the asphalt pavement resulting in formation of pot-holes.
- (iv) Polishing of the asphalt pavement under traffic resulting in a surface on which the vehicles are liable to skid. Before calling upon the contractor to remedy any defects in the surface an examination of the area concerned shall be conducted by the Exe. Engineer, in presence of the contractor. Defects in areas of asphalt pavement under guarantee shall, where they exceed the limits specified below, be remedied immediately by the contractor.
- (v) Minor undulations, tracking and other defects beyond the specification tolerance during the maintenance Period are to be remedied or removed and replaced, completely as may be ordered to the satisfaction of the Executive Engineer, Zonal Officer ().

The limiting values of defects shall be as follows :-

- (i) Deformation, 25mm, in 3 metres.
- (ii) Cracks exceeding 1.5 metre in length and 3mm in width.
- (iii) Disintegrated / raveled surface exceeding 200 Sq. cms. in area and / or 12mm in depth.

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(iv) Polishing to the extent greater than that of a sample agreed to a representative border line case by the contractor and the Exe. Engineer, cut from the road, divided into two approximately equal portions and retained for reference by the Exe. Engineer and by the contractor.

(v) **TABLE: Permitted Tolerance of Surface Regularity for Pavement Courses.**

Sl No.	Type of Construction	Longitudinal Profile with 3 metre Straight edge			Cross Profile		
	Maximum permissible undulation mim.	Maximum number of undufations permitted in any 300 mts. length exceeding mm.			Maximum permissible variation from specified profile under camber template		
		18	12	10	6		
1.	2	3	4	5	6	7	8
1.	Ashphaltic Concrete	8	-	-	-	10	4
2.	C.B.M.	10	-	-	-	30	6
3.	W.B.M.	12	-	-	-	30	8
4.	Sub base	15	-	30	-	-	12
5.	P.M.C.	10	-	-	30	6	6

NOTE: 1. Surface evenness requirements in respect of both the longitudinal and cross profiles should be simultaneously satisfied.

Rectification:

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

(1) Subgrade/Granular Sub Base:

When the surface is high, it shall be trimmed a'1d suitably compacted where the same is low, the deficiency shall be corrected by adding fresh material and compacting to specifications.

(2) WBM Base:

When the surface is high or low the top 75mm shall be scarified, reshaped with added materials as necessary and recompactd to specification. The area treated at a place shall not be less than 5 metres long and 2 metres wide.

(3) Bituminous constructions:

(a) For Bituminous constructions other than wearing course, where the surface is low, the deficiency shall be corrected by the adding fresh material and recompacting specifications, where the surface is high the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications.

(b) For wearing course, where the surface is nigh or low the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. In all case where the removal and

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replacement of a bituminous layer is involved, the area treated shall not be less than 5 metre and less than 1 land wide

8-25 TRAFFIC REGULATIONS

(a) Clause 112 of the SSRB shall apply to the whole works Tippers, trucks, Water Lorries to which when not in actual use Sh3!! be drawn clear off the road the safety to the public an precautionary measures shall be taken by way of lighting with bright red light and warning boards.

The contractor shall maintain watchman on the works and control and regulate traffic. If an where necessary. Notice boards shall be placed in suitable locations bearing in large letters in conspicuous columns.

Warning notices shall be placed at the points in the neighborhood of the work where other roads join and across the road and at such other places and points as may be directed to enable the motorists cyclists. . or other vehicular traffic, avoid the obstructed road by taking alternative routes. Extra payment will not be made for any such incidental items.

(b) penalty for not arranging traffic regulations:

If the contractor fails to make arrangements for traffic regulations as described in condition 8-25 (a) a penalty of Rs.500- day will be imposed on the contractor.

8-26 The Contractors are required to buy cement and steel from the open market and use them in the Buildings works. No materials will be supplied by the Buildings department to the contractors. The contractors should test the cement and steel as per relevant IS Standard in the Government or Government recognized laboratories at their own cost and produce the test certificate to the department engineers. If the S.E./E.E. feel that the materials like cement and steel are to be tested for cross verification the same should be tested in the laboratory as directed by the S.E./E.E. and the cost of such tests will have to be borne by the contractor.

8-27 Contractor shall maintain at site an account showing the receipts, issues and balance of stock on hand of cement issued by the department. The accounts shall be available at all times for the verification of departmental officers

8-28 Any Cement supplied in excess of the permissible limits to the contractor by the Corporation and not accounted for by him in his work will be liable for recovery from the contractor, at twice the issue rate, for the excess quantity.

8-29 BITUMEN

The contractors are instructed to purchase the bitumen by themselves for execution of contract works . Contractors have to test the bitumen at government laboratories or government recognised testing centers on their own cost and the certificates has to be handed over to the engineers of Bus Route Roads department , Further the Engineers of BRR department will confirm the quality of the material used by the contractor by testing the samples at government laboratories or government recognised testing centers.

8-30

Bitumen may be purchased for the works to be executed in the department.Bitumen has to be purchased from the central government concerns such as Indian Oil Corporation, Bharath Petroleum , Hindustan petroleum and Chennai petroleum Corporation with the prior permission from the corporation. While purchasing bitumen from the above central government, the relevant original invoice purchase slip to be handed over to BRR department.

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- 8-31** The contractor shall maintain at site an account showing the receipts, issues and balance of stock on hand. The accounts shall be available at all reasonable times for the verification of departmental officers.
- 8-32** Any bitumen supplied in excess of the permissible limits to the contractor by the Corporation and not accounted for by him in his work will be liable for recovery from the contractor at twice the cost of such quantity of bitumen. However for marginal excess quantity of bitumen used on the work upto 2 1/2% than the requirements as per data will be recovered at the rate as entered in clause No.8-30
- 8-33** The tender percentage to be quoted by the tenderer will only be based on the recovery rates as entered in Clause No.8-26 & 8-30. In this context it shall be specifically understood that the tender percentage quoted by the tenders shall not be applicable to the cost of materials supplied departmentally.
- 8-34 PRICE VARIATION FOR LIME-STONE POWDER**
The price to be tendered in the tender schedule for the finished asphaltic concrete wearing course is for a limestone powder as mentioned in the Specification. As the exact quantity of lime stone powder to be used may vary according to the test results as may be directed by the engineer during the execution of works, the rates for the finished works will be quoted rate plus or minus the cost of the actual quantity of lime stone powder used in excess or short of the percentage at the rate per tonne, to be quoted by the tenderer.
- 8-35** All works shall be executed in accordance with TNBP and S.S.RB unless otherwise specified
- 8-36 MATERIALS**
All the materials required for the works should be according to TNBP and S.S.R.B. and the relevant specification of the N.B.C. as directed by the department Officers.
- 8-37** Earth work excavation for foundations in all kinds of soils in varying depths including dismantling any masonry and roots met with in foundations and shoring plan (s, baling out water, if necessary and filling the sides of excavated trenches with excavated earth including clearing and leveling site., etc., all complete.

Filling in basement with excavated earth or excavated sand in regular layers of 15cm thick each including carefully ramming, watering consolidating, etc., complete.
- 8-38** All the R.C.C. works in general should be of machine mix with machine crushed blue granite jelly only if however hand mix is allowed the contractor shall use 10% extra cement for which no extra payment will be made.
- 8-39** (i) Supplying steel rods including cutting, bending hooks, cranking, fabricating and assembling laying in exact position tying with 16 or 18 B.W.G. for R.C.C. works etc., complete for R.C.C. works.

(ii) Centering for R.C. work should be provided with steel plates Rests used for scaffolding and centering should be firmly fixed to the ground and in no case shall centering be supported on bricks or on loose materials, etc, Double scaffolding should be used as per M.D.S.S. if required by the Exe. Engineer (Z.....) of the works.
- 8-40** The lime mortar should be prepared with the aid of mechanically operated plant, viz., 'Pan Mixer' machine.
- 8-41** Only sand from Palar river in Tammavaram Village in Chegalpattu Taluk in Changanallur MGR, Dist. 47Km. outside city limits. shall be used for all building works in this schedule and contract. For sand filling, Karanodai sand shall only be used.

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- 8-42

The detailed dimensions of foundations, etc, and dimensions of all R.C. Works in the plans are subject to alterations during execution.
- 8-43

Whenever there is an ambiguity in measurement of sizes, the corresponding equivalent of F.P.S system shall be- adopted
- 8-44

"As per Govt. orders issued in GO. Regd. No.985 Rural Development and Local Administration Department dated 14-5-1979 that for the quantity of cement, steel etc., wasted or used in excess of prescribed quantities (by more than 5%) or not returned in good condition by the contractor the recovery of the cost will be double the issue rates".

Note: The weight of reinforcing steel in all the "Supplying Steel roads and fabricating" items shall be . calculated on the section weight of the respective rods after measuring the finished and fabricated steel work laid in situ before the laying of concrete is ordered by the Engineer. The individual bars with measured and weight shall be weighted per metre as noted hereunder.

Diameter of bar in Millimeter	Weight per running meter in Kilograms
5	0.15
6	0.22
9	0.50
10	0.62
11	0.75
12	0.89
16	1.58
18	2.00
20	2.47
22	2.98
25	3.85

For Sections other than those specified above weights standard reference and Hand books or tables shall be adopted.

The bending and tying with and supporting device V/ill not be measured and the weight of such wires, etc., will be ignored. The rate per quintal tendered shall include all labour, materials, tools and equipments, bending and fabricating to shape and doing all the work involved in handling and placing the specified reinforced steel, tying and securing complete in place with all necessary styas and supported devices if and when required. However the weight of rods used in works may be wieghed by the respective Assistant Officers on a representative sample to make sure that the size and co-efficient adopted for various sections do not differ from the one furnished above

- 8.45

The rates should be quoted both in words and figures. No quotation or tender will be considered unless the rate is furnished both in figures and words. If there is any correction in the rate, it should be attested by the contractors and also by the officer concerned at the time of opening of the. quotation or tender. Incase of any discrepancy is found between the rates less (or) higher percentage In words and figures the lower value only be taken as tender rate.
- 8-46

Incase of any discrepancy found between the words & figures for the rebate amount offered for reusable materials to be retrieved from the structure proposed to be demolished the higher value only be taken.

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- 8-47** Should any tender/tenderers, fails/fail to undertake to commence the work from the date of handing over the site by the Corporation and complete the same and deliver the work to the charges of the Exe. Engineer within the stipulated time, the security deposit will be forfeited and the contract shall be considered as having been cancelled or terminated. The commissioner thereupon at such terms as he may think it, arrange either departmental or by any other person or persons to undertake, to perform provide, execute and do all works, materials/matters and things described in the tender schedule.
- 8-48** The Commissioner may put an end to the agreement at his option at any time, and in the case of bad work of material, the Engineer may remove the same and have it replaced, deductioning the value of the work, rejected or materials removed, or the cost of replacing the same, as he may think proper from any amount due that may became due to the party making this tender.
- 8-49** The levels furnished in the plan are based upon the investigations done by the Department. If any . change in level, water levels, etc., and found during actual execution, the contractor are bound to accept them and they are not eligible for any extra claim for such change in levels or otherwise.
- 8-50** As soon as the Contract is accepted, the contractor should give a programme of work which he proposes to adopt for execution. The progress of work should be conformity with the rate of progress specified under clause 1-16 of tender notice.
- 8-51** The contractor should use only the manhole steps of Corporation type design.
- 8-52** The contractor shall be absolutely and solely responsible for injury or damage to person and property of any description whatever, which may be caused by or result from the execution of the works whether these may have been carried out skillfully and strictly in conformity with the provision of the specification or not.
- 8-53** Any old iron work, pipers, bricks or other materials met within the works and which require to be removed for the construction of the work shall be held to belong to the Corporation and required by them the Exe. Engineer() may have them removed by the Contractor without any extra cost.
- 8.54** Any coins, couriosities or antiquities or treasure trove found during the constructions of the works shall be immediately delivered to the E.E. on behalf of the Corporation.
- 8-55** The contractor at his own expense shall disinfect with chloride or lime 0 other storing disinfectant all offensive matter immediately it is taken out of the trenches and shall cart away or cover up such matter as soon as possible.
- 8-55** The contractor shall art his own cost after completion of the work remove all water and all materials or rubbish of every description which may have collected in the works and find a deposit, therefore and anything which may have collected within the work, during the period of maintenance shall also be removed before the works are finally accepted by the Corporation.
- 8-57** The contractor must ascertain for himself if any and where pumping will be necessary during excavation and upto the completion of the work and make adequate provision for it in his rates. No extra will be allowed for pumping under any circumstances whatever.

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8-58 If the tenderer is a registered contractor of this department and if certificate for the current year had already been produced by him during the calendar year in which the tender is made it will sufficient if particulars regarding the previous occasion on which the certificate was produced.

8-59 The materials required for road works shall b.e supplied and stacked at the site. Measurements will be recorded then and there and check measured by the competent engineers before using them fork the works.

8-60 Based on site conditions, the contractor should raise the Manhole doors, valve doors etc, to the required levels. Also the Contractor should provide cable ducts and execute other works where ever is found necessary during the time of execution as directed by the Exe. Engineer.....
..... ().

8.51 The detailed list of roads in the details of works to the done in each road will be furnished separately .at the time of the award of contract.

8-62 No correspondence from the teachers will be entertained after the opening of the tenders before the award of the contract.

8-63 Tenders with conditions stipulated may not be considered.

8-64 In respect of bituminous course continuous record of the mixes shall be maintained at site for tallying the proportions of the materials and ensuring the correct rate spread

65 HOLIDAYS

Subject to any provision to the contrary contained in the contract none of the permanent work shall save as herein after provided be carried on during the night or on Sundays and other holidays without the permission in writing of the Exe. Engineer or of the officer in charge of the works in the format prescribed in 8-67. Save when the work is unavailable or absolutely necessary for the save of life or property or for the . safety of the works in which case the contractor shall immediately advise the Exe. Engineer.

8-66 SITE INSTRUCTION BOOK

A site instruction book shall be kept at the Corporation of Chennai Office on the site of the work. As for as possible, all orders regarding the work are to be entered in this book all entries shall be signed and dated by the Corporation of Chennai Officer in direct charge of the work and by the contractor by his representative. In important cases, the Exe. Engineer or the Superintending Engineer will countersign the entries, which have been made. The site instruction book shall not be removed from the site except with the written permission of the Exe. Engineer.

8-67 PERMISSION FOR EXECUTING THE WORKS DURING THE HOLIDAYS / NIGHTS.

Name of work..... Department.....
...

Location..... Date.....

Dn.....Unit.....Zone.....

Date & Duration of Work
to be done during Holidays / Nights

Name of the contractor

Name or the Departmental A.E. / J.E.

Signature of Contractor

Signature of the E.E.

8-68 SPEICIAL CONDITION FOR PILE FOUNDATIONS

1 . The tenderer shall fill quantities, rates and amount for all items except 8,10,11 and for alternative items where only rates are to be quoted.

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2. The tenderer shall fill in the designed capacity of RCC piles for which he is quoting his rate. He must give quantities against items 4 or 5 as per his design and quote his rates thereof. The design calculations for pile caps grade beams and piles must accompany the tender.
3. Details of dowel bars will be given by the Exe. Engineer / Superintending Engineer during execution of work but quantity of steel in pile caps and grade beams will be in accordance with the design of the tendered and to be approved by the competent authority. The cost of reinforcement in piles should be included in the cost of piles against items 4 and 5 of the schedule.
4. The number of tests to be conducted in items 9 to 11 shall depend on the direction of the Executive Engineer/Superintending Engineer.
5. The tenderer shall fill in the schedule, the quantities of steel and cement required to be supplied by the department and recovered at issue rate for the execution of the job. He should also enclose detailed calculations in support of the figures.
6. The tenderer shall also enclose a layout of piles as per pile design proposed by him.
7. The piles shall be designed and executed generally conforming to the ISS 2911 (part II Part II and Part IV) 1979 and National Building Code and other National Standards prevailing from time to time.
8. Payment shall be restricted only to the quantity furnished in the tender for items of work (Grade . beams, pile caps, mat concrete, etc.) or as per the tenderer's design to be approved later on, if any alternative design is furnished by the tenderer. It may be noted that under no circumstances payment shall be made for any additional quantities over and above the quantity furnished in the tender However payment shall be made for quantities executed at the request of the department if for which approval will be obtained by the contractor from competent authority.
9. The rate shall include work in shift system also and no extra will be entertained for such shift system of work.
10. The tenderer must state the number of piling equipment, the type of equipment and the staff that will be ear-marked for this work.
11. The tenderer must furnish the capacity of jack, the number of dial gauges and their range, the range of pressure gauge, the last date of calibration of pressure gauge, and the manufacturing details for jack, pressure gauge and dial gauges at the time of submitting his tender.
12. The tenderers must also furnish in his tender a diagrammatic sketch of the load test arrangement offered by them indicating all details of the load test therein if they do not agree to the standard norms for load test prescribed by the Department.
13. The tenderer must offer only in the department schedule furnished in the tender documents.
14. Tenderers which do not comply with the above conditions will be summarily rejected without assigning any reasons.

8-69 GENERAL CONDITIONS FOR PILE FOUNDATIONS

DEFINITIONS OF TERMS

1. Driven cast-in-situ pile:

The pile formed within the ground by driving a casing of uniform diameter, permanent or temporary and subsequently filling in the hold as formed with plain or reinforced cement concrete. For displacing the sub-soil, the casing tube is installed with a shoe or plug at the bottom end.

2. Cut off level:

It is the level where the installed pile is cut off to support the pile caps or beams or any other structural components at that level.

3. Test Pile:

A pile which is selected for subjects to load test and which is subsequently loaded, for that purpose. The test pile may form a working pile itself if subjected to routine load test upto 1 1/2 times the safe load.

4. Trial Piles:

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Initially one or more piles, which are not working piles, may be installed to assess load carrying capacity of the piles by load test. These are called trial piles. The piles are tested either to their ultimate bearing capacity or twice the working load.

5. Proposed working load:

This shall mean the safe load carried by the pile or group indicated by tenderer while submitting the tenderer.

6. Final working load:

This shall mean the safe load that will finally becoming on each pile or pile group due to RCC columns and grade beams. If the loading tests, as defined in clause show that the proposed working load cannot be obtained, the Superintending Engineer shall work out the safe load of pile or group of piles which shall be binding on the contractor.

7. Routine Test Load;

This is the load applied to a selected pile or group of piles to test its behaviours, under excess of loading at 150 percent of the working load.

8. Settlement:

This is the downward movement of the pile recorded from time to time during the test loading of pile

9. Total settlement:

This is the downward movement during the test loading of the piles and may consist of closer deformation of the pile itself, deforming of the ground surrounding the pile and any movement of the piles through the ground

10. Residual Settlement:

This is the different between the total settlement and amount of recovery records if the test load has been totally removed from the pile.

11. Elastic deformation:

It is the shortening of pile within the elastic limit of the material forming.

12. Follower tube:

A tube which used following the main casing tube when adequate set is not obtained with the main casing tube and if it requires to be extended further.

The inner diameter of the follower tube should be the same as the inner diameter of the casing. The follower tube shall preferably be an outside guide and should be watertight when driven in water bearing strata or soft clays.

13. Bored-cast-in-situ pile:

The pile formed with the ground by excavating or boring a pile within it with or without the use of a temporary casing and subsequently filling it with plain or reinforced concrete. When the casing is left permanently it is termed as cased pile and when the casing is taken out, it is termed as uncased pile.

In installing a bored pile, the sides of the borehole (When it does not stand by itself) it is required to be stabilized with the aid of a temporary casing or with the aid of drilling mud (bentonite) of suitable consistency. For marine situations, such piles are formed with permanent casing (liner).

14. Initial load test:

It is carried out on test pile(s) which is generally made for the purpose, with a view to determining the safe load and /or ultimate load capacity.

15. Routine (Check) load test:

It is carried out on a working pile with a view to determine displacement (settlement)

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corresponding to the allowable (Working) load.

SPACING OF PILES:

16. The centre to centre spacing of pile is considered from who aspects (viz).
17. Practical aspect involving installing the piles.
18. The nature of the load transfer, i.e., by friction alone or by end bearing alone or by both to the soil and possible reduction in the bearing capacity or group of piles thereby. The choice of spacing is normally made on semi-empirical approach. .
19. In case of piles founded on a very hard stratum and deriving their capacity mainly from end bearing the spacing will be governed by the competency of the end bearing strata. The minimum spacing in such cases shall be 2.5 times the diameter of the shaft.
20. Piles deriving their bearing capacity mainly from friction shall be sufficiently apart to ensure that the zones of soil from which the piles derive their support do not overlap to such an extent that their bearing values are reduced. Generally, the spacing in such cases shall not be less than 3 times the diameter of the shaft.
21. In the case of loose sand or filling, closer spacing than in dense sand may be possible since displacement during the piling may be absorbed by the vertical and horizontal compaction of the strata Minimum spacing in such strata may be twice the diameter of the shaft.

Note: In case of piles of non-circular cross section, diameter of the circumscribing circle shall be adopted.

For " Driven" Cast-in-Piles:

22. Piles shall be installed as accurately as possible according to design and drawings either vertically or to the specified batter. Greater care should be exercised in respect of installation of single piles or piles in two pile groups. As a guide for vertical piles, a deviation of 1.50 percent and for raker piles, a deviation of 4 percent should not normally be exceeded. Piles should not deviate more than 75mm from their designed positions at the working level of the piling rig. ,In the case of a single pile in a column, positional tolerance should not be more than 50mm. For piles to be cut off at a substantial depth, the design should provide for the worst combination of the above toleration in Position and inclination. In case of piles deviating beyond d these limits and to such an extent that the resulting eccentricity cannot be taken care of by a redesign of the pile cap or pile-tile, the piles should be replaced or supplemented by one or more additional piles.

23. In a pile group, the sequence of installation of piles, shall normally be from centre to the periphery of the group or from one side to the other.

24. Sufficient time shall be allowed, when installing piles in a group, for the freshly poured concrete in a pile to set before installing adjacent piles.

No pile should be less than 12 inches (30 cm.) in diameter or side of a square.

25. In forming cast in situ-piles the joints of the piling forms and follower and the bearing of the piling from \ on its shoe or any driving rim shall be effectively sided in an approved manner so as to prevent subsoil water from gaining access into forms at any stage of driving or withdrawing the forms or when the concrete is being shunted into forms. If water sand or slush or any other impurity get into the forms at the stage of casting or driving the piles and if the water sand or slush or any other impurity cannot be removed to the satisfaction of the Superintending Engineer. The forms shall be pulled out and driven if so required at the contractor's expenses. If in withdrawing the form after casting the pile, it is found that cast in situ pile has been disturbed in any manner or either through the displacement of the reinforcement of take as a whole or in part, the same shall be reported by the contractors to Superintending Engineer, who shall decide whether the piles shall be rejected and a fresh pile will have to be driven in the same place with a new shoe and if this is considered impossible or difficult, fresh piles not less than two in number shall be driven in every case of such rejection, at such places as will ensure the centre of gravity of the originally proposed group of system of piles to remain undisturbed and the contractor shall not be entitled to any payment on account of the rejected pile or of the extra piles required to preserve the centre of gravity of the system of piles undisturbed, nor can payments be made for any consequential increase in the capping or beams and payment shall be made only for one pile as if it were good pile.

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Pile Withdrawals:

26. Following the founding of the piles at the correct depth, concrete sufficient for a length of one third pile depth shall be placed in the tube before the initial withdrawal. As soon as the skin friction between the earth and the tube has been broken withdrawal shall be stopped and the remainder of the concrete placed in the tube after which the withdrawal may proceed.

27. During the process of withdrawal the concrete shall be completed by raising and dropping the 3 tones hammer on top of the tube. The amount of drops and the rate of stacking shall be applied when the pile tube, is at its maximum depth and during the pile tube withdrawal the drop may be reduced and the speed of the striking increased.

28. All concrete in the pile must be thoroughly completed in one operation throughout its length from pile shoe to top of piles, as soon as pile driving is completed. Piles shall not be left unconcerned after driving founding the casing in position at the end of day's work. Either the concreting should be carried out the same day or the pile casing stopped well above the founding depth say for 2 or 3 meters and driving continued next day

29. Records:

Observations made during the driving of each pile shall be recorded in the Performa enclosed. Number of piles driven and their respective length should be recorded and send to Executive Engineer's office every day. When the last blows for set are given on piles, the Exe. Engineer or his representative should be intimated to enable him to record the "set" observation made and recorded set each day shall be sent to the Exe. Engineer's office the following day.

A record shall be kept by the contractor of the total penetration of every pile and the behaviour of such pile during driving. Any deviation from the designed location, alignment or load carrying capacity of any pile shall be promptly reported dot the Exe. Engineer / Superintending Engineer and adequate corrective measure reported to him. Such measures shall be taken after approval of Exe. Engineer/Superintending Engineer plans showing such deviations and corrective measures shall be filed with the department. On completion of the pile installation all pile records together with other records such as additional boring or other subsoil information that were obtained during Installation for the piles shall also be filed with the department.

30. The contractor is to guarantee that each pile will sustain after the period of maturing safety without any undue deformation and settlement the proposed working load specified for the pile plus 50 percent over load. All piles shall be fit to carry the specified test load 28 days after placing of concreting in the pile.

31. In case the installation of piles shows a tendency to make the previously installed piles to have accurate level marks shall be put on all piles immediately after installation and all heaved piles shall be reinstated to the required resistance.

32. Mixing:

The concrete ingredients shall be mixed thoroughly in mixes designed so as to positively ensure uniform distribution of all the compound materials throughout mass at the end of mixing period. The mixing of each 1-1/2 cu.m. and less shall continue for about 1-1/2 to 2 minutes for as found best in practice after all materials except the full amount of water are in the mixer.

33. The concrete in RCC items shall be proportioned by volume .

34. For all RCC items, the coarse aggregate will be of broken stone, passing through a screen with 20mm Square meshes and retained on a screen with 6mm square mesh.

35. The reinforced concrete work shall comply in all respects with the Indian Standard specification art practice.

36. Effective means shall be adopted to ensure the specified cover to the reinforcement rods, as per ISS 20911 (PtI Sec.1) 1979.

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37. Where rods are lapped, the laps shall be of approved length in accordance with the ISS 456-1978.
38. **Consolidation:**
Each layer of concrete shall be on worked to obtain concrete of maximum density. All concrete works except concrete for "cast-in-situ" piles shall be compacted by the use of the vibrator.
39. **Uniformity and Strength:**
To obtain a uniformity good quality of concrete test specimen shall be taken by the contractor at his own cost on the days of concreting as and when required by the Exe. Engineer. These test specimens shall be standard cylinder 15cm2. diameter and 30 cm high. These tests cylinders shall be tested departmentally or at other approved laboratories and if these tests give strength less than those specified below, the Exe. Engineer shall have a right to penalise the contractor by rejecting the work done.

Minimum cylindrical strength requirements of RCC works

Mix	7days	28 days
1 :2:4	10N/Sq.mm	5N/Sq.mm
1:1 1/2:3	13.5N/Sq.mm	20N/Sq. mm

40. **Stresses:**
In no case shall the stress in the concrete under proposed working load exceed 50 kg/cm2, and70 kg/ cm2, in the case of 1:2:4 and 1:1: 1/2:3 mix respectively steel stresses shall not exceed 2300 kg/cm2 in tension and 1900 kg/cm2; in compression. When the stresses in concrete piles are reviewed. No consideration will be given for the effectiveness of reinforcement.
41. **For-Bored-Cast-in-Situ Piles:**
No pile should be less than 12" (30cm), in diameter or side of a square. The full depth of the boring in collapsible soil strata should be lined with temporary steel casings. Alternatively approved drilling mud suspension bentonite sturry. Of adequate specific gravity shall be used for the full depth of the bore, as boring proceeds, to prevent sides of the bore hole from collapsing.

Accordingly the piles shall be classified as

- (1) Lined, bored cast-in-situ piles.
- (2) partly lined bored cased in situ piles using drilling mud. In any case, a minimum length of one meter temporary casing shall be inserted in each bored pile.

42. The bottom of the bored hole shall be cleaned very carefully before commencing the concreting work. The cleaning of the hole must be ensured by careful operation of boring tool/and /or flushing of the drilling mud through the bottom of the hole. Flushing of the bore holes before concreting with fresh drilling fluid/mud is necessary. Sufficient pressure to flush the borehole must be maintained, which shall normally continue for required periods. After the borehole has been drilled to its final depth, fresh bentonite slurry shall be pumped through the chisel resting at the base of the hole, to remove completely all cuttings and other loose materials from the base of the hole. During this flushing the speed of the pump shall be increased to maintain additional high pressure. The flushing will normally be executed upto the required time say 15 minutes approximately depending upon the cleaning. After the hole has been thoroughly flushed, the chisel shall be removed for concreting.
43. **Control of Alignment:**
Piles shall be installed as accurately as possible as per the designs and drawings either vertically or specified batter. Greater care should be exercised in respect of installation of single piles or piles in two piles group. As a guide, for vertical piles, a deviation of 1.50 percent and for rake piles, a deviation of 4 percent should not be exceeded, piles should not deviate more that 75mm or 0/10 whichever is more in the case of piles having diameter more than 600mm. from their designed position at the working level of the piling rig. In the case of single pile in a column. Positional tolerance should not be more than 50mm(100mm, in case of piles having dia more than 600mm). In case of piles deviating beyond this limit and to such, an extent that the resulting eccentricity cannot be taken care of by a redesign of the pile caps or pile tie\$, the piles should be replaced or supplemented by one or more additional piles. In case of piles with non-circular cross sections. "D" should be taken as the dimension of the piles along which the deviation is computed. In such cases the permissible deviation in each direction should be different depending upon the dimension of the pile along that direction.
44. **The specification for bentonite and bentonite slurry shall be under:**
1. (a) Bentonite powder used for the work shall be tested for its liquid limit which shall be more than 300 per cent and less than 450 per cent. Sand content in bentonite shall be apply: 17 per

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cent (ie. passing through 15"5 Micron-Sieve in dry condition) Method of testing liquid limit shall be as per ISS 2720 (pt. V) clauses 3.4 and 3.5.1

- (b) Bentonite solution shall be made by mixing fresh water using a pump for circulation. The density of the solution shall be about 1.12 depending upon the site conditions and the viscosity as tested by March Cons method shall be approximately 35 seconds.
- (c) Consistency of the drilling mud suspension shall be controlled throughout the boring as well as concreting operations in order to keep the hole stabilized as well as to avoid concrete getting mixed up with thicker suspension of the mud.
- (d) The swelling index as measured by the swelled volume after 12 hours in abundant quantity of water shall be atleast 2 times its dry volume.
- (e) The PH value of the bentonite solution shall be less than 11.5.

45. Concreting operations should not be taken up when the specific gravity of bottom slurry is more than 1.12. concreting shall be done by Tremie method.

46. During installation of bored cast-in situ piles, the convenience of installation may be taken into account while determining the sequence of piling in a group.

47. Tremie method:

In addition to the normal precautions to be taken in the Tremie concreting the following requirements are particularly applicable in Tremie concreting.

- (a) The concrete should be coherent, which in cement (not less than 370kg/m³ and of slump not, less than 150 mm
- (b) When concreting is carried out under water, a temporary casing shall be installed to the full depth of the borehole or 2 meters into non-collapsible stratum, so that fragment of ground cannot drop from the sides of the hole into the concrete as it is placed. The temporary casing may not be required except near the top when concreting is done under drilling mud.
- (c) The hopper and Tremie should be a closed system embedded in the placed concrete, through which " water cannot pass.
- (d) The tremie should be large enough with due regard to the size of the aggregate. For 20mm aggregate, the tremie pipe should be of diameter not less than 200mm; aggregate more than 20mm shall not be used.
- (e) The first charge of concrete shall be filled up in the hopper after plugging the control hole of the hopper with a steel plug or plate. The plug is pulled up after the hopper is filled so that the entire concrete in the hopper will be charged in the bore hole the plug should not be lifted within the concrete.
- (f) The tremie pipe should always penetrate well into the concrete with an adequate margin with safety against accidental withdrawal of pipe is urged to discharge the concrete.'
- (g) The pile should be concreted wholly by tremie and the method of deposition should not be changed part way up the pile to prevent the laitance from being entrapped within the pile.
- (h) All tremie tubes should be scrupulously cleaned after use.

Normally concreting of the pile should be uninterrupted. In the exceptional case of interruption of concreting but which can be resumed within one or two hours, the tremie shall not be taken out of the concrete. Instead, it shall be raised and lowered slowly from time to time to prevent the concrete around the tremie from setting. Concreting should be resumed by introducing a little richer concrete with a slump of about 280 mm for easy displacement of the partly set concrete. If the concreting cannot be resumed before final set of concrete already placed, the pile so cast, may be rejected.

In case of withdrawal of tremie out of the concrete either accidentally or to remove a choke in the tremie. the tremie may be re-introduced in the following manner to prevent in purgation of laitance of scum lying on the top of concrete with little penetration initially. A warmiculite plug should be introduced in the tremie. Fresh concrete of slump between 150mm and 175mm shall be filled in the tremie which will push the plug forward and emerge out of the tremie displacing the laitance or scum. The tremie will be pushed further making fresh concrete sweep away laitance/scum of its way. When tremie is buried by about 60cm to 100cm. concreting may be resumed.

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48. "Records"

Observation made during driving of each pile shall be recorded in the proforma enclosed. Number of piles bored and their respective lengths should be recorded and sent to the Executive Engineer every day. When the pile boring is finished for every pile, it should be intimated to the Executive Engineer or his representative so as to enable him to record "set" observation.

49. For both "driven" and "bored" cast-in-situ piles:

Tenderers must satisfy themselves by careful inspection of the plans, examination of the actual sites and of the levels obtaining at the sites about the amount of levelling involved. ,

50. Tenderers shall furnish the following design features for the pile foundation offered by them after careful examination of the borechells. Laboratory test results on soil samples plans schedule of column loads for the buildings and specifications and tender condition furnished in the tender document.

- (a) The type of pile foundation proposed by them,
- (b) A layout of pile showing the single piles, pile grounds, category of the piles, total number, working load of proposed piles, mix design in each category of the pile, etc.,
- (c) Plan and cross section of .pile proposed showing the reinforcement details plan and section of typical pile caps, section of typical grade beam, etc.
- (d) A statement, showing the number of piles adopted, pile capacity, working load actually allowed on each pile
- (e) Breakup details for the quantities of various item adopted in the respective tender.

51. The Tenderer may be required to substantiate his claim for the proposed working load of each category of pile by a test carried but on a trial pile at his cost at site of work before the award of contract. This includes the cost of pile driving also and this test may be an initial load test or a routine load test or a routing load test at the discretion of the departmental officer.

52. In case the working load proposed in the tender cannot be achieved, additional piles and increased . size of pile caps as determined by the Superintending Engineer will have to be installed. The cost of the additional piles and any consequential increase in RCC cappings and grade beams will have to be borne by the .contractor

53. The mod~ of measurements for the piles shall be from the tip of the pile shoe to the bottom of the respective pile caps.

The contractors are requested to state the method of piling and concreting proposed by them i.e. volume basis or by weigh batcher.

54. The roots, of trees, etc. if met with during the pile drivings has to be removed by the contractors at their cost.

55. As the area available for depositing excavated earth at the site is limited, the contractor should make h is own arrangements to remove the surplus earth in such a manner that under the circumstances should progress of work in the particular building or in any part of either building within the site is held up due to accumulation of surplus earth.

56. The contractor should ensure before arranging for the conveyance of earth from site of work that sufficient quantity of the earth for filling in sides of foundations and basement is retained in the site and no extra payment will be made if due to the neglect of the contractor, earth has got to be brought from outside at a later date.

The rate for excavation shall include all necessary shoring, baling and .pumping water found necessary for the execution of the work.

57. The rate should also include for carting away surplus earth to anywhere within the site and within the purview of standard specification, i.e., lead of 10 metres and a 11ft of 2 metres as may be directed by the Superintending Engineer.

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58. The Superintending Engineer will supply details of column dowels bars to be provided in pile caps and the rods will be delivered at the section stores at site of work. The position of dowel bars for each RCC column shall wholly agree with the position of respective RCC columns as indicated in drawings supplied by the Superintending Engineer.

59. The contractor shall water, ram and thoroughly consolidate the bottom of all excavations at his cost before the construction of the foundation or other works is commenced.

60. A 75mm layer of plain cement concrete 1 :4:8 (one cement, four sand and eight hard broken granite stone jelly 40mm gauge), shall be provided under all pile caps and grade beams and may project 150mm all round beyond the caps and beams.

61. All caps and beams shall be cast so as to have a few construction joints as possible, provision shall therefore be made for casting caps and beams is not less than 8 1/2 cu.m. per day of 8 hours continuous operation. Normal setting cement conforming to I.S.S. alone shall be used for RC caps and beams and for cast in situ piles.

62. The design calculations for safe load on pile offered by the tenderer shall be in accordance with the relevant formulae as per ISS 2911 (Part/Section I/Section 2) - 1979 and consistent with the soil characteristics and soil parameters furnished in the tender.

Note: Design calculations adopting dynamic pile formulae, when the sub-soil is clayey and when the hard stratum is soft rock is not relevant.

63. Reinforcement proposed for the pile shall be proportional to the size of pile offered so that the reinforcement are not flimsy and does not drift out of position during concreting of piles:

Tender shall also work out the structural capacity of the Pile offered to substantiate the safe load purposed on pile. The stresses adopted for concrete and steel bars shall be in accordance with the IS456- 1978 ad ISS 2911 (Part/Section I Section) 1979.

64. Tenderer shall adopt provisions in ISS 2911 (part (/Section I), 1979 in the design calculation for pile caps. The depth of the pile cap adopted should be proportionate to the size of pile offered.

65. The details for grade beams shall be in accordance with the provisions in 155 291 I (PL III)

66. When a pile is group. designed for a certain safe load is found, during or after execution. to fall just short of the load required to be carried by it, an overload upto 10 percent of the Pile capacity may be allowed on each pile. The total overloading on the group should not be more than 10 percent of the capacity of the group nor more than 40 percent of the allowable load on a single pile. This is subject to the increase of the load on any pile not exceeding 10 percent of its capacity. This overhauling of pile will, however, not be acceptable in the initial stages at the time of submitting his tender.

67. The reinforcement and cover and all other details relating to this will *be*: governed by provision in ISS 2911 Part I/Section 2) 1979 and as per the directions of the Superintending Engineer / Executive Engineer during execution.

68. The contractor will conduct loading tests for any Particular Pile or Piles selected by the Superintending Engineer. The test load specified above should be put on a test cap over the pile unaided by another support.

69. The load test on a pile shall not be carried out earlier than 28 days from the time of casting the pile.

70. The contractor shall himself arrange for the necessary equipments for the application of loads, etc., in the load test and shall remove the same after the test. All the equipments, sand bags, etc., should also be removed from the site after the test is completed to the satisfaction of the Executive Engineer. Rates for testing shall include this and Department will not incur any expenditure for supplying or transporting the loads. etc.

71. Before any load test is made, the proposed testing equipments, instruments, loading structures to be used for making the load test shall be got approved by the Superintending Engineer.

72. The pressure gauge will be got calibrated from a recognized institution and the: calibration

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chart produced to the Superintending Engineer before commencement of test.

73. The arrangement of loading platform etc. shall conform to the specification and drawing enclosed to tender documents.
74. The floor of test pit shall be 15cm. clear below the bottom of pile cap and filling with soil. Bottom of pile cap should not be done.
75. The top of the pile cap shall be finished even and smooth and true to plane.
76. The dial gauges used shall be of metric units enabling direct reading of settlement in millimeters and shall be fitted to the datum bars with magnetic bases. The dial gauges should have a range upto 15mm atleast.
77. The datum bars shall be of suitable structural section. (preferable channel section) and should be built in position into masonry or concrete at a distance 5 d (five times the stem diameter of the pile) from face of the pile. The datum bars, if used as angles, or any other structural sections, should be straight for the full length. They may be stiffened with cross plates if necessary to keep straightness.
78. The loading platform should be kept atleast 1.50m above G.L. to have sufficient headroom to move about the static load on the platform should be 175 percent working load in the case of routine test and 225 percent working load in the case of initial test.

The test load may be applied by means of an appropriate capacity hydraulic jack with pressure gauge or load gauge with remote control pump reacting against rolled steel joints (or) suitable load frame obtaining reaction from the following:-

(a) Kentledge heavier than the required test load placed on a platform supported clear of the test pile. An existing structure of adequate weight and suitable construction may serve as kentledge. The centre of gravity of that Kentledge should generally be on that safe of the pile and the load applied by the jack should also be coaxial in the pile.

79. The test loads shall be applied in increments of about 20 percent of working load of pile per design.
80. Settlements shall be recorded with preferably four dial gauges (place equi-distance around the pile) of 0.02 mm sensitivity.
81. Each stage of loading shall be maintained till the rate of movement of the pile top is not more than 0.10mm per hour in sandy soils and 0.02mm per hour in case of clay soils and hard strata or a maximum of 2 hours whichever is greater. For this purpose, the type of soil met with at pile tip shall be considered. The designed safe load should be maintained for 24 hours and settlements should be observed every hour during this period.
82. For each increment, application of load shall be as smooth as possible. Time and settlement observation should be made at the commencement and completion of each increment. Settlement observation shall be continued when each increment load is kept instant at about 15 minutes intervals.
83. Each load increment, on the pile will be maintained by operating the jack pumps as required and even if the pressure falls down in the course of testing it will be restored by jacking to the required level.
84. The loading shall be continued upto twice the safe load (working load) designed for the pile or the load at which the total displacement of pile top/cap equals the appropriate value of settlement specified below in the case of initial load test.
85. The loading shall be continued upto 1 1/2 times the safe load (working load) designed for the pile or the load at which the total displacement of pile top / cap equals the appropriate value of settlement specified below in the case of initial load test.
86. The routine load test shall be cyclic load test
87. The load on the pile should be removed stage by stage releasing the pressure steadily after completion of the test and rebound observations made for two hours.
88. The assessment of safe load on the pile will be computed as follows in the case of "driven" cast in-situ piles and bored cast-in-situ piles.

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(a) Two thirds of the final load at which the total settlement attains a value of 12mm unless it is specified that a total settlement different from 12mm is permissible in a given case on the basis of nature and type of structure. In the latter case, the safe load shall be the corresponding load to actual total settlement permissible.

(b) Fifty percent of the final load at which the total settlement equals to 10 percent of the pile diameter in case of uniform diameter of piles and 7.50 percent of bulk diameter in case of under-reamed piles.

89. The observation readings of load test and the load displacement curve for the test shall be sent in triplicate to the Executive Engineer, in the prescribed pro-forma appended. **90.** The rates quoted shall include charges for such items of work as the following and shall be for the finished work i situ and shall include all contingent expenses including of taxes or import duties, etc.,

(a) Marking and setting at the work:- The contractors shall carryout the same with codolite and dumpy level and get it checked by the Exe. Engineer. The instruments required for accurate alignment should be procured by themselves.

(b) Provision of rods, stakes, ropes, concrete and masonry pillars for centre lines, level and labour required in setting out of the work.

(c) Provision of all necessary scaffolding, centering and labour and appliances for transporting the hoisting and pile driving machinery and appurtenances inclusive of preparation of road, and paths and for their transports.

(d) Provision of sheds to keep materials under cover.

(e) Payment for water and electricity charges, required for the construction, load test, etc.

(f) Arrangements for protecting work during inclement weather.

(f) Arrangements for protecting work during inclement weather

(g) Supply of clean pure water required for work and workmen from any source of water supply. Include for all charges of laying pipes, etc., and supply of water from the corporation mains for works and workman

(h) Disposal as may be directed of all rubbish superfluous materials and debris as they accumulate.

(i) Thoroughly clearing the whole of the work and work site in a clear and orderly condition.

(j) Allow for all necessary haulage and transport of earth from cutting to banking.

(k) Allow for hire tools and plant and test loads required for tests of piles and materials thereof of all labour and incidental charges.

(l) Allow for carriage expenses including all leads, lifts, loading, unloading and stacking to the satisfaction of the Exe. Engineer.

(m) Include for periodical test expense of materials and all inclusive that may be levied by the Superintending Engineer's discretion, periodically for test purposes. The opinion of the Superintending Engineer on the results of the tests as above conducted shall be final and binding on the contractor.

(n) Allow for all cost of excavation and running the necessary timber steel form or combination of both and pumping water wherever necessary.

(o) Watering R.C. caps and slabs for a period of three weeks from laying of each and other necessary incidental charges. .

(p) Allow for cutting off piles to an even level surfaces the top of the piles to project 50mm into the beams and caps and also for all cutting wastes or wreckage, etc. .

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- (r) Allow for the cost of binding wire for which no extra rate will be allowed.
- (s) Providing in case of cast-in-situ, piles for sealing the bearing of the piling form its shoes, as also at the joints of the followers and form with gunnies or homp or pulley or in any suitable and approved manner to prevent the subsoil water or any impurity from gaining access into the forms at any strata or driving the form.
- (t) The contractor should arrange for their own mixer and mixer driver.

9. ELECTRICAL DEPARTMENT

Special conditions

General conditions of the labour contract for laying If L. T .U.G. cables:

1. (a) The work should be commenced within 7 days of awarding the contract and after execution of necessary agreement and after should be completed within a reasonable period. Once the work is commenced there should not be stoppage of work except for weekly off and other reasons beyond his control.
(b) The service of the contract should be available in demand at any time of day on holiday of working days.
2. The work should be carried out strictly according to a specification.
3. In cases of abnormal delay in executing the work and also not doing the work according to the specification the Commissioner, Corporation of Chennai reserves the right to terminate the agreement and to take up the work either departmentally some other agencies. He will also have the right of the reduce the rate at this discretion, if the standard specification of worth not been followed by the Contract.
4. The responsibility for accident to any employees of the contractor will only rest with him. The contractor should, also execute and indemnify bond on stamp paper indemnifying. The department from the liability for any accident to the man employed by the contractor and also damaged caused to other.

Service such as P&T cables, street light cables, sewerage mains and wear-mains of Chennai Corporation and M.E.s. cables TNEB.

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5. The contractor shall be held responsible for the loss or damages to the department materials tools and plants, etc., during the execution of the works and the cost of such loss or damage will be recovered from the contractor
6. The work will be carried out under the immediate supervision of the staff of our department not below the rank of Assistant Supervisor.
7. The contractor shall acknowledge the receipt of various materials handed over to him by this department at the time of transporting from stores etc. It is the responsibility of the contractor to provide watch and ward staff for the materials transported and handed over to the contractor until the work is completed in all respects.
8. The entire route of the proposed erection of street lamp posts and proposed cable laying work will be given to the contractor and treated as site for all purpose.
9. The contractor should make his own arrangements for providing red flags during day time with caution boards and danger lights during night to the satisfaction of the Traffic Department.
10. The contractor will be held responsible in case of any theft or loss at site or during transport by the contractor.
11. The contractor or his authorised representative should be present at the time of execution of the work.
12. This department will get clearance from their various other department for cutting the Roads/Streets/ Pavement surfaces. The Contractor shall be responsible for causing unnecessary damages and cuts on the Roads/Streets/Pavement surfaces.
13. List of departmental materials to be transported by the contractor and to be taken over by the contractor.

Department supply: Fitting complete set alone will be supplied by the department. The same has to be transported by the contractor from the place of availability to the work site.

All other materials required for the work shall be supplied and utilized by the contractor, including the adaptor required for fixing the fitting of departmental supply. A sample adapted is available at the office of the Electric Engineers / S.E., for inspection.

10 GENERAL SPECIFICATIONS .

10-1 MATERIALS

General provisions: .

Materials should normally be supplied from the sources specified. However, materials complying with these Specifications will be accepted from any source of supply but the Superintending Engineer reserves the right to reject the entire output of any source from which it is impossible to get a continuous supply or when conditions are such that the use of unfit material cannot be prevented except by extraordinary methods. The materials should conform to the specifications referred to in this chapter.

10-1-1 Conveyance to Site:

Materials shall be brought to the site sufficiently in advance of construction. The contractor shall be responsible that vehicles used for transporting materials do not drop any of their contents on the road. The Superintending Engineer will order the removal of such material at the expense of the contractor in cases of neglect. Carts shall invariably be provided with tail boards.

10-1-2 Storing:

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Whenever a mixture of aggregates composed of two or more standard sizes of aggregates is specified for any work, the component parts shall be stored separately, Likewise, aggregates obtained from different sources; or for different purposes, whether of one standard size or not shall be stored separately, Materials shall not be stored unless they conform in all respects to the relevant specifications.

10-1-3 Measurement and Payment:

Materials as governed by the specifications will not be measured for payment nor paid for as separate items, but the cost shall be considered as included in the price paid for the relevant contract item of work.

10-2 Coarse Aggregate

10-2-1 Coarse Aggregate for Portland Cement Concrete:

The term "coarse aggregate" shall mean an aggregate most of which is retained on a 4.75mm(3/16") B.S.S. sieve contains over so much finer materials as is permitted for the various types described in this specifications. Coarse aggregates for Portland cement concrete shall comply with the following requirements.

(a) Description:

Coarse aggregates consist of broken granite having clean, hard, strong, dense and durable fragments, free from adhering coatings and conforming to the requirements of this specifications. Flaky and elongated pieces should be avoided.

(b) Deliterious Substances:

Aggregates shall contain no harmful materials in such quantities as to affect adversely the strength and durability of the concrete. Mica, shale or similar laminated materials shall not be present in such form or in such quantities as to affect adversely the concrete as ascertained by appropriate tests.

(c) Grading:

The aggregates shall be composed of different size fractions in the proportions herein setforth. Grading of the materials from anyone source shall be reasonably uniform. The grading of aggregates for a given work shall be specified in the Schedule "A".

In case concrete resulting from a mixture of aggregates approaching extreme limits of gradation is not workable, or when finished does not exhibit a proper surface due to an excess of particulars approximately 3mm to 12.5mm (1/8" to 1/2") size either a fine aggregate having a sufficiently greater percentage of fine materials or a coarse aggregate having a small percentage of fine materials shall be used if required by the Superintending Engineer.

10-2-2 Storage:

Aggregates shall be stored at the site of the work in such a manner as to prevent deterioration or contamination. Any material which is deteriorated or has been damaged shall be immediately removed from the site At the time of use, aggregates shall be free from all foreign materials.

10-2-3 Source, conveyance, storing:

The source for the coarse aggregate is Pallavaram Quarry, Clause No. 10-1 shall apply.

10-3 Fine Aggregate

10-3-1 Fine aggregate for portland cement concrete:

The term fine aggregate shall mean an aggregate most of which passes a 4.75mm (3/6") 8.S.S. sieve and contains only so much coarser materials as is permitted for the various types described in this specification. Fine aggregates for Portland Cement Concrete shall comply with the following requirements:-

(a) Description:

Fine aggregates shall consist of natural sand composed of fine granular material resulting from the reduction of rock by the action of the elements or sand produced by the crushing of rock. The particles shall be clean, hard, strong and durable.

(b) Deleterious Substances:

Aggregate shall contain no harmful materials as to affect adversely the strength or durability of the concrete.

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c) **Grading:** Fine aggregate when tested by means of laboratory sieves having square opening, shall conform to the grading requirements setforth below:

Grading limits for fine aggregates for portland Cement Concrete.

Sieve (A.S. T .M)	1. S.	Percentage by weight Passing Natural Sand	Crushed Stone Sand
3/16"(No.4)	480	95 -100	90 - 100
(No.8)	240	70 - 95	60 - 95
(No.16)	120	45 – 85	40 – 80
(No.30)	60	25 - 60	20 – 50
(No. 50)	30	5 - 30	5 - 30
(No.100)	15	0 -10	0 - 15

The gradation of fine aggregates from anyone source shall be reasonably uniform. For the purpose of determining the degree of uniformity, a Fineness Modulus determination shall be made upon representative samples of fine aggregates from such sources as are proposed for use. Fine aggregates having a variation in Fitness Modulus greater than plus or minus 0.2 from the Fineness Modulus of the Representative may be rejected.

In case the concrete resulting from a mixture of aggregate approaching the extreme limit of gradation is not workable or when finished does not exhibit a proper surface due to an excess of particles approximately 25mm to 12.5mm (1" to 1/2") in size, either a fine aggregate having a sufficiently greater percentage of fine material or a coarse aggregate having a sufficiently smaller percentage of fine aggregate shall be used.

10-3-2 Storage:

Clause 10-2-2 shall apply

10-3-3 Source, Conveyance, Storing, Measurement and Payment:

The Sources for the fine aggregate is Puduchatram Clause No.1 0-1 shall apply.

10-4 MORTAR SAND

10-4-1 Description:

The Sand to be used shall be composed of hard silicious matter. It shall be clean and of sharp angular grit type. The sand shall be screened before use. If the sand brought to the site dirty, it must be washed clean In water.

Screening:

For mortar, ordinary plaster and brick work sand shall be of such a nature as to pass through a sieve of 64 meshes per Sq. m. (Sq. inch)

10-4-2 Storage:

Clause No.10-3-2 shall apply.

10-4-3 Source, Conveyance and Storing:

Clause No.1 0-1 shall apply.

10-5 MATERIALS FOR WATER BOUND MACADAM

This specification cover the requirement of the different materials for the water bound macadam, viz., road metal and gravel.

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10-5-1 Road metal shall comply with the following requirements: .

(a) Physical requirements:

Road metal shall consist of broken stone clean, tough, durable and hard in texture, angular in shape, . possessing a low water absorption as possible, extracted from sound portions of designated quarries, and free from thin or elongated soft or disintegrated pieces, and dust, earth, rubbish, vegetable matter and other foreign materials.

(b) Shape:

The aggregate shall be angular that is possessing well defined edges formed at intersection of roughly flat pieces free from an excessive percentage of flaky or needle-like pieces.

(c) The aggregate shall pass through wholly in every direction in a screen of square mesh of 63mm (2YZ") side and wholly retained in every direction in screen of square mesh of 37.5mm(1YZ") sides.

10-5-3 Gravel:

The gravel' shall be composed of large, coarse, siliceous grains, sharp and gritty to the touch and free from dirt and foreign materials.

The aggregate shall pass through wholly in every direction in a screen of square much of 63mm (2YZ") side and wholly retained in every direction in screen of square much of 37.5mm (1YZ") sides.

It should not contain any lumps of stones larger than 20mm (3/4" gauge. A small natural admixture of clay upto 10% is not objectionable. The moorum should not contain more than 5% to 8% of fine sand passing a 200 mesh ASTM. (I.S. Sieve No.8) ,

Grading:

The materials shall be well graded from coarse to fine particles when a sample of the materials is wetted and squeezed in the hand, the following characteristics shall be noted:-

(a) The materials is extremely gritty.

(b) It can be formed into definite shapes that retain their forms even when dried.

(c) If the clay in the material alone adheres to the hands it should only be enough to discolour them slightly.

(d) If more than enough soil to discolour the hand adheres. It must consist of both sand and clay instead of clay alone, and,

(e) When the wetted sample is patted in the palm of the hand, it will compact into a dense cube that cannot be penetrated readily with a blunt stick, the size of a lead pencil.

10-5-4 Source, Conveyance Storing:

The source for the gravel is from any source beyond 7km outside city limits now fixed on Chennai Nellore Road. Clause No.1 0-1 shall apply.

10-6 Bricks

(a) Bricks shall be of first class and table moulded, of uniform size, shape and colour (generally deep red or copper) and must be well burnt so as to give a clear ringing sound when struck. They shall not break when thrown on wall a~ against other bricks. They shall be clean, whole and free from flaws, cracks, stones and under burnt lumps of any kind especially lime. They shall have sharp edges and angles and even surfaces.

(b) Bricks which when soaked in water for twenty four hours, abosorb more water than 1/5th of their dry weight shall be rejected.

(c) Unless otherwise ordered or permitted by the Superintending Engineer, standard size for wall bricks is to be adopted.

(d) Method of Manufacture. The raw bricks shall be moulded of such a size, that the burnt bricks shall have the specified dimensions. Only well matured clay free from all lumps shall be used

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and this clay shall preferably be passed through a pugmill. The bricks shall be moulded in wooden moulds which must be renewed as often as the Superintending Engineer may order. The bricks shall be burnt in chambers of and approved type. The above specifications for brick making shall be burnt in chambers of and approval type. The above specifications for brick making shall be complied with by the contractor in cases where he supplies his own bricks or he is to guarantee such compliances by the manufacturers in cases where he purchases bricks.

10-7 CEMENT

10-7-1 Requirements:

All portland cement shall conform to the requirements of Indian standard specifications I.S.269-1951. 10-7-2 Storage:

All cement shall be stored in suitable weather proof shed; which will protect the cement from dampness. Provision of storage shall be ample, to cope with the issue of cement by the department and the delivery of cement as received shall be separately stored in such a manner as to provide easy access for the identification and inspection of each delivery. The contractor shall keep accurate records of the deliveries of cement and of its use in the work copies of these records shall be supplied to the Superintending Engineer in such form as may be required.

10-7-3 Rejection:

Cement may be rejected if it fails to meet any of the requirement of these specifications.

At the time cement is incorporated in the work, it shall meet the requirements as to quality specified.

Cement which has become partially set or which contain lumps shall not be used. Unless it complies with the specifications after reclaiming in a manner satisfactory to the Superintending Engineer. The use of

salvage cement will not be permitted in any part of the work. Different kinds or brands of cement, of cement of the same brand from different mills shall not be used alternatively in anyone class of construction.

10-8 WATER

10-8-1 Source

This specification covers the requirements of water used with cement in concrete or mortar and water used for curing concrete.

10-8-2 Quality

Water shall be clean, clear and free from traces of oil, acid alkali, salts and other deleterious substances and in short generally fit for drinking.

10-8-3 Approval of Source:

Water shall be obtained from a source approved by the Superintending Engineer. Water from shallow muddy or marshy surfaces shall not be used.

10-8-4 Containers:

The containers for transport, storage and handling of water shall be clean so as not to cause contamination or deterioration in the quality of water.

10-9 STEEL

10-9-1 Description:

Reinforcement bars shall conform to the specifications and be of the shape and dimension shown in the plans.

10-9-2 Materials:

Reinforcement bars and annealed (binding wire) shall conform to the respective Indian standard specification as given below:-

Reinforcement bars-I.S.432-1953

Mild steel wire, annealed - I.S.280-1951

10-9-3 Steel List:

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Detailed steel lists and bending diagrams shall be furnished by the Superintending Engineer. The contractor should satisfy himself about the lists before fabricating.

10-9-4 Storage:

Reinforcing steel shall be stored under cover and protected at all times from injury. All bars of the same designation shall be assembled in racks and distinctly marked.

10.9.5 Cleaning:

Reinforcing steel, before being placed in the forms shall be thoroughly cleaned of loose mill and rust scale, mortar, oil, dirt and of coatings of any character that would destroy or reduce the bond.

10-9-6 Bending:

Reinforcing steel shall conform accurately to the dimensions shown on the plans.

A hook at the end of a bar shall be of form C and shall have an inner diameter, of the least four times the diameter of the bar. The length of the straight bars beyond the end of the curve to the end of the hook shall be at least four times the dia of the bar.

Bars shall not be bent or straightened in a manner that will injure the materials. Bars with kinks or bends shall not be used.

Bars shall be bent cold to the shape and dimension as shown in the drawings or as directed by the Superintending Engineer using bar bender operated by hand or power to obtain the proper radii of bends. The radii of all bends shall conform to the requirements given below:

The internal radius expressed in bar diameters of a bend in a reinforcing bar shall not be less than the value obtained by dividing the stress developed in the steel at the commencement of the bend by four times the permissible stress in the concrete in direct compression where the minimum concrete cover is used, and not less than two-thirds this value where conditions are such that there is no danger of splitting the concrete.

10-9-7 Placing:

Only reinforcing rods conforming to the appropriate size and shape shall be accurately placed in exact positions shown on the plans, and shall be firmly and securely held during placing and setting of concrete by wiring at intersections with S.W.G.No.16 or 18 annealed wire and by using stays, blocks or metal chairs, spacer, metal hangers, supporting wires and other approved devices at sufficiently close intervals so that the bars will not sag between supports nor be displaced during placing of concrete or by any operation over the work. Placing bars in layers of fresh concrete where the work progresses for adjusting bar spacing will not be permitted. The use of pieces of broken stone or bricks and wooden blocks will not be permitted. Layers of bars shall be separated by the precast mortar blocks or other approved devices.

Special care shall be exercised to prevent any disturbance of reinforcement in concrete that has already been placed. The reinforcements after being placed in position shall be maintained in a clean condition until it is completely embedded in concrete. Bars shall be accurately placed as shown in the plans.

Sufficient concrete coverage shall be provided to protect reinforcement from corrosion as indicated in the plans. All protruding bars from concrete to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected from rusting by a thin coat of neat cement grout.

10-9-8 Splicing:

Bars shall not be spliced except as shown on the plans or as directed by the Superintending Engineer. Splices of tensile reinforcement at points of maximum stress and splicing of adjacent bars shall be avoided. Splices shall be staggered as far as possible. Where bars are spliced they shall be lapped at least forty five diameters. In lapped splices, the bars shall be placed in contact and wired together.

10.9.9 Welding:

Whenever the plans and specifications call for welding of joints in reinforcement bars in lieu of lapping them, the bars shall be butt welded so as to transmit their full strength. Welded joints should preferably be

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located at positions where the steel will not be subject to more than 75% of the maximum permissible stresses and the welds should be so staggered that any one section not more than 50% of the rods are welded. Only

electric welding using a process which will exclude air from the molten metal be accepted. Welding shall conform to Clause No.10-21.

10.9.10 Inspection:

No concrete shall be deposited until the Superintending Engineer has inspected the placing of the reinforcement steel and given permission to place concrete. The concrete placed in violation of this provision will be rejected.

Accurate records shall be kept at all times of the numbers, sizes, length and weights of bars placed in positions or for the different parts of the work and verified before placing concrete.

10-9-11 Method of Measurement:

The weight of reinforcing steel incorporated in concrete and actually in place or shown on the plans or as directed by the Superintending Engineer will be determined correct to one kilogram on the following basis. The lengths of various sizes of rods will be measured after placing in position and weight calculated.

For the purpose of calculating the weight of rods placed in position the weight per foot length of the rods of each size shall be determined by actual weighing of sample taken from each consignment of approximately 10 tones.

When the bars are supplied by the manufacturers on the basis of section weight, then section weight shall apply

10-9-12 Basis of Payment:

Reinforcing steel placed as shown on the plans or as directed by the Superintending Engineer will be paid for at the price per metric ton of reinforcing steel as provided in the contract.

The price paid per tonne of the reinforcing steel placed shall include full compensation for furnishing all labour, materials, tools and equipments. bending, welding, joints and fabricating to shape and doing all the work involved in handling and placing the specified reinforcing steel, tying and securing complete in place with all necessary stays and supporting devices as directed by the Superintending Engineer and shall include the cost of steel and all wastages.

Full compensation for furnishing all the wires and supporting devices, stays and chairs shall be considered as included in the prices paid for reinforcement steel and no additional compensation will be allowed for such work.

10-10 Covers for curing and protecting concrete .

10-10-1 Description:

Covers for curing and protecting concrete shall meet one of the following requirements.

10-10-2 Burlap:

Burlap used for curing concrete shall be made of loose fibre and shall weigh when dry not less than 7 ounces per square yard.

10-10-3 Cotton or Jute Mats:

Cotton or Jute mats for curing concrete shall be one/ply sheets of cotton felt or jute felt or other filler suitably covered on both side with burlaps or coarse cotton fabrics. The mats shall weigh not less than 22 ounces per square yard when dry and shall absorb twice their weight of water.

10-10-4 Ponding :

The bunds shall be of clay and not less than 50mm (2") high. A minimum of 25mm (1") of water shall be maintained at times over the surface.

10-10-5 Wet Earth:

Wet earth for curing shall consist of a layer of sandy soil not less than 50mm (2") thick kept saturated with water at all times.

10-10-6 Tarpaulins:

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Tarpaulins or other water-proof cloth shall be used for protecting green concrete from rain. They shall be of quality as will keep off rain water effectively.

10-10-7 Prohibited Materials:

Straw, old and torn jute sacks shall not be used for curing.

10-11 Gravel

It is composed of rock particles, sand, silt and clay occurring naturally in deposits, free from dirt and foreign materials. It shall not contain any lumps of stones larger than 20mm gauge. A small natural admixture of clay upto 10 percent is not objectional.

10-12 Earth for filling the Embankment 10-12-1 Description:

The earth for filling in between the retaining walls shall be good sandy earth with clay content not exceeding 30% and free from rubbish, rank vegetation and other decayed matter.

10-12-2 Source, Conveyance, Storing, Measurements and Payment:

The Contractor shall make his own arrangements for the source of the earth. For conveyance, storing, measurement and payment-Clause No.10-1 Shall apply.

10-13 Foundation Excavation and Fill 10-13-1 Description:

Foundation excavation shall include the removal of all material of all kinds of soil except rock necessary for the construction of foundation and substructures in accordance with the plans or as directed by the Superintending Engineer. It shall include the furnishing of all necessary equipment and the construction of all cribs, cofferdams, dewatering, pumping, shuttering, etc., which may be necessary for the cofferdams and cribs and the placements of all necessary back fills and the disposal of any surplus materials as here in after specified.

The rights of way within the limits of structure shall be cleared of such trees, stumps, bust and other perishable matter as the Superintending Engineer may direct. All such material shall be burnt or otherwise removed from the right of way as directed. The cost of clearing of right way within limits of structure shall be included in the price bid for the various items of contract and no other payment will be made therefore.

10-13-2 Excavation:

Excavated materials is not to be placed nearer than three feet from the outer edges of the excavation but shall be placed any where within 9.14in (10 yards), as may be ordered by the Superintending Engineer without extra payment

10-13-3 Preparation of Foundations for Footing:

The bottom of the foundation pits shall be bets leveled in all directions and before any concrete is put in, shall be well watered and thoroughly rammed. The foundation trenches shall be dug out to the exact width of the lowest step of the footings and the depth shall be in accordance with the plans, or as may be otherwise

ordered by the Superintending Engineer. The sides shall be left plumb, if the nature of the soil admits of it, but when the soil appears treacherous or likely to fall in, the sides shall be sloped or shored up carefully to the satisfaction of the Superintending Engineer. When different foundation levels are necessary, the trenches shall be taken in horizontal terraces dug-out square. If by the contractor's mistake the excavation is mad deeper or wider, than shown on the plan, the extra width or depth shall be made up with concrete and not with earth or other material, at the cost of the Contractor.

10-13-4 Inspection:

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After each excavation is completed, the contractor shall notify the Superintending Engineer and no concrete shall be placed until the Superintending Engineer has approved the depth of excavation and the character of the foundation material.

10-13-5 Pumping:

Pumping from the interior of excavated pit shall be done in such a manner as to preclude the possibility of any portion of the concrete materials being carried away. No pumping will be permitted during the placing of concrete, or for a period of atleast 24 hours thereafter, unless it be done from a suitable sump separated from the concrete work, by a water-tight wall. In the case of deep excavations involving sub-soil water, a ring of interlocking sheet piles have to be sunk and the underground water completely pumped out before taking up foundation operations, Further this work has to be carried out as per TNBP., and S.S.R.B. No separate payment will be made for pumping items.

10-13-6 Disposal of Excavated Materials:

All materials excavated by the contractor shall be disposed off as directed by the Superintending Engineer . so as to leave the site in a neat condition. Material suitable for back-filling shall be used for that purpose to extent required to completely backfill the structure to the original ground level.

Material Suitable for approach fills, and not required for back fill shall be placed in the approach fills. . Material not suitable for back-filling or approach fills shall be disposed off as directed by the Superintending Engineer.

10-13-7 Back Filling:

The Contractor shall back-fill completed structures in accordance with the following requirements.

No back-filling shall be placed against structures until permission shall have been given, by the superintending Engineer or 14 days after the concrete has been placed. The trenches or other excavations shall be filled up with the excavated earth carefully rammed, in regular layers of not more than 230mm (9") in thickness and compacted and consolidated by the addition of necessary water to each layer.

10-1.3-8 Method of Measurement and Payment:

Payments for excavation shall be made at the unit rate per 28.32m³ (1,000cft.) agreed upon fl. 'r the actual quantity excavated in conformity with the plans or directed by the Superintending Engineer but no payment shall be allowed for the measurement, which is outside of the volume bounded by vertical planes 450mm (18") outside of and parallel to the next lines of the footing.

Excavations for structures measured in its original position by the cross section method shall not include water or other liquids, but shall include muds muck and other similar semi-solids.

The top and bottom limits of completed volume shall be the original ground surface and the bottom of the completed footing. Individual quantities shall be worked out to the nearest 0.028m³ (1cft.) and the total of 1 set nearest to the 0.28m³ (10cft.)

When it is necessary in the opinion of the Superintending Engineer to carry the foundation below the levels shown on the plans, the excavation for the first 915mm (3 feet) of additional depth will be included in the item, "Foundation excavation," for which payment will be made at contract unit prices. Excavation below this additional depth will be paid for as extra work, unless the contractor is willing to accept payment at contract prices.

10-14 Embankment 10-14-1 Description:

This work shall consist of the constructions embankments by depositing, placing and compacting materials, in accordance with the requirements of the specification and in conformity with the lines, grades and cross sections, shown on the plans.

10-14-2 Materials:

Material for the embankment is good earth suitable for the work. For the supply of good earth the contractor should make his own arrangements for the source.

10-14-3 Equipment:

The equipment used in the construction of the embankment shall comply with the following general requirement :-

- (a) Equipment for digging, moving and spreading earth. .
- (b) Power Roller:- The power roller shall be a three wheel general purpose type. The pressure per inch width of rear wheel shall not be less than 147.kg (325lbs). under working conditions.
- (c) Water lorries fitted with spray bars or other satisfactory means of applying water controlled amounts. If approved by the Superintending Engineer alternative equipments supplemented by manual labour may be used in lieu of equipment listed above.

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10-14-4 Construction Methods.

The methods used in performing the work shall conform to the following Requirements:-

(a) Preparation of the Existing Service:

The full width of the base of the embankment shall be cleared of all trees, shrubs, weeds, grass and vegetable mould. The root shall be thoroughly grubbed up. Loose stones, rubbish of all sorts and all sod stuff must be removed from the surface to be covered and deposited outside the beds or disposed off as the Superintending Engineer may direct. Ant hills are to be completely dug out and queen ants destroyed before the work is started.

(b) Placing Materials:

The embankments filled with earth shall be constructed in layers not exceeding 8 inches and levelled, parallel to the finished grade and extending the full width of the embankment and building up of embankment by dumping the material at the ends is always prohibited. Throughout the work in each layer, the outer portion of the embankment shall be kept lower than the middle. Each layer of earth shall be compacted with power rollers or suitable mechanical equipment to be approved by the Superintending Engineer and to guarantee a uniform dry density of not less than 1842.13Kg/m³ (115lbs./C.ft.) throughout the compacted fill in each layer. The compaction of the earth shall be carried out only under optimum moisture content condition in the earth. On resuming work after one interval, if the previously compacted surface has dried up or hardened, it shall be moistened and scarified before any fresh material is placed on it.

Areas inaccessible to rollers around the retaining walls, shall be built in continuous layers not more than 100mm (4") deep and each layer shall be thoroughly compacted with mechanical or manual tampers.

10-14-5 Method of Measurement and payment:

The payment for earth fillings shall be made only on the Compacted Quantity. The quantity shall be arrived at by taking levels on each occasion. The difference in levels between the compacted surface and the original ground level shall be taken to compute the quantity of earth for the purposes of payment. On no account shall the quantity of earth, excavated or carted from the different sources be taken into consideration for payment.

The Contractor is expected to make due allowance for compaction of earth to base his tender rate, as the payment will be only for the compacted quantity of earth as defined in the respective schedules. .

The rate should include full compensation for performing all work required under embankments and for furnishing all necessary equipment, tools, labour and other items incidental to embankment.

10-15 BRICK WORK

10-15-1 Materials:

The materials to be furnished and used shall conform to the requirement set forth in the specifications for the several parts of the completed structure. Specific reference to important items are as follows:-

- (1) Bricks-Should conform to Clause No.10-6.
- (2) Cement-Should conform to Clause No. 10-7.
- (3) Sand-Should conform to Clause No. 10-4.

10-15-2 Construction Methods:

No four course of brick-work, with three joints, shall exceed in height, when built, one inch more than the same bricks piles upon one another without mortar. The bricks are to be well soaked in water before use on

works, in proper through so as to be thoroughly wet when laid. The Cessation of the bubbles through the water is an eradication of saturation being complete.

For ensuring thorough soaking of the bricks every one or two bricklayers or more as necessary, shall be provided with tubs for use. The wall of structures shall be carried up regularly in all cases when the nature

of the work will admit of it not leaving any part 915mm (3 feet) lower than another. Horizontal courses shall be straight, level and even and faces of walls smooth and plumb. A straight edge and a plumb-bob shall be used for constant checking during progress of the work. No brick-bats shall be permitted to be used except when necessary for obtaining the dimension of the different course or for obtaining the specified bond. All unfinished work must be raked back in course unless otherwise directed and when new work is to be jointed to it the surface of unfinished work must be cleaned and wetted. The bricks shall be laid by placing sufficient mortar on the wall and forcing every brick into it

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in such a manner as to completely fill every joint with mortar whether at the bottom, side or end of the brick. The mortar to be used shall be that specified for the relevant schedule items and shall comply with the specification for the mortar specified. The bond used shall be English and shall be carried throughout the work. At all angles forming the junction of any two walls, the bricks shall, at each alternate course be carried into each of the respective walls, so as to thoroughly unite the work. When the faces are to be plastered, the joints shall be well raked out before any plaster is laid on should the plaster from want of proper joint ranking detach and fall off from the brick work, the contractor shall strip off the plaster bodily to the extent ordered by Superintending Engineer and shall re-do the work properly at his own expense.

All requisite scaffolding shall be provided at the contractor's expense and shall be double i.e., must it have two sets of upright supports Care must be taken to ensure the safety of the work people and the contractor must comply with such instructions as the Superintending Engineer may issue to ensure such safety. The contractor will be entirely responsible for any damage or injuries to person or property resulting from ill-erected scaffolding, defective ladders, or otherwise arising out of his default in this respect.

The brick work for the retaining wall shall proceed side by side with the depositing and compacting of earth between the retaining walls. At no time shall the brick-work be constructed more than 405mm (1'-4") above the compacted earth. In the retaining wall weep-holes shall be provided at suitable intervals as instructed during execution, with the inner surface of the weep-holed plastered 20mm (3/4") thick in cement mortar 1:4 crouched rock of grades in different layer shall be provided at the inner end of the weep-holes to prevent the choking of the weep-holes to have full drainage. No extra payment will be made for this and no deductions will be made for this in the brick-work.

10-15-3 Measurement and Basis of Payment:

The quantity of the item which constitute the completed and the accepted structure will be measured for payment according to the provisions of the contract and in terms of the unit provided therein. Only accepted work shall be measured for payment and the computations of the quantities thereof will be based on the dimensions shown on the plans or ordered in writing by the Superintending Engineer.

The quantity measured will be paid for at the contract unit price. The contract unit price shall be payment in full furnishing all materials, labour, equipment, scaffolding materials, tools and incidentals necessary to complete the work as specified.

10-16 CONCRETE FOR STRUCTURES

10-16-1 Description:

Concrete for structures shall consist of an approval portland cement, a fine aggregate, a coarse aggregate and water, mixed in the proportions specified.

10-16-2 Materials:

All materials shall conform to the requirement of the relevant specifications as set forth below:-

Ordinary Portland Cement	...	Clause 10-7
Water	..	Clause 10-8
Fine aggregate	...	Clause 1-3
Coarse aggregate	...	Clause 10-2
Bitumen for water proofing	...	I.S. 73-1950
Expansion joint filler	...	I.S.1838-1961
Covers for curing and protecting concrete	...	Clause 10-10

Note: Only ordinary portland cement shall be used in the work. If for any reason the contractor desires to use high early strength cement, he shall obtain the written permission of the Superintending Engineer to use it.

10-16-3 Equipment:

All equipment, tools and machinery used in performing the work shall be of approved design, and shall be maintained in a satisfactory working condition.

- (a) Mixer:- The mixer shall be of approved design and shall have a rated capacity of not less than 0.2m³ . (7cft.) of mixed concrete.
- (b) Boxes shall be of strong construction and provided with handle for convenient lifting and loading the mixer. The boxes shall be of such size that it should be possible to measure out the requisite quantity of aggregate in whole boxes or by multiples thereof. Each box shall be provided with a straight edge for striking off after filling.

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- (c) Additional Equipment:- The contractor shall provide all small tools and other equipment necessary to complete the work in accordance with the specification.

10-16-4 Staging and centering:

The contractor shall submit detailed plans for staging and centering for examination by the Superintending Engineer. If such plans are not satisfactory to the Superintending Engineer, the contractor shall make such changes in them as may be required, but it is understood that the Superintending Engineer concurrence in the use of the plans as submitted or corrected shall in no way relieve the contractor of responsibility of obtaining satisfactory results.

For calculating the strength of staging or centering, a weight of 2400kg/m^3 (150 lbs./c.f.t.) shall be assumed for green concrete. The contractor shall make allowance for the deflection of forms and for shrinkage and settlement of staging or centering in addition to the allowance of dead loads, deflection and camber, as shown upon the plans.

The Superintending Engineer may require the contractor to use screw jacks hard wood wedges to take up any settlement in staging or centering either before or during the placing of concrete. All staging and false work shall be build on foundations of sufficient strength to carry the load without the appreciable deformation on stable soils like stiff clay and sand spread footings are used and shall be of size to be determined by the load to be supported. In. other location, the false work shall be supported on piles. The piles shall be spaced and driven to support the required loads without settlement. Staging and centering will be considered as a part of the work and no extra compensation will be allowed..

10-16-5 Forms:

The contractor shall submit detailed plans of form work for examination by the Superintending Engineer. In designing forms concrete shall be treated as fluid weighing 2400kg/m^3 (150 lbs./c.ft.) and in addition, a live load of 245kg/m^2 (50 lbs./s.ft.), on horizontal projection of surface shall be used. Forms shall be so designed and constructed, that they may be removed without injury to the concrete Blocks and bracing shall be removed with the forms and in no case shall any portions of the wood forms be left in the concrete. The forms shall be so constructed, set and maintained that the finished concrete shall be of the form and dimension shown on the plans and true to the line and grade.

Form shall be filleted and all sharp corners should be given a be well in the case of all projection such as girders, copings, etc., sufficient to ensure the easy removal. Special attention must be paid to ties and bracing and when the forms appear to be insufficiently braced of unsatisfactorily built either before or during the placing of concrete, the work shall be suspended until the defects have been corrected without any additional compensation.

The forms shall be printed with a colour less oil or some other satisfactory means taken to prevent the concrete from adhering to that. The forms shall be thoroughly drenched with water immediately before the concrete is placed in them. Forms used a second time shall be thoroughly cleaned and shall be free from bulge, splits, or warps. All forms shall be mortar tight and rigidly braced to prevent distortion due to Pressure of the concrete and other loads incidental to construction. In the case of compaction of concrete by vibration external and internal the forms shall be as designed as to withstand the effect of vibration.

The foregoing specifications for forms shall also apply to steels forms. The sheets used shall be of such thickness that the forms will remain true to shape. All bolts and reet heads shall be counter sunk, clamps, pins or other connecting devices shall be designed to hold the forms rigidly together, and to allow removal without injury to the concrete. Steel forms which do not permit a smooth surface or live up properly shall not be used. Special care shall be exercised to keep steel forms free from rust, grease or other foreign matter which would discolour the concrete. No compensation will be allowed for forms, price for concrete shall include the price for forms.

10-16-6 Removal of Staging, Centering and Forms:

All forms shall be removed in a careful workman like manner. Supports shall be removed in such a manner as to permit the concrete to uniformly and gradually take the stresses due to its own weight

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No super-imposed load either dead or live shall be allowed upon the bridge within the period for which the false work is required to remain in place. Forms may be removed from the vertical surface after 24 hours provided however that in no case shall the forms be removed until the concrete is sufficiently set so that it is self supporting. The time for removal of staging, centering and forms, shall be as follows

Centering under beams	...	28 days
Floor Slab	...	10 to 14 days
Columns unloaded	...	4 to 7 days

At the discretion of the Superintending Engineer the contractor may be required to leave them in place for a longer period of time and no compensation shall be paid to the contractor.

10-16-7 **Classes of Concrete:**

Unless otherwise stipulated concrete shall be of ordinary grade.

10-16-8 **Proportioning and Mixing:**

The approximate proportions necessary to produce concrete have in the required work ability and strength using the aggregates from the sources designated will be furnished in the tender documents, it being expressly understand that this information is only for the convenience of the tenderer. After the award of the contract the proportions, that is, the field mix determined by the laboratory for the particular aggregates approved by the Superintending Engineer shall govern.

- (a)
- Minimum Compressive Strength:** Concrete shall be made of materials accepted for the project, of the proportions designated by the Superintending Engineer and in accordance with the requirements hereinafter setforth. The proportions shall be based on 'laboratory tests and shall be such that they will produce durable concrete of satisfactory plasticity and workability and which will attain compressive 'strength specified below or other values that may be stipulated for a particular work using ordinary Portland cement.

Mix	Minimum cylinder strength requirements 28 days and 7 days optional 0.070.3Kg / cm2 (lbs. / sq.in.)			Modular Ratio
	Preliminary Tests		Work Test	
	Days		Days	
	28		7	
1:2:4 Ordinary	2700	1800	1200	15
1:2:4 High Grade	3420	2280	1520	15
1:1:1/2:3 Ordinary	3060	2040	1360	15
1:1:1:1/2:3 High Grade	3960	2640	1760	15

(b) **Minimum Cement Content:-**

The minimum cement content shall not be less than 16 bags of 50.8kg per 2.83m3 (1cwtper 100c.ft) of ordinary grade concrete of 1 :2:4 mix. Substitute mixes designed by the contractor will not be accepted.

The Strength of the concrete will be determined by the Superintending Engineer by testing at least, one test specimen prepared at the site of the work each day concrete is placed, except when additional test specimens are required to obtain result upon which to base the removal of the forms or the opening

of the structure of traffic. The test specimens shall be standard cylinders 6 diameter by 12, height and . shall be made from concrete taken from the mixes in actual use. The contractor shall transport the specimens from the site of the works to the laboratory. During transportation the specimens shall be embedded in straw, burlap, or other acceptable material in a manner meeting with the approval of the Superintending Engineer so as to protect them from injury or damage. .

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Testing will be done departmentally. The Contractor shall furnish the concrete and forms used in making tests of the cement, materials and equipment necessary for proper transportation and curing, and labour incidental to the preparation, storage, the cost of all the above shall be included in the contract unit price for concrete. If the test results reveal that any specimen does not conform to the specified strength requirements, the Superintending Engineer shall have authority to reject the corresponding work and all other portions, structurally connected with it.

- (c) **Water Content:-** The quantity of water used in the mix shall be the minimum to permit proper compaction and surface finishing of the concrete. The amount of water to be added to each batch will be adjusted by the Superintending Engineer to maintain as nearly as practicable a slump of 50mm to 100mm (2" to 4") for normal reinforced concrete sections normally compacted or heavily reinforced sections compacted with vibratory equipment and slump of 100mm to 175mm (4" to 7") for sections with congested reinforcement not suitable for vibration. The total free water in each batch shall not exceed the volumes given below:-

For 75mm (3") Slump					
Maximum size of aggregate	...	12.5mm(1/2")	20mm(3/4")	25mm(1")	37.5mm (1 1/2")
water in 0.4536Kg/2.83m ³ (lbs./100 cubic ft.)		1,333	1,241	1,204	1,122
Water in 454 litres/0.028m ³ (Imperial gallons/c.ft.)		1.33	1.24	1.2	1.12

Note:- To obtain 25mm (1") increase or decrease in slump increase or decrease the water content / by 3 percent.

Subject to the maximum water content set forth above, satisfactory plasticity and workability shall be obtained by suitable adjustment in the proportion of coarse aggregate to fine aggregate taking care not to exceed the specified water cement ratio. In case it is found that there is no other course, but to exceed the water content, the cement content shall be increased so as to maintain the water cement ratio at the minimum value specified.

During construction the Superintending Engineer shall determine the amount of free moisture and the absorption of the aggregate as often may be necessary and suitable allowances shall be made for these to ensure reasonable control of batching.

- (d) **Consistency:-** The consistency shall be determined by making trial mixes with dried aggregate such that the concrete shall be sufficiently workable to enable it to be well consolidated to be worked into the corners of shuttering and around the reinforcement to give the specified surface finish. The slump shall not exceed throughout the whole batch of concrete made with same material, mixed in the same proportions as the trial mixes and used in those parts of the works as directed. The slump of the trial mix of approved consistency shall be measured using the slump cones at least 5 times a day. The contractor shall furnish the concrete necessary for the test.

- (e) **Price Adjustment:-** In case satisfactory plasticity and workability are not secured using the proportion originally designated by the Superintending Engineer he may alter such proportions as he may deem necessary. If such alternations change theoretical cement factor originally fixed at the laboratory and if the cost of the cement is included in the unit price of concrete, payment will be adjusted for or against the contractor in whatever amount the total cost of the cement has been increased or decreased. The amount of such increase or decrease shall be calculated from the theoretical cement factor determined by the laboratory. No such price adjustments for the variations in gradations of aggregate mixture shall be allowed.

- (f) **Batching and Mixing:-**

The location and preparation of the sites for the stock piling of aggregates the maximum size of stock piles and the method adopted to prevent segregation of coarse and fine material shall be subject to the approval of the Superintending Engineer. Each separate size of coarse aggregates shall be stock piled separately.

The aggregate shall be handled from the stock piles to the batching plant in such a manner as to secure a typical grading of the material. Aggregates that have become mixed with earth or foreign material shall be used only after washing and cleaning. All washed aggregates shall be stocked for draining at least 12 hours before being batched.

After determining the proportions of ingredients for the field mix, the fine aggregate and each separated size of coarse aggregate shall be proportioned and placed into the hopper of the mixer along with necessary quantity of cement. Cement shall be measured by the bag per by weight. At batching or mixing of materials as far as possible shall be on the basis of one or more whole bags of

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cement. The Superintending Engineer may permit the use of fractional bags of cement in a manner meeting with the approval. Water may be measured either by volume or by weight.

The contents of the hopper shall then be emptied into the drum of the approved mixer taking care to prevent possible loss of cement by being blown away in high wind. The aggregate and the cement shall be thoroughly mixed in the mixer for a period of not less than one minute during which time the drum shall make not less than 16, not more than 20 revolutions per minute. The water shall be introduced in a uniform manner during the first 15 seconds of the mixing period. The mixing time may be extended if necessary to obtain thorough mixing and uniform consistency. Any concrete mixed less than the specified mixing time shall be rejected and disposed off by the contractor at his expense.

The entire contents of the drum shall be discharged before any materials are placed therein for the succeeding batch. The skip and throat of the drum shall be kept free of accumulation. The volume of material mixed per batch shall not exceed the manufacturer's rated capacity of the drum. The mixer shall be placed as close to the part of the structure being concreted as possible.

The concrete shall be mixed only in the quantity required for immediate use. In volume batching suitable allowance shall be made for the bulking of fine aggregate due to the presence of water. For this purpose the bulking shall be determined as directed by the Superintending Engineer. When hand mixing is authorised it shall be done with 10% increase in cement content on a watertight platform and in such a manner as to ensure a uniform distribution of the materials throughout the mass. Mixing shall be continued until all the stone particles are thoroughly covered and a homogeneous mixture of the required consistency is obtained. Hand mixed batches shall be of volume to take in one bag of cement only. No extra cost will be paid for this 10% cement.

10-16-9 Handling and Placing:

Concrete which has remained mixed without reaching its final position longer than 30 minutes or which has developed initial set shall not be used. Retempering concrete by adding water or by other means will not be permitted. No mixture containing lumps of hardened concrete shall be used.

- (a) **General:-** The Contractor shall notify the Superintending Engineer of all proposed deposit on of concrete sufficiently in advance thereof to permit the S.E. to inspect the forms, reinforcement, and casting preparations before concrete is placed.

The operation of depositing and compacting concrete shall be conducted so as to form a compact, dense impervious artificial stone of uniform texture which shall show smooth faces on all exposed faces. The method and manner of placing concrete shall be such as to avoid segregation or separation of the aggregate or the displacement of the reinforcement. If any section of concrete is found to be defective, it shall be removed or repaired as directed by the Superintending Engineer without additional compensation.

Concrete shall be placed in continuous layers of thickness as directed by the Superintending Engineer. Not more than one hour shall elapse between the placing of successive layers of concrete in any portion of the structure. Each layer shall be placed and compacted before the preceding batch has taken initial set, to prevent injury to the green concrete and avoid surfaces of separation between the batches. Placing of concrete shall be so regulated the pressures caused by the concrete shall not exceed those used in the design of the forms.

Special care shall be taken to fill each part of the forms by depositing concrete directly as near the final position as possible, to work the coarse aggregate back from the face and to force the concrete under and around the reinforcement bars, without displacing them. All faces shall be well spudded and the mortar flush to the surface of the forms by continuous working with concrete spading implements. In the cases in which difficulty is encountered in puddling the concrete adjacent to the forms, because of reinforcement, shape of forms or any other condition, the concrete mix may be altered by reducing the amount of coarse aggregate.

Immediately following the discontinuance of placing concrete all accumulation of mortar splashed upon the reinforcement steel and the surface of the forms shall be removed. Dried mortar chips and dust shall not be puddled into the unset concrete. After the concrete has taken the initial set care shall be exercised to avoid jarring of forms or placing any strain on the ends of projecting reinforcement.

All Concrete shall be placed and finished during day light. Whenever it is necessary to continue the mixing, placing or finishing of concrete after the day light hours, the site of the work, shall be sufficiently lighted so that all operations are plainly visible for inspection and with the approval of the Superintending Engineer...

- (b) **Placing Large Volumes of Concrete:-** Each monolithic section shall be placed in one continuous operation. Whenever the volume is too great to be placed in one continuous operation, the work shall be sub-divided as shown in the plan or as directed by the Superintending Engineer. In general the order of construction or sequence of the work will be as indicated on the plans.

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- (c) **Bonding New and Old Work:-** When new concrete is to be placed in contact with the old concrete or with concrete that has already reached its final set, the surface of the old concrete shall be thoroughly cleaned of all laitance, dirt or other foreign materials, then roughened and thoroughly drenched with water until saturated and covered with a coating of mortar or neat cement throughout against which new concrete shall be placed by the cement covering taking the initial set. Care shall be taken to tighten the forms against the face of the old concrete and to thoroughly compact the fresh concrete when placed so as to ensure a good bond.

10-16-10 Placing concrete in Footings:

- (a) **General;-** The concrete should be placed in the air rather than under water whenever possible.

- (b) **Placing Concrete in Footings:-** No Concrete shall be placed in footing until the depth and character of the foundation material have been inspected and approved by the Superintending Engineer. Suitable wood or metal forms shall be used to enclose all footing concrete.

Concrete shall be placed in footing dewatered and dried. That is, the water shall be kept out of the trenches while the concrete is being placed therein. If conditions are such that it is necessary to operate the pumps while placing the concrete, the seepage water must be conducted to a sump at a pump in take in such a manner as not to flow over the freshly posited concrete. Great care must be used to prevent from pumping cement out of the concrete with the water.

If unusual or unforeseen conditions are encountered the Superintending Engineer may permit the placing of concrete under water.

When footings can be so placed forms may be omitted and the entire excavation filled with concrete to the top of the footings, and no payment shall be made for concrete placed outside of the footing dimensions shown on the plans.

In wet or soft foundations care shall be taken to prevent dirty mud, or other foreign materials from becoming mixed with concrete which is being placed in the footing.

10-16-11 Mechanical Vibration:

Concrete during and immediately after depositing shall be thoroughly compacted; unless otherwise provided, the compaction shall be done by mechanical vibration to the following requirements:-

The concrete shall be compacted by means of a mechanical vibrator operated within the mass of concrete. When required by the Superintending Engineer vibration shall be supplemented by hand spading. The concrete shall be spaded by hand in all covers and angles of the forms, and along from faces while it is being vibrated. The concrete shall be vibrated with a frequency of not less than 3,500 impulses per minute. The vibration shall be of sufficient intensity and duration to cause flow or settlement in to place and complete compaction. Over vibration shall be avoided.

The mechanical vibrator shall be: of a type and design approved by the Superintending Engineer. It shall be adequately powered and capable of transmitting vibration of the required frequency to the concrete. A sufficient number of mechanical vibrators shall be provided on the job so that each batch may be thoroughly compacted immediately after placing and that there will be no delay in placing and compacting ensuring batches. The vibrator shall be applied to the concrete, immediately after depositing and so manipulated that the concrete is reduced to a uniform plastic mass thoroughly compacted. It shall be thoroughly compacted around the reinforcement and worked into the corners and angles of the forms. The forms of the reinforcement shall not be vibrated.

Concrete shall be placed in layers of uniform thickness not exceeding 300mm (12") and the apparatus so operated that the vibrating element does not penetrate through the layer of the fresh concrete and disturb the partially hardened concrete in lower layers. Vibrators shall not be pushed into or withdrawn from the mass of concrete too rapidly.

The water content of the concrete shall be the minimum necessary to produce uniformly dense concrete free from aggregate pockets or honeycombing

10-16-12 Surface Finish:

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Immediately following the removal of forms all cavities produced by the removal of form ties and all other hooks and depressions honey-comb spots, broken edges of corners and other defect, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered smoothly with mortar of cement and fine . aggregate mixed in the proportions used in the frade of concrete that is being finished and of as dry a consistency as is possible to use, Considerable pressure shall be applied in filling and pointing to ensure thorough filling in of all holes. Surfaces which have been pointed shall be kept moist for a period of 24 hours. All construction and expansion joints in the completed work shall be left carefully tooled and free of all mortar and concrete. Expansion joint filler shall be left exposed for its full length with clean and free edges. After the pointing is completed and the concrete hardened, all fins and irregularities shall be removed neatly by chipping and finished by using carborundum brick to produce a smooth finish. Entire surface after finishing shall present a smooth surface free from water pockets, air bubbles and other honey-comb spots. All such work shall considered incidental to the placing of concrete.

10-16-13 Joints - Sliding and Friction Joints :

When sliding joints are called for on the plans, the surface of the supporting concrete shall be trowelled to a smooth and shall be covered with the required thickness of the bituminous materials or otherwise treated as specified on the plans or as directed by Superintending Engineer.

The plates, angles or other structural shapes shall be accurately shaped, at the shop to conform to the section of the concrete floor. All precautions shall be taken in placing the joints to keep them in correct position during the placing of the concrete. Opening at expansion joints shall be that designated on the plans at normal : temperature, and care shall be taken to avoid impairment of the clearance in any manner. The details of the expansion joints shall be as shown in the drawings.

10-16-14 Bridge Seats :

Special attention shall be given to the finishing of areas to receive bearing plates so as to secure a true . plane at the correct level and thereby obtain uniform contacts over the bearing plates.

10-16-15 Protection and Curing of Concrete:

Concrete which has been placed shall be protected against any vibration, jarring or other movement which might injure it before it has reached its final set. Other precautions to ensure the development of strength shall be taken as the Superintending Engineer may direct.

Concrete floor slabs and the exposed or surfaces of contract subject to rapid drying shall be protected from the direct rays of the sun and newly placed concrete shall be protected from rain by means of tarpaulin.

Concrete surface exposed or surfaces from which forms have been removed shall be protected by covering as soon as possible with canvas, straw, burlap, and / or other satisfactory materials, or if the surfaces are not covered they shall be kept moist by flushing or sprinkling. Curing shall be continued for a period of not less than 14 days after placing the concrete.

10-16-16 Method of Measurement:

The quantities of the several items which constitute completed and accepted structure will be measured . for payment according to the provisions of the contract for these items and in terms of the units provided therein for such item.

Only accepted work will be measured for payment and computation of the quantities thereof will be based . on the dimensions shown in the plans ordered in writing by the Superintending Engineer.

All concrete except hand rail concrete confirming to the plans and specifications accepted and placed as directed shall be measured in cubic foot in place; individual quantities shall be measured in cubic foot in place, individual quantities shall be worked out to the nearest 0.0028m³ (1/10cft.) and the total of each set of measurement shall be rounded of correct to the nearest m³ (cft) No measurement or other allowances will be made for work or material for forms, false work, bracing, or other incidental necessary to complete the work as required and no measurement or other allowances shall be made for concrete, placed for the convenience of the contractor, greater dimensions than those shown on the plans. No deduction shall be made for the volume of the concrete displaced by the embedded steel reinforcement, drain pipes and downfall pipes, expansion joints (bituminous or metallic) and similar items.

10-16-17 Basis of Payment:

(a) **General:-** The several quantities, measured as provided above will be paid for at the contract unit price such as deck slab, tee beams, kerbs, columns, etc., constituting the structure and listed in the contract These contract unit prices shall be payment in full, for furnishing hauling and placing all

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materials and for furnishing all labour, equipment, tools, and incidentals necessary to complete the work as specified. Concrete for hand rails will be paid for as provided under separate clause.

- (b) **False Work and Centering:-** The cost of false work and centering complete in place including materials, tools, equipment, labour and work incidental thereto, shall be included under price for concrete and no additional payment will be made therefor. The price for concrete shall also include the cost of any working plant for false work as required by Superintending Engineer.
- (c) **Forms:-** The cost of forms, complete in place, including materials, tools equipment, labour and all work incidental to the erection and maintenance, in proper condition until the concrete is poured and hardened and their removal shall be included in the unit prices of concrete for which they are build and no other payment will be made therefore.
- (d) **Curing and Protecting Concrete:-** The cost of curing concrete and protecting concrete poured including all materials, tools, equipment, labour and all work incidental thereto shall be included in the unit price of concrete and no other payment will be made therefore.
- (e) **Structural and Expansion Joints:-** The cost of steel reinforcements, downfall pipes, drainage t pipes, expansion joints and other steel structurals shall be paid for separately.
- (f) **Finishing Concrete Surfaces:-** The cost of finishing all concrete surfaces including labour, tools, equipment and all work incidental thereto shall be included in the unit price for the class of concrete rate.

10-17 REINFORCED CONCRETE STRUCTURE

10-17-1 General:

Provisions of this section shall apply to all types of R.C.C. structures. Concrete structures and such other parts as are of concrete, shall be built in conformity with the lines, grades dimension, details and design indicated therefore on the plans, and in accordance with the pertinent specifications for all works necessary to complete the bridges structures designated in the proposal. This clause should be read along with Clause 10-16.

10-17-2 Materials:

The materials to be furnished and used shall conform to the requirements setforth in the specifications for the several parts of the complete structure. Specific reference to the important items are as follows:-

- (a) **Concrete for structures :-** Clause 10-16 shall apply.
- (b) **Reinforcement Bars :-** Clause 10-9 shall apply.

10-17-3 Construction Methods:

- (a) **General Requirements:-** The construction method used shall be in accordance with the requirements setforth in the specifications for the several parts of the completed structure.
- (b) **False work and Forms:-** Shall conform to Clause 10-16.
- (c) **Placing concrete in Slab Superstructure:-** The entire span shall be placed in one continuous operation except as otherwise ordered by the Superintending Engineer.
- (d) **Placing Concrete in Girders:-** Concrete, preferably, shall be deposited by beginning at the central span and working from the centre towards the ends. In sloping girders, pouring shall being at the one end of the structure that is, lower end and proceed upwards, Concrete in girders shall be deposited uniformly for the full length of the girder and brought by evenly in horizontal layers.

Concrete girder haunches less than 915mm (3') in height shall be placed at the same time as that in the girder stem. Whenever a haunch has a vertical height of 915mm (3') or more, the haunch and the girder shall be place in successive stages, first, upto the lower fide of the hauch, second, to the lower side of the girder and third to completion.

Concrete in Tee beam or deck girder spans may be placed in one continuous operation or may be placed in two separate operations, each of which shall be continuous, first to the top of girder stem, and second to completion. In the latter case, the bond between stem and slab shall be secured by means of suitable shear keys in the top of the girder stem.

- (e) **Placing Concrete in Columns:-** Concrete in columns shall be placed in one continuous operation unless otherwise direct. Unless otherwise permitted by the Superintending Engineer no concrete shall be placed in the superstructure until the column forms have been stripped sufficiently to determine the character of the concrete in the column forms have been stripped sufficiently to determine the character of the concrete

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in the columns, the load of the superstructure shall not be allowed to come upon the bents until they have been in place at least 14 days, unless otherwise permitted by the Superintending Engineer.

- (f) **Kerbs and Railings:-** Solid panelled railing shall be poured the day after the concrete in the floor has been placed. Kerbs and concrete railing other than the solid panelled type shall not be placed until the false work for that superstructure until has been removed.
- (g) For all other: items of work the concreting shall be done as directed by the Superintending Engineer.

10-18 GRAVEL SOLING FOR EMBANKMENT

10-18-1 Description:

This work shall consist of gravel placed on the embankment fill and compacted in accordance with specifications and conforming to the line, grade and cross-section shown on the plans or as directed by the Superintending Engineer.

10-18-2 Material:

The material shall be grave conforming to clause 10-11.

10-18-3 Conveyance: Clause 10-1 shall apply.

10-18-4 Tools, Plants and Equipment:

- (a) Generally tools of any kind will not be supplied departmentally nor does the Department undertake to arrange for the purchase of tools on behalf of the contractor who shall himself make all arrangement for providing the tools required for work.
- (b) According to the nature of consolidation rollers specified shall be supplied by the contractor.
- (c) The contractor shall provide for the work all tools, plant and equipment. The following list of items of tools, plant and equipment is intended to serve as a rough-guide:-

Signs, barricades,. red-flags, danger-lights and other devices for regulating traffic and for protecting the green surface.

Strings and stacks.

A set of three camber boards.

A set of three boning rods.

`Spirit Levels.

Fish line (thin cotton twine) to 60.96m (200 feet) length.

Tape 30.48m (100 feet)

Straight edge 30.48m (100 feet) long.

Brooms.

Special tools and equipment for spreading metal, gravel, laterite. etc. mechanically or by manual labour, equipment for sprinkling water. Any other items as may be specified by the Superintending Engineer.

Tools, plant and equipment shall be furnished in sufficient numbers so as to ensure satisfactory progress of work. The contractor is not precluded from using plant and equipment other than those mentioned in these specifactions of introducing refinements in construction methods and speeding up the progress of the work, subject to the approval of the Superintending Engineer.

10-18-6 Construction Method:-

- (a) **Spreading and Compacting:-** The earth filling in the embankment shall be moistened and theaterial (Gravel) shall be spread upon it uniformly to the specified depth and in specified layers by an approved method, but no material shall be dumped in piles on the embakment and spread therefrom. The material shall be dragged with a long base drag or other levelling device so as to secure uniform distribution an eliminate all un eveness. The grade shall be checked by means of a set of three boning rods, the crown shall be checked with a set of three camber boards and fish-line following the method explained in Clause 10-191-5(c).

The material shall theil be uniformly moistened in quantities just sufficient in secure to specified compaction and rolled to such compaction with an approved roller. Rolling shall commence at the edge of each course and progress towards the centre. Under no circumstances shall the centre of any course be rolled first. During compaction care shall be taken to maintain a smooth and uniform surface and crown as shown on the plans, and the finished surface shall conform to the line grade and cross-section

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shown on the plans or directed by the Superintending Engineer. During rolling the surface shall be frequently checked and all irregularities shall be corrected by loosening the material and removing on adding material and re-establishing a smooth uniform firm surface.

Work on each course shall be performed in a similar manner as mentioned above. No additional layer shall be placed upon a course until it has been thoroughly compacted and sufficiently dried.

- (b) **Testing :-** On completion, the surface shall be tested by means of a ten feet straight edge laid parallel to the centreline of the road, and there shall be no depression visible below the straight edge, 12.5mm (half-an inch) or more in depth.

10-18-7 Joining the Old and New Surfaces:

During construction the contractor shall take all precautions to ensure a smooth and shock free junction between the old and the new surfaces.

10-18-8 Method of Measurement:

Supplying, spreading and consolidation of materials will be measured by area in sq.m.(sq.feet) in length being taken along the centre line of the soling and the width along the line at right angles to the centre line. The thickness will be measured by taking difference of levels.

10-18-9 Basis of Payment:

Supplying, spreading and consolidation of materials as measured above will be paid for at the contract unit price for same which price shall include the cost, conveyance and stacking of materials and shall include full compensation for spreading, watering, rolling, finishing and all incidental work and for furnishing at labour, tools, plant and equipment necessary for the proper execution of the work.

10-19 METALLING THE ROAD

10-19-1 Description:

Metalled road shall consist of a layer of compacted aggregate constructed on a prepared base in accordance with the specifications conforming in all respects to the lines, grades and typical cross-sections shown on the plans. When the cross-section calls for a nominal thickness of more than 75mm(3") the surfacing shall be constructed in two or more courses as directed by the Superintending Engineer.

10-19-2 Conveyance shall conform to Clause 10-1.

10-19-3 Tools, Plant and Equipment shall conform to Clause 10-18-4.

10-19-4 Camber shall conform to Clause 10-18-5.

10-19-5 Construction Methods:-

The methods employed in performing the work and equipment, tools and machinery used for executing any part of the work shall be subjected to the approval of the Superintending Engineer. The construction methods shall conform to the following requirements.

- (a) **Setting out:-** The edge of the surfacing shall be correctly marked by straight lines stretched between stakes driven at suitable intervals.
- (b) **Spreading Metal:-** When the contract calls for thickness of more than three inches in uncompacted condition, the surfacing shall be constructed in two or more course each course being not more than 75mm(3") or less than 37.5mm (1 1/2"). The metal shall be spread true to the grade line in cross section, and evenly to the uncompacted depth as provided in the contract.

The metal shall be spread by means of approved spreader boxes or by manual labour using baskets, the men turning their hands smartly so also scallier the stones well. The materials as spread shall be well graded, shall have no pockets of coarse or fine materials and shall be free from segregation of fine and coarse particles. Loose material shall not be let in unsprayed heaps at the end of each day's work.

- (c) **Hand packing.-** The metal shall be packed to camber and grade, a set of three identical camber boards with spirit level being constantly used in conjunction with a fish line a set of three boning rods in the following manner, with the aid of the boning rods, areas about one foot square and 9.14m(30') apart and along the centre line shall be first packed so that they are on the correct grade ahead of packing to camber. This shall be the reference points for

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grade and shall be readily identifiable Starting with the first tow of these points two strips about 450mm(18") wide shall then be packed to correct camber and two of the three camber boards firmly held over this. A fish line weighted at both ends shall be held taut over

The ends of these two camber boards and parallel to the centre line of the road. To ensure correct .

positioning .of the fish line camber boards shall be identically marked. Packing of the spread materials between these two camber boards shall then be commenced checking the camber by means of the third camber board moved slowly in between the end camber board. Hand packing shall be done by a row of four or five persons for a twelve foot pavement. After the area between the end camber boards is fully packed to correct camber and grade the first camber boards shall be moved over to the third reference point and the process repeated.

- (d) **Rolling-General:-** All rolling shall be done by means of eight to ten power rollers. When hollow steel rollers are used they shall be suitably ballasted with sand or water as directed.

In the case of power roller, care shall be taken that the roller is worked or started and stopped without jerks. he rollers shall not be stopped in the working section. In the case of steam rollers the furnace shall not be raked out nor the bunker replenished over the pavement under construction. In ~ach forward and reverse trip manoeuvring to get the roller into the correct position shall be done outside of the length under rolling either over the completed surface behind or over the incomplete surface ahead.

If three wheeled rollers are used, the rolling shall begin with the outside rear wheel of the roller at the end of the road and the roller shall be run forward and backward. When the edges have thus been firmly rolled, the rolling shall progress gradually from edges to the centre, parallel with the centre line of C .. the road and lapping uniformly each proceeding rear wheel track by one half width of the track, and shall continue until all the surface has been rolled by the rear wheels three or four times.

Rolling shall be done in lengths not less than 91.44m(300 feet) and the .total length of surfacing various stages of construction shall not exceed 274.32m (900 feet). Rolling shall be carried out in the presence of the person authorised to supervise it.

- (e) **Dry rolling:-** The road metals as spread shall be sprinkled with water in just sufficient quantities to moisten the cushioning below and to facilitate interlocking and rolled preferably with a three wheeled roller.

When the whole area has been rolled three or four times the camber and grade shall be checked by means of the three camber boards and fishline and a 3m(10 feet) straight edge laid parallel to the' centre line of the road. In all uneven areas observed the materials shall be thoroughly loosened by hand picking, surplus materials removed from high spots or depression refilled with fresh material and again rolled for the purpose of making of depressions small quantities of metal may be left unspread in the stacks when spreading is in progress.

- (f) **Wet Rolling:-** When all the defects have been dealt with rolling shall proceed water being applied copiously as directed by the Superintending Engineer until creeping or waving of metal ahead of the roller shall have ceased and the metal is well assembled.

During rolling if any individual fragment get crushed, they shall be removed and replaced with fresh materials.

The wet-rolled surface shall not vary more than 37.5mm (1%) from a 3m (10 feet) straight edge applied to the surface parallel to the centreline of the road.

- (g) **Haunch Bunding:-** Haunch bunds to a width of about 300mm(12") and to such height as to prevent water added during consolidation from flowing to the sides shall be formed along the edges of the surface.

- (h) **Gravel Rolling:-** The purpose of the operations described in this paragraph is that of incorporation the . gravel in the metalled surface in order to blind or seal the surfacing from water as well as provide a thin cushion over the finished surface which will produce a smooth riding surface. After the wet rolling of the surface is done until there is no movement of the stones, the stones all well assembled and their interlocking complete, the surface shall be tested with a 3m (10 feet) straight edge laid parallel to the centre line of the road and any irregularity exceeding 12.5mm (one-hald inch) shall be corrected by loosening the surface and recompacting the same after adding or removing materials as required. Gravel 'J; shall be spread evenly over the surface to a thickness of one-fourth the thickness of the surface course 9 or as directed by the Superintending Engineer in successive thin layers. After each thin application of gravel, the surface shall be rofusely sprinkled with water, the resulting slurry swept in with hand brooms to fill the voids properly and the surface rolled again water being applied to the wheel in order to wash down the gravel that may be slicking to them. The slurry shall be swept-up from the haunches to the crown and upgradient and no pat of the slurry shall be allowed to dlow up the road surface as this will result in the loss of soil fines, which impart binding properties to the gravel. The spreading of gravel binder sprinkling of water, sweeping with brooms and rolling shall continue until the slurry that is formed after filling all voids, will form a wave before the wheels of the moving roller. The rolling at all times shall begin at the sides arid progress towards the centre, thoroughly covering the entire surface with the rear wheel till a hard smooth solid paving is produced.

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- (1) **Defects appearing during work:-** Should the sub-grade become soft and mixed while the work is in progress, the contractor shall without additional compensation. Remove the mixture re-shape and compact sub-grade, replace the materials removed with clean metal which shall be rolled, broomed and filled until compacted satisfactorily, uniformly and in conformity with the surrounding surface.

10-19-6 Curing:

The surface shall in dry weather by kept lightly sprinkled with water and kept moist for about 15 days.

When the new metalled surface is to be joined up with the surfacing previously done, the crown of the one shall be merged into the crown of the other in a smooth and shock-free manner.

10-19 Method of Measurement:

Supplying, spreading and consolidation of materials will be measured by area in m² (square feet), the length actually being taken along the centre line of the metalling and the width along the line at right angle to the centre line.

10-19-9 Basis of Payment:

Supplying, spreading and consolidation of materials will be paid for at the contract unit price, which shall include cost, conveyance and storing of the materials and shall include full compensation for all operations described in this specification such as spreading metal and gravel, watering, rolling, curing and incidental work, all in accordance with the specification and for furnishing all labour, tools, plant and equipment necessary for the proper execution of the work.

10-20 PLASTERING WITH CEMENT MORTAR

10-20-1 Method:

All joints in the masonry shall be raked out atleast 20mm(3/4") deep. The walls shall be washed with fresh water and thoroughly wetted for six hours or as directed by the Superintending Engineer before plastering is commenced.

The plaster shall then be laid on with some what more than the required thickness and levelled with a flat wooden rule. The finished thickness shall be sufficient to cover by 12mm(1/2") the surface of the wall in brick masonry. The plaster shall be well pressed into the joint and the surface rubbed smooth after floating it with a thick coat of pure Portland Cement. The proportion of cement and sand shall be one Cement and three sand, the mortar conforming to the specification stated below:-

- (i) The mortar shall consist of Portland cement and sand each complying with its respective specification mixed in the proportions of one cement and three sand.
- (ii) Portland cement shall be measured by weight, 40.8kg (90 pounds) being taken as 0.1e foot and sand in suitable -sized measuring boxes. They shall be spread on a clean dry platform in layers one over the other and mixed dry three times over.
- (iii) Water is to be added to the mixtures, only when the mortar is required for use, and then only is sufficient quantity to make the material not profuse enough to drown the cement. All cement mortar to which water has been added, shall be finally deposited in place before initial set begins.

If the mortar has become set or hardened before being used, it shall be rejected and removed from the workspot.

The plastering shall be kept constantly watered for three weeks to avoid possibility of the cracking of plaster, the contractor should in all cases obtain instructions regarding the size of the strips or squares to be laid in one operation and complete adjoining trips on different days. Should the mortar crack or perish through neglect of watering or for other fault of the contractor, the work shall be removed and re-done at the contractor's expense, or should the contractor fail to water the work to the satisfaction of the Superintending Engineer the latter may supply the requisite men to water the work properly and charge the cost to the contractor.

10-20-2 Measurement and Payment:

The plastering shall be measured in m² (square feet) of the Surface plastered.

Plastering will be paid for at the contract unit price which shall include the cost, conveyance and storing of materials and shall include full compensation for all operations described in the

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specification, mixing, mortar, plastering, curing and for furnishing all labour, tools necessary for the proper execution of the work.

10-21 WELDING

10-21-1 Scope :-

This specification applies to the design and construction of welds made by the metal arc process.

10-21-2 Materials :-

Reinforcing bars shall conform to Clause 10-9, Electrodes used for strength welds shall conform to the requirements of Class 'A' electrode in 1.5.814-1957.

10-21-3 Forms of Butt-Joints :

Butt-Joints shall unless otherwise agreed to by the Engineer, be made in one of the following forms:

1. Double 'V Butt-Joint
2. Single bevel Joint

Reinforcement of Butt-Weld :-

- (i) Butt-welds shall be build up so that the thickness of the reinforcement at the centre of the weld is not less than 10% the size of the butt-weld subject to a maximum of 3mm (1/8").
- (ii) Where a flush surface is required, the butt-weld shall be first build up and then dressed flush.

10-21-4 Size of Electrode:-

The maximum gauge of the electrode is 10mm (3/8") diameter for 20mm (3/4") and above diameter bars.

Workmanship :-

- (a) Welds should be made in the flat position.
- (b) Arc length, voltage, and amperage shall be suited to the diameter of the material, type of groove and other circumstances attending the work.
- (c) The surfaces to be welded and the surrounding materials for a distance of at least 12.5mm (1/2") shall be freed from scale, dirt, grease, paint, heavy rust and other surface deposit..
- (d) Rods to be welded shall be held in correct positions by clamps or other suitable devices until welding has been completed.
- (e) Fusion faces may be cut by shearing, chipping, machining or machine gas cutting. Edges shall be left free of slag.
- (f) Each time the work is started, the electrode travel shall be delayed until base metal fusion at the starting point is assured. At the completion of a run, the electrode travel shall be delayed sufficiently to fill the arc crater.

After every interruption of the arc except at completion of the run, the arc shall be re-started ahead of the previous deposit and moved back to fill the crater: or such alternative technic shall be used as will equally well ensure complete filling of the crater, complete fusion between the new and old deposits and the base metal at the point of junction, and complete resultant continuity weld.

- (g) Exposed faces of welds shall be made reasonably smooth and regular shall come form as closely as practicable to design requirements and shall not at any place be inside the intended cross sections.
- (h) Welds showing slag inclusions, porosity or lack of proper penetration shall be cut out and reworked.
- (i) Finished welds and the adjacent parts shall be protected with clean boiled linseed oil after all slag has been removed.

Safety Precautions:- This applies in case of site welding.

- (a) Operators of welding and cutting equipment shall be protected from the rays of the arc flame by gloves and by helmets, hand shields, or goggles equipped with suitable filter lenses.
- (b) Suitable protection against the rays of the arc shall be maintained by the contractor when arc welding operations might be viewed with harmful range by persons other than the welding operators and supervisors.

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- (c) Welding shelter should be provided to protect welders and the parts to be welded from the weather.

Superintending Engineer Inspection:-

- (a) The Engineer shall have free access to the work at all reasonable times and facilities shall be provided so that during the course of welding he may be able to inspect any layer of weld metal.
- (b) The Superintending Engineer shall be notified in advance of any welding operations.
- (c) The contractor shall furnish the Superintending Engineer with copies of large scale working drawings, all the joints in mild steel bars that are to be welded.

Plant:- The welding plant and equipment shall be best of the type of modern design and to the approval of the Superintending Engineer either direct or alternating current (but not both kinds) may be used, throughout the whole of the work. An ammeter shall be provided to each arc and so situated that the Superintending Engineer can check easily the current being used by the operator.

10-21-5 Test :-

As soon as welders are employed they shall be required to make a joint in bars and the finished welds (including sufficient lengths of bars on each side) shall be cut out and tested to destruction in a tensile testing machine. If the welded joint on testing develops the full strength of the bar, the welding technic may be deemed satisfactory and the welder competent for the job. Otherwise the weld is to be rejected and the welder is not to be employed.

10-22 CEMENT WASH

10-22-1 Materials:

- (1) Cement.
- (2) Slaked lime
- (3) Powdered glue
- (4) Plaster of Paris
- (5) Alum

10-22-2 Preparation and mixing:

The cement wash should be prepared as follows:- First take dry materials consisting of 75% of Portland Cement, 10% each of slaked lime and powdered glue size, 3% of plaster of Paris and 2% of Alum. First place the cement in a pile and mix just sufficient water with it to bring it to a thick paste and keep it stirred with a stick. In a separate vessel mix the lime and plaster together with cement mortar to a somewhat thinner consistency. When thoroughly mixed with, add this to the cement and stir the two mixtures very thoroughly together.

In the meantime, melt the glue size with hot water and then pour this solution into the other ingredients. Finally dissolve the alum and add taking care to mix the whole well together. When this has been done, regulate the consistency of the wash by the addition of clean cold water and the best guide is to say that it would be of the thickness of fairly rich cream.

At the same time, a very important point to watch is to see that no greater quantity of cement wash should be made up at one time that can be used within half an hour. If desired, this need only apply to the cement mixture as the other ingredients may be made up in bulk if required. Then if fresh quantities of cement wash are made up from time to time as they are required, the other proportion of the necessary ingredients may be added from a large quantity and thus a better uniform and more reliable wash should result.

10-22-3 Application:

Immediately before applying the cement wash to a surface, the wall should be washed down with plenty of water. Two coats should be applied at intervals of 24 hours. As soon as the cement wash has dried up the surface should be kept damp by sprinkling water on it at least 7 days.

10-22-4 Measurement and Payment:

The cement wash shall be measured in m² (sq. feet) of the surface to which the wash is given. Cement wash will be paid by the contract unit price which shall include the cost, conveyance, storing of materials and shall include full compensation for all operations described in the specifications, mixing, curing, etc., and for furnishing all labour, tools, necessary for the proper execution of the work.

10-23 HIGH GRADE CONCRETE

- (1) It shall be controlled concrete.
- (2) The mix of the ingredients shall be decided at the time of execution of the work to arrive at the densest concrete.

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- (3) The minimum strength of the concrete as specified shall be obtained.
- (4) Preliminary tests shall be made prior to the commencement of the work.

- (5) Daily and whenever the materials or the mix, is changed, at least two cylinders shall be tested. and in addition at least one consistency test carried out.
- (6) The minimum cement content shall be as per the mix adopted.
- (7) The concrete shall be mixed for a period of not less than two minutes in the mixer. This should be read along with Clause 10-16.

10.24 BLUE GRANITE ROUGH STONE PACKING FOR REVETMENTS, ETC.,

Gravel Backing:

The surface to receive the gravel backing shall be neatly trimmed to the proper slope free from all vegetation and profusely wetted and rammed before gravel is laid on.

Standard gravel shall then be mixed with water and worked with mamooties till it can be formed into stiff plastic balls. Gravel so mixed shall be carried in baskets to where it is to be laid and placed in a single layer to give 150mm (6") in finished thickness and shall be well rammed in position with flat wooden or iron rammers.

The Finished surface of gravel should be left untouched until the gravel dried up and does not show signs of yielding.

Rough Stone Packing:-

The stones shall be perfectly sound, as regular in shape as possible and their lengths equal to the thickness of the required revetment and each stone shall not be less than 0.014m³ (1/2c.ft.) The stones shall be laid closely in position on the prepared bed and firmly set with the finished surface of the packing. The stones shall be laid breaking joint as far as possible. The stones are to be placed perpendicular to the finished surface, (i.e.) perpendicular to the slope.

The interstices between adjacent stones shall be filled in with stones of the proper size, well driven with crowbars to ensure tight packing and complete filling of all interstices. Such filling shall be carried on simultaneously with the placing in position of the large stones and shall in no case be permitted to fall behind,. The final wedging shall be done with the largest sized chip practicable each chip being well driven home with a hammer so that no chip is possible of being picked up or removed by hand.

10-25 SPECIAL CONDITIONS FOR FABRICATION OF STRUCTURAL STEEL WORK

1. General:

All the steel tested or untested required for the fabrication of a structural steel work will be supplied to the contractor.

2. Price Variation:

Price variation due to any cause whatsoever for any material viz., steel, bolts, and nuts, red lead, electrodes, etc., Will not be allowed and the tenderer should include all these factors, while quoting a firm rate.

3. Design and Drawings:

Before actual fabrication is started, detailed working drawings should be furnished by the Contractor to the Superintending Engineer....., Department, Corporation of Chennai for approval where section specified in the drawings are not readily available the use of alternative sections for fabrications will be considered and the alternate sections will be allowed to the firm payment to the Contractor will be based on the total weight of steel work done.

4. Fabrication and payment:

The Fabrication of the steel work will be to I.R.S. Specification No.B.3/61 or B.1/62 as the case may be (for steel structures and bridges girders).

5. Calculation of Weight of Fabricated Steel:

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The weight of material for which payment has to be made for fabrication erection shall be that which actually enters into the process of fabrication and forms an integral part of steel work as fabricated. In computing the weight of finished steel, no deductions will be made for rivet holes or bolt holes, skew cuts, notches etc. and the overall length of the members used in actual fabrication will be taken into account. This will also apply to gussets, which will be paid on the dimensions of the smallest enclosing rectangle. In computing the weight of fabricated steel 3 percent extra will be added to cover the weight of bolts, nuts, etc. and no payment beyond this will be made.

6. Holding down bolts, nuts and washes as well as anchor channels or plates will be paid for by their actual weight at the same rate applicable to fabricated steel, other bolts, rivets etc to be used for fabrication on the site connections will be supplied by the contractor in accordance with the approved drawings. Without extra payments beyond the 3% admissible as per clause 5 above. Any weight over and above the admissible 3% should therefore be taken into account by the tenderers in quoting their rates.

7. No additional payments will be made for joint in structural steel work beyond payment indicated in clause 5 above.

8. Shop Paints :

The fabricated steel shall be given one shop coat of paint with red oxide. This will be also be included in the quotation submitted by the Tenderers and no extra will be paid.

9. Rivetted or Welded Constructions :-

Tenderers are to quote for welded construction:-

welded Designs :-

In the case of welded designs the following directions shall be observed.

- (a) Shop welding should be adopted wherever possible in fabricating components and sub-members.
 - (b) Suitable jigs and fixture should be used both in the field as well as in the shop to avoid distortions during fabrications and erection.
 - (c) Components which are mass fabricated in the shops should be proved in the master templates.
 - (d) Suitable facilities shall be provided for the inspection of the work during the progress by inspecting officers. .
10. For contract involving fabrication and erection, the contractor shall be responsible for the transportation from the contractors work to the site of erection, loading the materials and stacking them at the site of work besides being responsible for any damages occurring in transit and while keeping them stacked till the materials are erected by him and work is finally accepted by the Corporation.

11. Variations and Weight :-

The weight furnished in the schedule is only approximate and liable to vary based on final approved drawings.

10-26 EARTH WORK EXCAVATION

Shall conform to T.N.B.P.No.23 and S.S.R.B. No.304-02 and 301-02.

Earth work excavating and depositing on bank with initial lead of 10 meters and initial life of 2 meters as per specification. No extra payment will be made for removing the masonry, concrete or any other material met with either at the surface or below at the surface within the specified depth during excavation. Necessary precaution not to damage the underground cables, etc., shall be taken by the contractor and necessary supports . such as strutting, planking, shoring, etc., are to be given for which no extra payment will be made.

10.27 SAND FILLING

Shall conform to TNBP No./7&25

Sand filling for road works shall be clean sea sand obtainable from Ennore sand bar and shall be used for the works in the case of North Zone. Cooum mouth at sea shore near Napier Bridge in the case of works in Central and South Zone for the works at other roads, specified in the P.W.D. schedule for Chennai City free from vegetation or other foreign matter shall be filled and watered and rammed suitably as may be directed during the execution. River sand shall only be used while laying cement concrete base course.

10-28 LEAN CEMENT CONCRETE 1 :5:11

- (a) **Coarse Aggregate:-** The coarse aggregate shall consist of blue granite metal of 25mm. and 12mm I.S.S. / I.R.C. in 66 2/3% and 33 1/3% proportions respectively. The material should conform generally to T.N.B.P. No.5A. The aggregate shall be from Pallavaram Quarry.

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- (b) **Fine Aggregate:-** The fine aggregate shall be clean river sand free from clay, vegetation or other decayed matter, etc., and free from dust and dirt and shall conform to T.N.B.P. No.7. The river sand should be quarried from palar river in Timmavaram village in Chengalpattu Taluk.

- (c) **Cement:-** Good quality Portland cement shall be used vide T.N.B.P.No. 10 and S.S.R.B.211.
- (d) **Water:-** All Water used in mixing or curing shall be clean and free from oil, salt, or acid, vegetable or other substance injurious to finished products and shall conform to S.S.R.B.212.
- (e) **Concrete Mixing and Placing:-** The concrete shall be machine mixed and vibrated to the satisfaction of the Exe. Engineer or his representative.

The water cement ratio shall be maintained as directed by the Exe. Engineer. The Work in general shall conform to S.S.R.B.XII and T.N.B.P.28. If however hand mixing is permitted the contractor shall use 10% extra cement for which no extra payment will be made.

10-29 THE KERB WALL PAVEMENT WITH C.C. SLABS

The I.R.C. Kerb and C.C. Slab shall be precast and shall be in size of 450mm x 375mm x 200mm and 450mm x 450mm x 50mm, respectively.

C. C. Kerbs: Cement concrete for kerbs shall be 1 :2:4 mix using 20mm. I.S.S.B.G. Metal. Kerbs shall be of size 450mm x 375mm x 200mm thick.

C. C. Slabs: Cement concrete for slabs shall be 1 :2:4 mix using 20mm. I.S.S.B.G. Metal.

10-30 C. C. EDGING OR WATER TABLE

For water table the ground between the edge of the surfacing and the kerbs shall be excavated to a depth of about 100mm of 85mm for 75mm or 60mm thick water tables respectively and old metal spread and compacted thoroughly and finished to form firm subgrade with smooth surface. Sufficient slope towards the kerbs should be given for the water from the road to flow towards the kerb. The concrete shall be placed on the prepared subgrade, struck off and compacted to the required thickness, viz., 75mm or 60mm thick as the case may be. The concrete shall be rammed sufficiently to eliminate all voids to bring the mortar to the surface after which it shall be finished smooth with cement at 10kg, per 10m² to the required levels and slopes. After finishing the cement concrete the water table shall be cured. After the concrete has set sufficiently and where necessary, the contractor back fill adjacent to the water table with suitable materials. The back fill shall be compacted and graded in satisfactory manner. In respect of renewal of water table over the existing water table they shall be 40mm or 25mm thick and 300mm or 250mm width.

10~31 C. C. TRAFFIC KERBS AND SEGREGATORS

The cement concrete for C.C. Traffic Kerbs shall be of 1:3:5 mix and for segregators shall be of 1:2:5:3:5 mix. The maximum size of the coarse aggregate being 20mm ISS size and the concrete shall be well tamped and consolidated. The CC Traffic kerbs and segregators shall be precast and shall be of size (304.8mm (254mm + 154mm) /2 x 254 mm) i.e. (1'0" x (0'10" + 0'6")/2 x 0'10") and 457.1mm x 228.6mm x 63.25mm) i.e. (1' 6" x 0' 9" x 0' 2.5") respectively. The surface of the traffic kerbs and segregator shall be rendered smooth with cement at 10Kg./10m².

10-32 FORMING OF CC TRAFFIC KERBS AND SEGREGATORS

Traffic Kerbs:

Picking up the existing road surface shall be made to the required depth and the kerbs shall be set on edge to the required alignment and levels.

The joints shall not exceed 6mm and shall be pointed with C.M. 1:3 to full depth and be flushed with the surface of the kerb. The kerbs shall be cleared satisfactorily of all excess mortar. The space on the back of the kerb shall be back filled with the acceptable materials in layers of not more than (4") 102mm in depth and in front upto WBM surface on the road side with BG metal. In the case of removing and refixing of kerbs, refixing

shall be done after filling the excavated trenches to proper level and consolidating the same as per new kerbs. Cement concrete of 1 :3:6 mix using 12mm to 20mm is size BG metal shall be laid along the CC traffic kerbs to a width of 163mm (6") and 76mm (3") thick and shall be cured for sufficient time. The traffic kerbs shall be painted two coats of cement based paint, white colour and two coats of cement based paint black colour alternatively.

Segregators :

Picking up the existing road surface shall be made to the required depth and the segregator shall be set, compacted to firm and even surfaces. The segregators shall be fixed to proper level and alignment and shall be pointed with CM 1:3 to full depth and shall be cured for sufficient time.

10.33 PROVIDING CHUTE PIPES

150mm dia or 100mm dia stoneware glazed pipes or 150mm hume pipes shall be provided in the footpaths and carriage way wherever necessary at suitable intervals as directed to drain of the rain water, etc. the pipes shall be placed in open trenches after excavation to the necessary depth and after thoroughly consolidating the bedding surface throughout the length of the pipe. The pipes shall be jointed with necessary collars in cement mortar 1 :2. At the inlet of the pipe near the water table suitable bell mouth shall be formed

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in cement mortar 1:3 for easy flow of water. As rapidly as the conditions of the pipe will permit selected earth .. free from large clods, lumps etc, shall be placed alongside the pipe in layers not exceeding 150mm and thoroughly compacted so that on each side of the pipe there shall be a berm of thoroughly compacted or undisturbed soil atleast as wide as the external diameter of the pipe.

10-34 LAYING AND JOINTING S. W. PIPES

For conduits the stone ware pipes of 150mm and 250mm internal diameter required for the work shall be according to MOSS No.107 and S.W. pipes shall be laid to proper alignment and level and joining the same by inserting splln yarn. in the socket and pointing with cement as per MOSS N.o.110. The S.W. pipes shall be laid in trenches excavated and refilled with sea sand. These pipes shall be inserted through brick retaining walls at the edges and middle of the trenches consisting of stock brick work in cement mortar 1:6 over a bed of brick jelly concrete in lime mortar 1 :2:5 for which items payment will be made on unit basis for the measured quantities.

Note :- The specifications given above may not be taken as complete but shall be read together with the relevant clauses of CSRB, in the absence of the relevant clause in the SSRB, the relevant clause of the MOSS Shall be applicable.

10-35 MANUFACTURING AND FIXING OF R.C.C. GUARD RAILS

The guard rails shall be manufactured as per the type design.

(i) The cement concrete for manufacturing RCC guard rails shall be of 1 :2:3 mix using 10mm to 20mm 1.5.5. size B.G. Metal with reinforcement of 7.71 kg per each railing. The surface shall be rendered smooth with .- cement at 16.5kg *110m2* and shall be cured for sufficient time. The size of tile guard rail will be 1905mm x 914mm x 76mm.

(ii) **Fixing of RCC guard rails of size 1905mm x 914mm x 76mm: .**

The R.C.C. guard rails shall be fixed to proper alignment and as directed cement concrete of 1 :3:6 mix using 40mm 1.5.5. size metal shall be laid for the foundation including compacting top surface of the legs shall be plastered with C.M. 1 :4-12mm thick. The joints of R.C.C. railings shall be pointed with C.M. 1:3 tp full depth including curving for sufficient time including 2 coats of white washing etc., complete.

10-36 FORMING FOOT-PATH

(a) Forming foot-path with C. C. Slab:- The foot-path shall be formed to proper alignments with good earth to the required thickness as may be specified shall be spread in regular layers of 100mm watered and compacted to firm and even surface. The kerb shall be set, and rammed including, sectioning and levelling, etc., and shall be paved to proper level and alignment with CC slabs 450mmx450mmx50mm size pointing the joints with C.M. 1:3 to full depth including curving, thread lining, etc., complete. The pavement shall be made over sand cushion of 150mm thick.

(b) Forming foot-path with gravel (which will pass through 25mm. sieve size):- The foot-path shall be formed to proper alignment, good earth to the required thickness as may be specified shall be spread, watered and rammed. This shall be laid over with gravel and shall be uniformly spread to a thickness . as specified watered and rolled with hand roller. If directed premix carpet using 6mm. Metal shall be laid over the compacted smooth surface of the gravel and spread to an uniform thickness as specified and rolled with hand roller. The gravel shall be quarried from any source & beyond 7k.m. outside the city . limit now fixed on Chennai Nellore Road

(c) Forming foot-path with granolithic flooring :- The foot path shall be formed to proper alignment with good ear1h to the required thickness as may be specified shall be spread in regular layers of 102mm. (4") watered and rammed including sectioning and leveling, etc., and shall be paved with granolithic flooring to a consolidated thickness of 50mm. With cement concrete of 1"2:4 mix using 8mm. to 10mm. is. S. size B.G. metal over sand cushion as per the directions of the Exe.Engineer. The surface shall be rendered smooth with cement at 10kg. per 10m2 including curving and thread lining etc., complete.

(d) Forming ramp:- The ramps shall be formed to proper slope as directed with good earth to the required thickness as may be specified shall be spread in regular layers of 102mm. 4" thick watered and rammed including sectioning and levelling, etc. The cement concrete of 1 :2:4 mix using 12mm. to 20mm. size I.S.S.B.G. Metal shall be laid over sand cushion and compacted to the require thickness as directed. The concrete shall be tamped sufficiently to eliminate all voids to bring the mortar to the surface shall be finished smooth and shall be cured for sufficient time.

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- (e) **Fonning of Kerbs :-** Excavation shall be made to the required depth and the material upon which the kerb is to be set shall be compacted to a firm and even surface. The kerbs shall be set on edge to the required alignment and levels. The joints shall not exceed 6mm. and shall be pointed with cement mortar 1:3 to full depth and be flush with surface of the kerb. the kerb shall be cleaned satisfactorily of all excess mortar and shall be back filled with acceptable material in layers of not more than (4") 102mm in depth and in front upto WBM surface on the road side with B.G. metal. In the case of removing and refixing of kerbs refixing shall be done after filling the excavated trenches in proper level and consolidation the same as per new kerbs.

10-37 SOLING WORK

Soling shall be formed with gravel which will pass through 25mm sievel size to a consolidated thickness as may be required in regular layers. The grade used for the work should be according to T.N.B.P. No.6 and each layer should be properly consolidated by means of appropriate power roller after watering the surface properly.

10-38 WATER BOUND MACADAM

Water bound macadam surface shall be formed by using 40mm. metal of IRC size with necessary gravel blind age or quarry fine blindage as detailed in specification.

Water bound macadam:- The Construction methods shall conform to the following requirements.

- (a) **Preparation of base:-** The sub-grade/sub-base/base to receive the WBM course shall be prepared to the specified grade and camber and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm.
- (b) **Spreading B. G. metal:-** The B.G. metal (40mm IRC size) shall be spread uniformly and evenly upon the prepared base in such quantities that the thickness of the compacted layer does not exceed 75mm or more or otherwise specified. In no case, however, shall the thickness of compacted layer exceed 100mm.

The metal shall be spread by means of approved spreader boxes or by manual labour using baskets. The metal shall be spread true to the grade, line in cross section and evenly to the uncompacted depths as provided in the contract and hand packed to correct camber.

- (c) **Dry Rolling:-** The road metal as spread shall be rolled with 8-10 tonnes power roller preferable with a three wheeled roller.

Except on super elevated portions where the rolling shall proceed from inner edge to the outer, rolling shall begin from edges gradually progressing towards the centre. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to centre line of the road, in successive passes uniformly lapping preceding tracks by atleast one half width. During rolling slight sprinkling of water may be done if necessary. Compaction shall be done until the metals are thoroughly keyed. The rolled surface shall be checked transversely and longitudinally with templates and any irregularities observed shall be corrected by loosening until the entire surface conforms to desired camber and metal and re-rolling until the entire surface conforms to desired camber and grade.

- (d) **Spreading Gravel:-** Gravel shall then be spread to a thickness as specified evenly over the metalled surface in successive thin layers in order to bind or seal the surfacing from surface water as well as provide a thin cushion over the finished surface which will produce a smooth riding surface.

Gravel shall be well graded which will pass through 10mm sieve size and retain on 150 microns and fraction passing 75 microns does not exceed 10 percent and having a P.I. value of less than 6.

- (e) **Wet Rolling:-** After each thin application of gravel, the surface shall be profusely sprinkled with water, the resulting slurry swept in with hand broom to fill the voids properly and surface rolled again. Water being applied to the wheels in order to wash down the gravel that may be sticking to them. The sprinkling, sweeping and rolling operations shall be continued until

the aggregate has been thoroughly keyed, well bonede and firmly set in its full depth. The rolling at all times shall begin at the sides and progress towards the centre with 8-10 1onnes power roller, thoroughly covering the entire surface with the rear wheels till a hard smooth solid paving is produced.

- (f) **Curing:-** The surface shall in dry weather be kept lightly sprinkled with water and kept moist for about 15 -days The compacted WBM course should be allowed to completely dry and set before the next pavement course is laid over it.

10-39 COATED BITUMINOUS MACADAM

10-39 (A) TACK COAT:

As per clause 503 of MOST III Revision.

Preparation of Base ..

The Surface on which the tack coat is to be applied shall be cleaned of dust and any extraneous material before he application of the binder, by using a mechanical broom or any other approved equipment / method as specified by the Engineer.

Application of Binder

Binder may be heated to the temperature appropriate to the grade of bitumen and approved by the engineer and sprayed on the base at the rate of:

- i) 3.00 kg /10 m2 - Over bituminous surface.
- ii) 4.00 kg /10 m2 - Over non-bituminous unprimed granular surface.

The binder shall be applied uniformly so as to provide a uniformly unbroken spread uf bitumen.

10.39 (B) BITUMINOUS MACADAM
(Clause 504 of MOST specification)

The tentative requirements of coarse aggregate for Bituminous Macadam is furnished below :-

B.M. Thickness	Size of Metal	% of aggregates (by weight)	Metal required for 10m2
50 mm thick	26.5 mm - 11.2 mm Graded metal	60% by weight	0.42 m3
	11.2 mm - 2.8 mm Graded metal	15% by weight	0.10 m3
	2.8 mm and below BGmetal	25% by weight	0.18 m3

The aggregates so combined should satisfy the physical requirements.

The contractor shall have the responsibility for ensuring proper proportioning of materials and producing a uniform mix satisfying the following grading requirements.

Aggregates Grading for Bituminous Macadam

IS Sieve Designation	Percent by weight passing the sieve Grading I
45.0 mm	100
26.5 mm	75 – 100
22.4mm	60 – 95
11.4mm	30 – 55
5.6mm	15 – 35
2.8mm	5 – 20
90.0 micron	0 - 5

1. The bitumen content for Bituminous Macadam shall be 3.0% to 3.55% by weight of mix.
2. It is the responsibility of the contractor to meet the approved gradation and binder content. Any variation from the tendered specification should be borne by tne contractor. No extra charges will be paid for the variation. While quoting the rate the above points should be borne in mind.

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Mixing

Hot mix plant of approved type shall be employed for mixing the aggregate with bituminous binder.

The binder shall be heated to the temperature appropriate to the grade of bitumen approved by the Engineer-in-charge, in bitumen 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 Engineer- in-charge and then the heated binder shall be distributed over the aggregates at the rate specified.

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

Mixing shall be thorough to ensure that a homogenous mixture is obtained in which all particles of the aggregates are coated uniformly.

The mixture shall be immediately transported from the mixer to the points of use in suitable vehicle or wheel barrows. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer-in-charge.

Spreading: The hot-mix shall be spread on the prepared road surface with rakes to the required thickness and camber or distributed evenly with the help of drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. The temperature of mix at the time of laying shall be in the range 120°C - 160° C.

Longitudinal joints and edges shall be constructed in tune to the delineating lines parallel to the centre lines of the road. 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.

Rolling: As soon as sufficient length of bituminous material laid, rolling shall be done by 8 to 10 tonnes power roller. Rolling shall be commenced at the edges and progress towards the centre longitudinally .except that on superelevated 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 over, any high spots or depressions which become apparent shall be corrected by removing or adding, fresh material. The rolling shall then be continued till the entire surface has been rolled to compaction, 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 shall be kept damp if necessary to avoid the bituminous material from sticking to the wheels and being picked up. In no case shall fuel lubricating oil be used for this purpose nor excessive water poured on the wheels. Rolling operation shall be completed in every respect before the temperature of mix fall below 100°C.

Roller shall not stand on necessary laid material while there is a risk that it will be deformed thereby.. The edges along and transverse of the bituminous macadam laid and completed earlier shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

10-40 Premix Carpet

Laying Premix Carpet processed in portable hot mix plant

The requirement of aggregates for various thickness are furnished below.

		size of metal	Quantity required
25mm thick carpet	for 10m2	12mm I.R.C	0.22m3
		10mm I.R.C	0.11m3
		Buitumen content 17.85kg./10m3	
20mm thick carpet with seal coat	for 10m3 PMC	13.2mm I.R.C	0.18m3
		11.2mm I.R.C	0.09m3
		Bitumen content 14.6kg./10m3	
	for 10m2 Seal Coat	6mm Hard Broken Stone	0.09m3
		Bitumen content 7.3kg/10m2	
20mm thick carpet	for 10m2 for paving foot-path	6mm Hard Broken Stone	0.27m3
		Bitumen content 17.3kg/10m2	

(a) Preparation of Premix:

Hot mix plant of approved type shall be employed for mixing the aggregates with bituminous binder.

The binder shall be heated to the temperature appropriate to the grade of bitumen approved by the Engineer-in-charge, in bitumen boiler of suitable design avoiding local overheating and ensuring a continuous supply.

The aggregate shall be dry and suitably heated to a temperature as directed by the Engineer-in-charge and then heated binder shall be distributed over the aggregate at the rate specified.

The mixing of binder with aggregates shall be continued until the aggregates are thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicle or wheel barrows. The vehicles employed for transport shall be clean and be covered over in transit if so directed by the Engineer-in-charge.

(b) Spreading and rolling :-

The premixed materials shall be spread on the prepared road surface with rakes to the required thickness and camber or distributed evenly with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous materials has been laid, rolling shall commence with the appropriate power roller. 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 centre line of the pavement.

(c) Seal Coat:-

The mix for seal coat mixed and processed in P.H.Plant shall be laid immediately after laying . and consolidating P.M.C.

10.40. D SEMI DENSE BITUMINOUS CONCRETE

(Clause 511 of MOST specifications)

The tentative requirements of coarse aggregates for various thickness of semi dense bituminous concrete is furnished below:

S.D.B.C Thickness	Size of Metal	% of aggregates (by weight)	Metal required for 10m2
25mm thick	11.2 mm IRC H.B.G. Metal	27.0%	0.10 cu.m
	6.7 mm IRC H.B.G. Metal	43.0%	0.16 cu.m
	2.8 mm & below IRC H.B.G. Metal	30.0%	0.11 cu.m
40 mm thick	13.2 mm IRC H.B.G.Metal	16.0%	0.10 cu.m
	11.2 mm IRC H.B.G. Metal.,	27.0%	0.16 cu.m
	6.7 mm IRC H.B.G. Metal	27.0%	0.16 cu.m

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	2.8 mm & below <i>IRC</i> H.B.G Metal	30.0%	0.18 cu.m
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The aggregate so combined should satisfy the physical requirements and the contractor shall have the responsibility for ensuring proportioning of materials and producing a uniform mix satisfying the following grading requirements.

AGGREGATE GRADAION FOR SEMI-DENSE UITUMINOUS CONCRETE

IS Sieve Designation	Percent by weight passing the IS Sieve	
	Grading I (For 25 mm Thick)	Grading III (For 40 mm Thick)
22.4 mm	***	100
13.2 mm	100	79 -100
11.2 mm	88 – 100	68 – 90
5.6 mm	42 – 64	33 – 55
2.8 mm	22 – 38	22 – 38
710 Micron	11 – 24	6 – 22
355 Micron	7 – 18	4 – 14
180 Micron	5 – 13	2 – 9
90 Micron	3 – 9	0 - 5

Note:
Grading I shall be adopted for 25 mm Compacted thickness and grading III for 40 mm Compacted . thickness.

10.40. D (i) MIX Design :-

Requirements of mix: Semi-dense bituminous concrete mix shall be properly designed so as to satisfy the criteria laid down in 10.40.D.(ii).

It is the responsibility of the contractor to meet the approved gradation and binder content. Any variation from the tendered specification Should be borne by the contractor. No extra charges will be paid for the variation. While quoting the rates, the above points should be borne in mind.

10-40. D (ii) Requirements of semi-dense bituminous concrete mix :-

1.	Marshall .stability (ASTM Designation: D 1559) determined on Marshall Specimens compacted with 75 Compaction blows on each end	820 kg (1800) lbs (Minimum)
2.	Marshall flow (mm)	2-4
3.	.Percent air voids in mix	3 – 5
4.	Percent air voids in mineral aggregate (VMA) (Minimum)	13 – 15 (for 13.2 mm max size)
5.	Percent voids in mineral aggregates filled with bitumen (VFB)	65 – 75
6.	Binder Content. percent by weight. of mix	Not less than 4.0 Percent

10.40. D (iii) Job Mix Formula :-

The Contractor shall intimate to the Engineer-in-charge in writing, atleast 20 days before the start of the work, the job mix formula proposed to be used by the contractor for the week.

While working out the job mix formula, the contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredient satisfy the physical and strength requirements of the specifications

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Approval of the job mix formula shall be based on independent testing by the Engineer-in-charge for which samples from contractor is required by the former. The approval of job mix formula shall remain effective unless and until modified by the Engineer- in-charge. Should change in the source of materials be proposed, a new mix formula shall be established and get approved from the Engineer-in-charge before actually using these materials

10-40. D (IV) field control .

- 1 . The individual aggregate materials shall confirm to the sieve analysis given in the job card and be used dry
- 2. The combined grading of the different constituent materials shall satisfy the job limits specified.
- 3. The binder should be heated to 150°C - 163°C and the aggregate to 155°C - 163°C prior to mixing. On no account shall be difference between the temperature of binder and the aggregate exceed 14°C. The discharge temperature of the mix shall be taken 120°C - 160°C.
- 4. The paving mix shall be laid hot, at the laying temperature of 120°C - 160°C.
- 5. The compacted course shall have a field density of 2.421 gms/c.c(minimum).
- 6. Core specimen shall be cut from the previous day's surfacing to determine the field density.
- 7. Adequate drainage facilities shall be provided for the pavement.
- 8. Rolling operation shall be completed in all respects before the temperature of the mix falls below 100°c.

10-40. D (V) Permissible variation from Job mix formula

It shall be the responsibility of the contractor to produce a uniform mix confirming to the approved job mix formula subject to the permissible variations of the individual percentages of the various ingredients in the actual mix from the job mix formula to be used within the limits as specified in table below. These variations are intended to apply to individual specimens taken for quality control tests. "

PERMISSIBLE VARIATIONS FROM THE JOB MIX FORMULA

S.No	Description of Ingredients	Permissible Variation by weight of total mix-percent
1.	Aggregate passing 13.2 mm sieve and larger siever	+/- 8
2.	Aggregate passing 11.2 mm sieve and 5.6 mm sieve	+/- 7
3.	Aggregate passing 2.80 mm sieve and 1.40 mm sieve	+/- 6
4.	Aggregate passing 710 micron sieve and 355 Micron sieve	+/- 5
5.	Aggregate passing 180 Micron sieve	+/- 4
6.	Aggregate passing 90 Micron sieve	+/- 2
7.	Binder (Bitumen)	+/- 0.3
8.	Mixing temperature	+/- 10°C

10-41 DENSE GRADE HEAVY DUTY ASPHALTIC CONCRETE

(a) Coarse Aggregate :-

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I. S. Sieve	Total passing by weight using 80/100 bitumen 30/40 or 60/70
25mm (1")	100
20mm (3/4")	90-100
12.5mm (1/2")	72-88
10mm (3/8")	60-80
4.75mm (3/16")	35-65
2.36mm (No.7)	20-50
1.18mm (No.14)	14-38
300 micron (52)	3-20
150 micron (100)	2-15
75 micron (200)	2-8

The coarse aggregate shall conform to SSRB t-Jo.205 and shall be broken granite stone from Pallavaram Quarry.

(b) Fine Aggregate :-

The fine aggregate shall conform to SSRB No.205 and shall be crushed stone from Pallavaram Quarry and sea sand obtainable from Ennore Sand Bar including a lead of 10 Kms from city limits on Coastal express Highway for North Zone, Cooum mouth at sea shore near Napier Bridge in the case of work in Central and South Zone as specified in PWD schedule for Madras City.

(c) Filler :-

Filler shall be conforming to BSS 594 of .1958 and shall be dry and clean lime stone powder having a 'Cao' content of not less than 60"/0

(d) Gradation:-

The combined materials of coarse and fine aggregates and filler shall be conform generally to the following gradation

(e) Requirement of DGAC mix at optimum binder content :-

Bitumen content: The Bitumen content shall be as specified in the table below for the penetration grade of 30/40 and 60/70 respectively in the order of preference. The percentages by weight of aggregates, strength and requirements for the mix for the different grades of bitumen used should be as specified below. This may vary according to test results from time to time.

Grade of Bitumen	Bitumen Percentage by weight of	Field Density of mix	Strength of Marshall stability	Flow Value	Total percentage voids filled in aggregate	percentage of air voids in total mix
30/40	5.75	2/347/m3	1360kg (3000 lbs.)	8 to 16	75 to 85	3 to 5
80/100	5.75	2/289t/m3	900kg (1980 lbs.)	8 to 16	75 to 85	3 to 5
60/70	5.75	not less than 2.289t/m3	1180kg (2600 lbs)	8 to 16	75 to 85	3 to 5

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(f) Temperature:

Aggregate Temp.	Bitumen Temp.	Laying Temp.
155C to 163C	150C to 177C	120C to 160C

(g) Job mix Formula:

Requirement of Aggregates using bitumen of 60/70, 80/100 Grade and 30/40 Grade are as follows:

	Material	For 60/70 (or) 80/100 grade % of Material	For 30/10 grade % of Material
Coarse aggregates	B.G. Metal 20mm IRC	25%	23%
	B.G. Metal 12mm IRC	20%	25%
	B.G. Metal 6 mm IRC	32%	25%
Fine aggregate	Sea sand	20%	25%
Filler	Lime Stone Powder	3%	2%
	Bitumen content	5.75% wt. of aggregate 5.44% by wt. of mix	5.75% wt. of aggregate 5.44% by wt. of mix

(h) Thickness of pavement:- After compaction the pavement (i.e.) the wearing surface or road will be as specified in the Bills of Quantities.

(i) Tolerance:

A tolerance of 3mm (1/8") on 3m (10ft)straight will be allowed and any variation beyond this limit is to be rectified by the contractor suitably.

10-42 DGAC MIX DESIGN AT OPTIMUM BINDER CONTENT

1. Requirement Qf Mix:-

Apart from conformity with the grading and quality requirements of individual ingredients, the mix shall .meet the requirements setforth in Clause 10-41 (e)

2. Binder Content:-

The binder content shall be so fixed as to achieve the requirements of the mix set forth in

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Clause 10-41 (e) and shall be 5.44% by weight of total mix.

3. Job mix formula:-

The Contractor shall intimate to the Engineer-in-charge in writing, atleast 20 days before the start of the work, the job mix formula proposed to be used by the contractor for the work and shall give the following details.

- (i) the source and location of all materials.
- (ii) proportions of all materials expressed as follows where each is applicable
 - Binder as percentage by weight of total mix
 - Coarse aggregate as percentage by weight of total aggregate
 - Fine aggregate & Mineral Filler including mineral filler.
- (iii) a single definite percentage passing each sieve for the mixed aggregate.
- (iv) the reslts of test enumerated in Clause 10-41 (e) as obtained by the contractor.

While working out the job mix formula, the Contractor shall ensure that it is based on a correct and truly representative sample of the materials that will actually be used in the work and that the mix and its different ingredient satisfy the physical and strength requirements of the specifications.

Approval of the job mix formula shall be based on independent testing by the Engineer-in-charge for which samples of contractor as required by the former

The approved job mix formula shall remain effective unless and until! modified by .the Engineer- in-charge. Should change in the source of materials be proposed, a new job mix formula shall be established and get approved from the Engineer-in-charge before actually using these materials.

REQUIREMENTS OF ASPHAL T1C CONCRETE MIX

Sl.No.	Description	Requirements
1.	Marshall stability (ASTM Designation D 1559 determined on Marshall specimens compacted by 50 compaction blows on each end	As per specification in 10-41 (e) for 30/40, 60/70 and 80/100 grade
2.	Marshall flow-(0.01 inch)c	8-16
3.	Percent voids in mix	3-5
4.	Percent voids in mineral aggregate filled with bitumen	75-85
5.	Binder content percent (a) By weight of aggregate (b) By weight of total mix	5.75 5.44

4. Permissible variation from job mix Formula:

It shall be. the responsibility of contractor to produce a uniform mix conforming to the approved job mix formula subject to the permissible variations indicated in table below. These variations are intended to apply to individual specimen taken for quality control test given in para 10-41 (e)

TABLE

Signature of the tenderer

Sl.No.	Description of ingredient	Permissible Variation by Weight of total mix
1.	Aggregate passing 4.75mm sieve	+/-5.0 percent
2.	Aggregate passing 2.36mm sieve	+/-4.0 percent
3.	Aggregate passing 600 micron sieve	+/-3.0 percent
4.	Aggregate passing 75 micron sieve	+/-1.0 percent
5.	Binder	+/-0.3 percent

CONSTRUCTION OPERATION FOR D.G.A.C.

1. Weather and seasonal limitations:- Asphaltic concrete shall not be laid during rainy weather or when the base course is damp or wet.

Preparation of base:

The base on which asphaltic concrete is to be laid shall be prepared, shaped and conditioned to the specified levels, grade and camber as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and other foreign matter.

Tack Coat:

A tack coat complying with Clause 10-39 (a) shall be applied over the base. Application of tack coat shall, however, not be necessary when the laying of asphaltic concrete follows soon after the provision of a bituminous base/levelling course without opening it to traffic.

2. Preparation of DGAC 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 either be of batch type or continuous one, having co-ordinated set of essential units such as dryer for heating the aggregates, device for grading and batching / feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for determining out the

correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder and aggregate. A fines feeder for incorporation of the correct quantity of fines is also a necessary auxiliary.

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

Mixing shall be thorough to ensure that homogeneous mixture is obtained in which all particles of the mineral aggregates are coated uniformly. The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in transit, if so directed by the Engineer-in-charge.

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, tamping and finishing the mixture to specified grade, lines and cross section. The temperature of the mix at the time of laying shall be in the range 120-160°C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150mm from those in the binder courses. 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.

Rolling :-

After the spreading of mix by paver, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5k.m. per hour. The initial or breakdown rolling shall be with 8-12 tonne three wheel roller and the surface finished by final rolling with 8-10 tonne tandem rollers or suitable pneumatic rollers. The Wheels of roller shall be kept moist to prevent the mix from adhering to them but in no case shall fuel/lubrication oil be used for this purpose. Rolling shall commence longitudinally from the edges and progress towards the centre except that on superelevated portions it shall progress from the lower to upper edge parallel to the centre line of the pavement. The roller shall proceed on the fresh material 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 preceding pass. Rolling shall be continued till the density achieved, is atleast 95% of that of the Laboratory Marshall Specimen and all roller marks are eliminated. Rolling operations shall be completed in every respect before the temperature of the mix fall below 100oC.

10-44 Opening for Traffic

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

10-45 Surface Finish of Work

The surface finish of construction shall conform to the requirements as follows.

1. General:

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

2. Horizontal Alignments:

Horizontal alignments shall be reckoned with respect to the centre line of the carriageway as shown on the drawings. The edges of the carriage way as constructed shall be correct within a tolerance of 25mm there from. The corresponding tolerance for edges of the roadway and layers of Pavement shall be 40mm.

3. Longitudinal Profile:

The levels of the sub grade and different pavement courses as constructed, shall not vary from these calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer-in-charge, beyond the tolerance mentioned below wearing course: +\ -10mm provided however, that the negative tolerance for wearing course shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6mm.

4. Surface Regularity of Sub grade & pavement Course:-

The surface regularity of completed sub bases, base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated in Table of clause 8-24 of General Condition. The longitudinal profile shall be checked with a 3 metre long straight edge, at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set of three camber boards at intervals of 10 metres.

10-46 QUALITY CONTROL OF WORK

Control of the quality of materials and the works shall be exercised by the Engineer-in-charge as furnished below.

10-46-1 The materials supplied and the works carried out by the contractor shall conform to the specifications prescribed in the proceeding clauses.

10-46-2 For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control test, as described hereinafter, by the Engineer-in-charge. The testing frequencies set forth are the desirable minimum and the Engineer-in-charge shall have full authority to carryout tests as frequently as he desirable minimum and the Engineer-in-charge shall have full authority to carry out tests as frequently as he may *deem* necessary to satisfy himself that the materials and works comply with the appropriate specifications..

10-46-3 Tests procedures for the various quality control tests are indicated in the respective sections of the Specifications or for certain tests within this section. Where no specific testing procedure is mentioned. The tests shall be carried out as per the prevalent accepted engineering practice to the directions of the Engineer- in-charge.

10-46-4 The contractor shall collect at least 25% of the materials required for laying the road at site as per specifications furnished in the preceding conditions and shall bear the cost and furnish the required number of samples for getting the materials tested by the department in the appropriate laboratory. At no time the

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quantity of materials at site shall be not less than 25% of the Quantity required for the work and the process of testing prescribed above shall be repeated at intervals as required by the Engineer in charge for ensuring uniform quality of the work as per specifications.

Tests of Bituminous Constructions

Sl. No.	Type of Construction	Test	Frequency
1.	Asphaltic Concrete	(i) Quality of binder	As Required
		(ii) Aggregate impact value, Flakiness index and Stripping Value of aggregate	One test per 50-100m3 of aggregate
		(iii) Mix grading	One set of test on individual constituents and mixed aggregates form the dryer for each 100 tonned of mix subject to a min. of two sets per plant per day.
		(iv) Control of temperature of binder in boiler, aggregate in the dryer and mix at the time of laying and rolling	At regular close intervals
		(V) Stability of mix vide ASTM D-1559	For each 100 tonnes mix produced a set of three Marshall specimens to be prepared and tested ofr stability, flow value, density, void contents, subject to a min. of two sets being tested per plant per day.
		(Vi) Binder content and gradation in the mix Binder content test vide ASTM D-2172	One test for each 100 tonne of mix subject to a min. of two tests per day per plant.
		(vii) Rate of spread of mixed material	Regular control through checks on the weight of mixed material and layer thickness.
		(viii) Density of compacted layer	One test per 500 m3 of aggregate.

10-47 CEMENT CONCRETE ROAD: (UNREINFORCED)

Coarse aggregate: The metal shall be clean, tough and durable; conforming to 15:383-1970 and comply with IRC 15-1981.

Fine aggregate: Good coarse river sand consisting of clean, hard, sharp and durable grains free from balls or rolls of clay and other foreign matte; conforming to IS:383-1970 and shall pass through 6.3mm sieve.

Cement: Portland cement conforming to IS:269-1976 shall be used.

Water: Water shall be potable.

Laying of cement concrete road:

Mixing: A suitable type of mixer for mixing the aggregates with cement shall be used. The metal and sand are loaded into mixer in alternate layers with the cement to facilitate easy mixing. The required quantity of water is then added and the materials mixed for about 2 minutes thoroughly until the batch is of a uniform colour.

The mix is then unloaded thoroughly and conveyed to the spot by head load or wheel barrows and place against the forms spaced evenly across the width of the road while placing the mix, shall be continously sliced and packed with suitable rods to ensure removal of all air pockets from it. The mix is to be levelled to the to{s of the forms. Care shall be taken to see that no segregation of aggregates occurs. Concrete shall not be dropped from pans or baskets held at a height exceeding 600mm (2 feet). The concrete, when delivered by wheel barrows shall be tipped a few feet away from the actual working place and then shoveled into its final position.

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Compacting: Concrete shall be deposited at its final position to proper thickness so that correct thickness will be obtained after compaction without any appreciable transfer of material! from one point to another. Mix shall be compacted by vibration. The concrete as soon as it is placed, is struck off uniformly - and screed to such elevation above the base that on compacting and finishing, the pavement will conform to the required grade and cross section. Full compaction is ensured in the entire mass particularly by the side of the forms.

Any irregularities in the surface shall be raked well and fresh mix added and compacted properly.

Finishing and curing: The surface is then finished properly by means of flats and straight edges. The edges of the concrete along the forms shall be rounded off with a suitable tool.

The concrete thus laid shall be cured for the next 22 days with water retained by ponding it or covering with wet gunnies. Water used for curing shall not contain any deleterious material.

Approximate proportions: The mix proportions furnished in the tender schedule is for guidance only and being expressly understood that this information is only for the convenience of the bidder. The mix shall be designed as to ensure the minimum flexural strength of pavement concrete 40kg per cm2 at 28 days and controlled in the field on the basis of its flexural strengths.

Field mix: After the award of contract, the proportions, that the field mix, determined by the laboratory for the particular aggregates approved by the Engineer shall govern. The proportions will be corrected and adjusted by the Engineer to compensate for moisture content in the aggregates and fluctuation in the grading of coarse and fine aggregate at the time of use. Where fine aggregate is permitted to be measured volumetrically, due allowance should be made for bulking. The water content per batch of concrete should ~ be maintained constantly except for suitable allowances to be made for free moisture and absorption by aggregates determined from time to time during construction.

Joints :

Premoulded Joint Filler: This shall be thickness shown of the drawings within a tolerance of +/-1.5mm. IT shall be 25mm less in depth than the thickness of slab, within a tolerance of +/-3mm and of the full width between road forms. Holes to accommodate dowel bars shall be accurately bored or punched out. The joint filler shall comply with the requirements of 15-1838-1961

Joint filling compound: The sealing compound shall comply with the requirements of the IS: 1834-1961

Dowel Bars: These are required at expansion sealing compound joints to transfer wheel loads to the adjacent slab. For slabs of thickness less than 150mm no dowel bars may be provided. Design Details of Dowel Bars.

Design Loading	Slab thickness (cm)	Dowel bar details		
		Diameter (mm)	Length (mm)	Spacing (mm)
4100kg	15	25	500	200
	20	25	500	300

Note: The recommended details are based on the following values of different design parameters: permissible flexural stress in dowel bar = 1400Kg / cm2; permissible bearing stress in concrete = 100kg / cm2; E value for concrete = 3.0 x 1 05kg / cm2; poisson's ratio = 0.15 K-value of foundation = 8.3kg / cm2; maximum joint width = 20mm; and design load transfer = 40 percent.

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Tie bars: Tie bars are used across the joints the concrete pavements wherever it is necessary or desirable to ensure firm contact between slab faces or to prevent abutting slabs from separating. Tie bars may be used across longitudinal joints in slabs of uniform thickness to prevent the separation of slabs.

Design Details of Tie Bars for Central Longitudinal Joint of Two-Lane Rigid Highway Pavements .

Slab thickness (cm)	Tie bar details			
	Diameter (mm)	Maximum spacing (cm)	Minimum Length (cm)	
			Plain bars	Deformed bars
15	8	38	40	30
	10	60	45	35
20	10	45	45	35
	12	64	55	40
25	10	30	45	35
	12	45	55	40
	14	62	65	46

Quality Control Tests of Materials:

The quality control tests on the materials and the frequency of tests are given in IRC: Special Publication No. 11 "Handbook of Quality Control for Construction of Roads and Runways (First Revision)" These are reproduced in Table below for ready reference.

TABLE - QUALITY CONTROL TESTS ON MATERIALS

Materials	Test	Test Method	Minimum desirable frequencies
1. Cement	Physical and Chemical Test	Is : 269/445/1489/8112	once for each source of supply occasionally when called for in case of long and / or improper storage.

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2.Coarse and fine aggregates	(i) Gradation	IS : 2386/ Pt.(1)	one test for 15m2 of each fraction of coarse and fine aggregate
	(ii) Deleterious Constituents	IS: 2386 / Pt. (11)	-do-
	(iii) Moisture content	IS : 2386/Pt. (111)	Regularly as required subject to a minimum of one test per day for coarse aggregate and two tests per day for fine aggregate.
	(iv) Bulking of fine aggregate (for volume batching)	-do-	once for each source for deriving the moisture content bulking relationship.
3. Coarse Aggregates	(i) Los Angles abrasion value / Aggregate impact test	IS : 2386/Pt. (V1)	once for each source of supply and subsequently when warranted by changes in the quality of aggregate.
	(ii) Soundness	Is : 2386 / Pt. (V)	As required
	(iii) Alkali – Aggregate reactivity	IS : 2386/Pt. (V11)	-do-
4. Water	Chemical Test	IS : 456	once for approval of source of supply subsequently only in case of doubt.

10-48 ARRANGEMENT OF TRAFFIC

10-48-1 Passage of Traffic along a part of the Existing carriage-way under improvement:

This method shall be adopted where, in the opinion of the Engineer-in-charge, the improvement works, namely widening/strengthening of existing pavement or reconstruction / repairs to cross drainage works, could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part. The road shoulder shall be dressed and brought in line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where work is progress in continuous long stretches, passing places, atleast 20 metres wide, inclusive, of the width of the existing carriageway, shall be provided in half to one kilometer intervals as directed by the Engineer-in-charge. Extra treatment to shoulders were necessary shall be given as ordered by the Engineer-in-charge.

10-48-2 Passage of traffic along a Temporary Diversion:-

If in the opinion of the Engineer-in-charge it is not possible to pass the traffic on part width of the Carriageway for any reason, a temporary diversion close to the highway shall be constructed as directed. It shall be paved with locally available materials such as hard moorum, grave, brick or stone metal to the specified thickness and provided with bituminous surfacing where directed. In all cases, the alignment, gradients and surface type of the diversion, including its junctions, shall be approved by tile Engineer-in-charge before the highways to be detoured is closed to traffic. At Cross drainage points, the Contractor shall provide temporary crossings for the diversions according to the designs approved by the Engineer-in-charge.

10-48-3 Traffic Safety and Control:

The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

The barricades erected on either side of the carriage way portion of the carriage way closed to traffic shall be of strong design to resist violation, and painted with alternate black and white

strips. Red lanterns of warning lights of similar type shall be mounted on the barricades at night and kept it throughout from sunset to sunrise.

At the points where traffic is to deviate from its normal path (whether on temporary diversion or part width of the Carriageway) the channel for traffic shall be clearly marked with the aid of pavement markings, painted drums or a similar device to the directions of the Engineer-in-charge. At night the passage shall be delineated with lanterns or other suitable light source.

One way traffic operation shall be established whenever the traffic is to be passed over part of the carriageway inadequate for two-lane traffic. This shall be done with help of flagmen kept positioned on opposite sides during all hours. For regulation of traffic, the flagman shall be equipped with red and green flags and lanterns flights.

On both sides, suitable regulatory / warning signs shall be installed for the guidance of road users. On each approach atleast two signs shall be put up, one close to the point where transition of carriage way begins and the other 120 metre away. The signs shall be of approved design and of refelectory type if so directed.

10-48-4 Maintenance of Diversions and. Traffic Control Devices:

Signs, lights, barriers and other traffic control devices, as well as riding surface of diversions shall be maintained in satisfactory condition till such time they are required as directed by the Engineer-in-charge. The temporary travelled way shall be kept free of dust. by frequent applications of water if necessary.

10-48-5 Measurements for Payment:

All arrangements for traffic during construction including maintenance thereof but excluding initial dressing and/or extra treatment to shoulders and construction of temporary diversions shall be considered as incidental to the works and contractor's responsibility.

Construction of temporary diversion, initial dressing of the shoulders and extra paving at passing places shall, however, be paid for as provisional sum.

10-49 Recording of Measurements:

All measurements shall be made in the metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant sections read in conjunctions with the General conditions of contract. The same shall not, however, apply in the case of lump-sum contracts.

All measurements and computations, unless otherwise indicated, shall be carried nearest to the following limits.

- (i) Length and Breadth 10 mm
- (ii) Areas 0.01 Sq. metres.

In recording dimensions of work sequence of length, width shall be followed.

10.50 LEVELS TO BE TAKEN BEFORE AND AFTER LAYING

Levels shall be taken before and after construction, at a grid of points 10 metres centre to centre longitudinally in straight reaches but 5 metres at curves. Normally, on two-lane roads, the levels shall be taken at four positions transversely, at 0.75 and 2.75 metres from either edged of the carriage way, and on single fane roads these shall be taken at two positions transversely, being at 1.25 metre from edge of the carriageway.

Suitable reference for the transverse grid line should be left in the form of embedded bricks on either ends or by other means so that it is possible to locate the grid points for level measurements after each successive course is laid.

For pavement courses laid only over widening portions, atleast one line of levels shall be taken on each strip of widening, or more depending on the width of widening as decided by the Engineer-in-charge.

Notwithstanding the above, the measurements may be taken at closer intervals also if so desired by the Engineer-in-charge the need for which may arise particularly in the case of estimation of the volume of the material for levelling course. The average thickness of the pavement course in any area shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that area, provided that the thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer- in-charge in writing.

As supplement to Level measurements, the Engineer-in-charge shall have the option to cut cores/holes to check on the depth of construction.

10-51 CHECKING OF PAVEMENT THICKNESS FOR PAYMENT ON AREA BASIS

Where payment for any bituminous course in Clause viz allowed to be made on area basis the Engineer- in-charge may have its thickness checked with the help of a suitable penetration gauge at regular intervals or other means as he may decide.

10-52 SCOPE OF RATES. FOR DIFFERENT ITEMS OF WORK

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For item rate contracts, the contract unit rates for different items of work shall be payment in full for completing the work to the requirements of the specifications including full compensation for all the operations detailed in the relevant sections of these specifications under 'Rates'. In the absence of any directions to the contrary, the rates are to be considered as the full inclusive rate for finished work covering all labour, materials, wastage, temporary work, plant, overhead charges and profit as well as the general liabilities, obligations and risks arising out of the General conditions of contract.

10-53 RESTORING THE ROAD-CUTS, FOOT-PATH, WATER-TABLE 10-53-1 Restoration of Road cut:

(i) After the Service Department has completed the laying/repairing mains/cables. The filled up trench should be re-excavated and filled in with sand to the required depth. The re-excavation of the trench restricted to the top 300mm only, if the soil at site is either sand or gravel. The fill must be well watered and consolidated.

(ii) Gravel is laid to a consolidated thickness of 225mm for the top 300mm in two layers, top finished level with the road surface. Water to the required extent should be added to ensure maximum compaction.

(iii) After the Gravel has been compacted, the trench is dressed and WBM layer laid to a thickness of 100mm top finished level with road surface. For the blinding material for this layer of WBM quarry fines will be used instead of gravel. If however, the existing road is having a WBM wearing surface, the WBM layer in the road cut will have gravel blinding, water to the required extent to be added to ensure maximum compaction,

(iv) After the WBM has been cured and set and becomes dry, the surface can be brushed and after necessary tack coat the P.C. carpet wearing course laid and rolled down by power roller to a consolidated thickness of 25mm. After blinding with sand at site, traffic can be allowed over B.T. surface and carting away the excavated earth to a lead as directed etc. complete.

10-53-2 Restoration of foot-path including necessary earth work excavation to the required depth supplying and filling in with sand to the required depth including watering and consolidating, providing and paving new CC 1 :2:4 slab 450mmx450mmx50mm thick to proper level and alignment, pointing the joints with CM 1:3 to full depth, carting away the excavated earth to a lead as directed, etc. complete.

10-53-3 Restoration of foot-path including necessary earth work excavation to the required depth, supplying and filling in with sand to the required depth including watering and consolidating, supplying and spreading with gravel to a thickness of 50mm including watering and consolidating, laying 20mm thick Premix Carpet processed in portable hot-mix plant including consolidating with hand roller over a tack coat using bitumen at 5kg /10m², carting away the excavated earth to a lead as directed, etc. complete.

10-53-4 Restoration of Cement Concrete kerbs and water table including necessary earth work excavation, providing and fixing in position new C.C.kerbs 600mm x 300mm x 100mm or IRC kerb 450mm x 375mm)(200mm including pointing the joints with CM 1:3 to full depth, providing and laying C.C. 1 :2:4: water table 250mm (or) 300mm wide x 60mm thick including rendering the surface smooth with Cement, clearing away the surplus excavated earth etc. complete.

Signature of the tenderer

I/ We agree to execute the works in accordance with general conditions and general specifications enlisted above.

MATERIALS	SOURCE
River sand	Palar river in Timmavaram village in Chengalpattu Taluk in Chegai M.G.R. District 47 K.M. outside City limits.
Brick and Products	Nerkundram
Sea sand	For North Zone : Ennore sand bar including a lead of 10kms. from City limits on Coastal Express Highway. For Central and South Zone : Cooum mouth at Sea shore near Napier Bridge.
Gravel	From any source beyond 7km. outside city limits now fixed on Chennai Nellore Road.
Blue Granite Jelly	Pallavaram Quarry
Filling Sand	Karanodai in Cholavam Village Ponneri Taluk from Korattalaiyar river in Chennai Nellore Main Road.

Signature of the tenderer

10-54 MATERIALS AND SOURCE

CERTIFICATED FOR OWNING/POSSESSION OF EQUIPMENTS
BY THE TENDER

(TO BE ISSUED BY A GAZETTED OFFICER OF THE GOVERNMENT OR AND OFFICER OF THE CORPORATION OF CHENNAI NOT BELOW THE RANK OF A CLASS-II OFFICER)

I.....
.....hereby certify that M/s. Thiru / Tmt. is
owning / in possession of the under mentioned machineries.

- a. Portable Hotmix Plant
- b. Road Roller 8 to 10 Tonnes
- c. Headmaster Boiler

(a) Hotmix Batch Plant per hour capacity		30/40 Tonnes :
(b) Mechanical paver finisher	...	1 No.
(c) Tippers	...	6 Nos. .
(d) Lorries (to Transport Materials) Sufficient Nos.		
(e) Road rollers 8 to 10 Tonnes	...	2 Nos.
(f) Front end Loader	...	1 No.
(g) Lab. Unit ...	...	1 No.

SIGNATURE :

NAME :

DESIGNATION :

OFFICE SEAL :

N.B. : The Certifying Officer shall personally verify before issuing the certificate and he should responsibility for any discrepancy mis-statement or untruth in the certificate.

Signature of the tenderer

SCHEDULE-B

B.R.R.C.No.B4/ 2342/2008

I/We do hereby agree to execute the works as per the office schedule of rates **2008-2009** contained in this tender schedule with less or higher percentage as detailed below:

SL.No.	Name of work	Ward/ Zone	Less or higher percentage tendered both in figures and in words
	Construction of Cement Concrete Pavement at A.A.Scheme Road (Stephenson Road junction to B.B. Road junction) in Ward-36, Zone - III	36/III	

I/We have persued the schedule of rates attached herewith. This less or higher percentage of tendered rate by me/us shall be applicable to each and every individual items of work contained in tender schedule of office schedule of rates attached herewith.

This less or higher percentage of tenderer rate is inclu- sive of sales tax and all other taxes in force.

Important Note to the Tenderer:

The Tenderer should quote the percentage in both words and in figures. The tenderer is required to quote up to two decimal points only. No tender will be considered, unless the percentage is furnished both in figures and words. If there is any correction in the percentage, it should be attested by the contractor and also by the officer concerned at the time of opening the tender.

Chennai
Date

Signature of the Tenderer
Address of the Tenderer
in Block Letters

N.B. : The Tenderer should quote the percentage in both the words and figures in the tender schedule 'B' attached in this tender Book. No tender will be considered if rates are quoted for individual item of work.

Signature of the tenderer

From

To

Sir,

Sub : Tender No.....
for the work of

I have tendered for the above work enclosed E.M.D. for Rs.....

In case my tender is not considered, the E.M.D. furnished by me may be refunded to me. I give below my advance receipt for the amount duly stamped.

Yours faithfully,

ADVANCE STAMPED RECEIPT

Received from.....Rs.....towards refund of E.M.D.
furnished by me along with my tender for the work of.....
.....
remitted in challan.....Dated.....

Signature of the Tenderer.

Recommendation of the Head of the Department

Signature and Designation

Signature of the tenderer

Directions to the Tenderers for Cement Concrete Roadworks

1 The Concrete road works are of special nature and are required to be carried out with high degree of supervision quality and construction techniques. the tenderers are therefore required to go through all the tender documents including special conditions / directions before filling of the tender. In the event of any contradiction between these special conditions / directions and general specifications for road works and general conditions of contracts of civil works, these special conditions / directions shall supersede corresponding provisions elsewhere and shall prevail.

2. The contractors / their engineers shall carefully go through the various relevant specifications / tests standards / apparatus standards which are summarized in the accompanying appendix-I for guidance. It will be the responsibility of the contractors to execute the quality work in accordance with a specification of MORTH, IS, IRC, SSRB and issued by the Engineer specifications_ The contractor shall use RMC and all ingredients shall confirm to the relevant IS codes, RMC supplied shall confirm to the standards specified in IS-456-2000 version IS- 4926-1976
3. In addition to the qualities of strength and durability greater attention will need to be devoted to the qualities of the payment surface, which directly affect the user perceptions, comfort and safety_ In this connection, the wear resistance, surface evenness (riding quality) and skid resistance, as well as freedom of the surface from structural or other quality blemishes (example Cracks, Joint and edge spalls, surface pitting / Popouts, scaling / Potholes, etc.,) will need additional attention.
4. Weigh-batching is being introduced on a compulsory basis, for the manufacture of pavement concrete with control on water content, with a objectives of controlling variations in mix proportions and water cement ratio.
5. The contractors will have the full responsibility for quality control and delivering requisitic quality in the field.
6. Contractor shall employ minimum one Senior qualified concrete Engineer on each site in addition to atleast one Junior Engineer, they will additionally employ adequate number of trained supervisors and skilled labours. Contractor's Engineers should be experienced and will be conversant with the concrete mix design procedure and should be thoroughly acquainted with the construction of concrete roads. Contractors not employing such qualified engineers shall not be allowed to commence with the work and the days lost on this account shall be counted as working days. The qualified engineers shall be available on site throughout the period of execution of the work.

7. MATERIALS

Corporation of Chennai will not supply cement to contractors. They shall have to purchase cement from open market that is manufactured by reputed cement companies. It is proposed to use ordinary Portland cement of 43-53 grade, confirming to IS : 269. Cement shall have to be got tested at Municipal Laboratory or at the Highways Research Station (HRS), Guindy or at the Laboratory approved by Engineer at contractor's cost before its use, for each batch of 1500 bags. In case, the cement test results are not available before its use, the concreting work may be permitted after carrying out compressive, strength test for 3 days at the site laboratory and the C.C. Cube test results for 3 days should confirm to the proportionate strength, however, cement test results will have to be obtained by the contractors from the laboratories as approved by Engineer before proceeding with the work further.

8. Only ordinary Portland cement of 43 or 53 Grade will be used. Contractor shall provide two independent cement godowns with a capacity of 1500 cement bags each, under' double lock. system with one lock with the contractor and other will a staff of Corporation of Chennai. Cement from locked godowns will be released only after getting satisfactory test results as per clause 7 above. At least one godown must always be full of 1500 cement bags. For a particular slab, same brand cement should be used.

- 8.1 Admixtures: Admixtures confirming to IS : 6925 and IS 9103 will be used to improve workability of the concrete or extension of setting time on satisfactory evidence that they will not have any adverse effect on the properties of concrete with respect to strength, volume change, durability and have no deleterious effect on steel bars. Satisfactory performance of the admixture shall be proved both on the laboratory concrete trial mixed and in trial paving work.

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9 - Water

- 9.1 The rate proposed in this tender for all concrete and allied works are inclusive of water cost. The contractors shall have to make their own arrangements at their cost for bringing adequate water for mixing concrete, curing etc. purposes and for this no extra payment will be made.
- 9.2 Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter and other substances harmful to the concrete. It shall meet the requirements stipulated in I.S.456. The water brought for concreting and curing etc. Shall be got tested from Metro Water testing lab (situated at Kilpauk Water works) or any other laboratories as approved by Engineer such as King Institute, I.I.T to verify whether it is suitable for above purpose, whenever directed. This testing will be done at contractor's cost.
- 9.3 Contractors will have to make their own arrangement of water for drinking purpose. The contractor has to pay the water bill separately as raised by Metro Water.

10 Sand shall be of approved quality with fineness modulus between 2.4 to 3.5 as per approved mix design. The sand will have to be screened and washed to reduce the silt contents below 8% by volume after one hour and to bring it within the permissible range of fineness modulus. Blending of sand of fine and coarse quality may be permitted to achieve the required FM if it is found necessary to give desired results. In case, stone dust is required to be added for mixing with the sand, for bringing the admixture within the desired range of fineness modulus, such stone dust shall be of approved quality with fines passing through 75 micron sieve limited to 15% or less. In case percentage of fines in stone dust is found to be more than 15% prescribed under I.S.Code 383 of 1970, the same to be washed and cleaned so as to bring it within the permissible range. The fine aggregates will be tested and retested as directed by the engineer till they satisfy the required norms as per ISI and as specified above.

11.If coarse aggregates are found having white spot the same shall be got tested from approved testing laboratory to eliminate possibility of potential aggregate - alkali reactivity, before accepting or using spotted aggregates.

12.The contractor should make the necessary arrangement to stack the aggregates separately so that they do not get mixed up with each other and / or with the foreign materials, and do not get segregated. the screening of the aggregates shall be done if found necessary, as directed by the engineer

13.The contractors shall have to bring M.S./ Tor Steel and structural steel required for this work. M. S./ Tor steel and structural steel shall conform to the relevant latest Indian Standard Specifications. The Steel brought on site shall be got tested at Municipal or any other approved laboratory at the contractor's cost, before using on site.

TESTING

14.To determine the 'K' value, it is necessary to take a plate load test within the scope of the work. The test will be taken by Highways Research Station (HRS) at Guindy, however, contractor shall arrange at his cost for excavation loading and refilling. No payment will be made for this work however, if the refilling of the trench is required to be carried out in C.C. as directed by the engineer, then the payment will be made as admissible as per the rates quoted in the tender for the relevant item.

For conversion of K-value to CBR value the values of CBR/K values shall be adopted from IRC/58 of 1988, as detailed below:

Approximate 'K' Value corresponding to CBR value for homogeneous soil standards									
CBR Value (%)	2	3	4	5	7	10	20	50	100
K-Value (Kg/cm ³)	2.08	2.77	3.46	4.16	4.84	5.54	6.92	13.85	2.2

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The recommendations of IRC: 15-1981 shall be followed and a K-value of less than 5.5kg/cm³ tested on the subgrade shall not be permitted. In case, a large number of tests are required, either in view of low K-value obtained, or in view of heterogeneity / variability of subgrade, additional field soaked CBR tests may be conducted, using the above table for assessing the K-value. The final checking will, however, be based on plate bearing test.

- 15 Contractors shall set up a laboratory at site before commencement of work at their cost for performing various tests and at least the following machines and equipment's shall be provided therein.

- a. Compressive strength testing machine (for cube tests) of 130 tonne capacity
- b. Set of sieves required for finding fineness modulus of sand and also for aggregate grading
- c Laboratory weighing balance of minimum 10kg capacity
- d Aggregate drying equipment. (Electrical oven or the spirit methods)
- e Equipment for testing of silt content in sand
- f Thermometers calibrated upto 200 degree C for checking

asphalt / bitumen temperature

- g Sieve shaker (electrically operated)
- h. Cuddappah stone platform of size 2.5 m x 0.9 m approx.
- i. Electrically operated weighing machines of 60 kg to 150 kg
- j. V. B. Apparatus for workability
- k. Other machines as may be directed by engineer of Corporation of Chennai

All the test records shall be meticulously maintained in the site laboratory and made available as and when required.

- 16.1.1. Even though, it is the obligatory duty of the contractors to have an well equipped laboratory at site and carry out the necessary tests in this laboratory, they shall submit atleast, once in two weeks, additional 3 cubes of M40 cement concrete work for testing at the Municipal Laboratory for 28 days strength. The contractors shall send to the municipal laboratory once in a month, 6 flexural beams along with the corresponding 6 c.c. cubes for testing flexural as well as compressive strength. The contractors should arrange to send the cubes to the laboratory within four days from the date of casting of the cubes for seven days test, failing which these will be got conveyed by the Engineer in charge and the cost will be recovered from the contractor's bill.

The charges for the testing of cubes and beams
shall be as under Cubes Rs.30/- per cube
Beams Rs.50/- per beam

The cubes shall also be tested for 7 days, 14 days and 28 days strength at the contractor's laboratory in the presence of Asst. Exe Engineer incharge of the work. Whenever the material cubes and beams are required to be sent to the Municipal laboratory, the same shall be transported to the Municipal laboratory by the contractors at their cost. However, the contractors shall cast, 9 cement concrete cubes during concreting of each slab to be cast in M 40 and test the cubes at site laboratory in accordance with I.S.516 for 7 days, 14 days and 28 days strength. The acceptance criteria for the test results shall be accordance with I. S. 456.

The average compressive and flexural strength of each consecutive group of 6 cubes and 6 beams shall be calculated. The compressive strength of cubes shall not be less than 40 Mpa at 28 days and flexural strength of beams shall not be less than 5 Mpa at 28 days.

- 16.2 While designing the mix in the laboratory, correlation between flexural and compressive strengths of concrete shall be established on the basis of tests on samples for any adjustment in design. However, quality control in the field may be exercised on the basis of compressive strength. It may, however, be ensured that in such case, the materials and mix proportions remain unaltered. The water content shall be the minimum required to provide the

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agreed workability for full compaction of the concrete to the required density. The maximum water cement ratio approved by the Engineer is to be adopted.

- 16.3 Atleast three cube specimens, one each for 7 days, 14 days and 28 days strength testing shall be cast for every 50 Cu m. or part thereof of concrete placed construction. On each day's work, not less than nine cubes shall be cast and the same shall be tested in presence of the Asst. Exe. Engineer in accordance with the testing procedure.
- 16.4 The ratio between the 7 and 28 days strength shall be established for the mix to be used in the slab in advance, by trial design mix. The average strength of the 7 days cubes shall be divided by the average strength of the 28 days for eachwork and the ratio 'R' shall be determined. The ratio 'R' shall be expressed to three decimal places.
- 16.5 If during the construction the value of 7 days test results falls below the required 7 days strength as per the design mix then the cement content of the concrete shall, without extra payment be increased by 5%. The increased cement content shall be maintained at least until the 28 days strength have been assessed for its conformity with the requirements. Whenever the cement content is increased, the concrete mix shall be readjusted to maintain the required workability.
- 16.6 Incase the cube test for 28 days period fails, cores shall be taken from the concrete slab and will be tested at contractor's cost. The core will be 100 mm dia, if it fails, action as contemplated under clause no.17. 7 shall be taken.
- 17.1 The density of the compacted concrete shall be such that the total air voids are not more than 3%. The air voids shall be derived from the difference between the theoretical maximum dry density of the concrete calculated from the specific gravities of the constituents of the mix. The average value of two samples shall be considered of cores of at least 100 mm diameter. If the average of any two consecutive measurements of density of cores is below the minimum required, the extent of defective concrete shall be determined by additional cores or other means approved by the Engineer and the concrete shall be removed and replaced with new materials in accordance with the specification.
- 17.2 All cores. taken for density measurements shall also be checked for thickness. in case of doubt, additional cores may be ordered by the Engineer and taken at locations decided by him to check the depth or density of concrete slab without any compensation being paid for the same. Thickness of the slab at any point checked as mentioned above shall be within a tolerance of as per specification. Quality concrete test for concrete road specification of MORTH of the specified thickness as per drawing. The cost of core samples to be taken and their testing shall be borne by the contractors. The test samples shall be taken by the agencies approved by Engineer.
- 17.3 In calculating the density, allowance shall be made for any steel in cores. Cores shall be reinstated with compacted concrete with mix proportions of 1 part of portland cement 2 parts of fine aggregate 2 parts of 10 mm, nominal size single sized coarse aggregate by weight or as directed by the engineer at the contractor cost, in case the cores are taken from the road already opened to traffic, the mix / material adopted for filling shall be such as will develop the requisite strength in a minimum of time.
- 17.4 At each site of work, minimum 3 cores shall be taken for testing.
- 17.5 Core density test shall be carried out in accordance with relevant I.S codes. For testing of cores for strength, refer Para 17.6.
- 17.6 The results of crushing strength tests on these cores shall not be less than 0.8 times the corresponding cube crushing strength requirement, where the height to diameter ratio of the core is two. Where height to diameter ratio is varied then the necessary corrections would be made in calculating the crushing strength of cores in the following manner

The crushing strength of cylinders with height to diameter ratios between 1 and 2 may be corrected to correspond to the standard cylinder of height to diameter ratio of 2 by multiplying with the correction factor obtained from the following equation.

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f	=	0.11 n + 0.78
Where f	=	Correction factor and
n	=	height of diameter ratio

The corrected test results shall be analysed for conformity with the specification requirements for cube samples. Where the core tests are satisfactory, they shall have precedence for assessing concrete quality over the results of moulded specimens. The diameter of cores shall not be less than 10m m.

- 17 7 If the tests on cores of the concrete is not satisfying the strength requirements, then the payment for the slab shall be withheld upto 5 years. Slab under reference shall be kept under observation during this period and if defects are noted, then further course of action as deemed fit including replacement of the slab will be taken as decided by commissioner and whose decision will be final. In such cases, the decision of the commissioner regarding release of payment, fully or partly, on such slabs, will be binding on the Contractor.

PRE-CONCRETE CONSTRUCTION PHASE

- 18. Pert / Bar chart shall be furnished while submitting the tender. If it is not done, the tender may be rejected. Contractors should note that the work is carried out in three or more phases depending upon the traffic diversion problems and they should visit the work site to examine the site conditions before tendering.
- 19. The contractors should make such arrangements that minimum 40 slabs admeasuring about 4.5 m x 4.5 m are cast per month. However, it should be seen that the adjacent slab should not be cast before 48 hours gap. These should be considered while preparing PERT/BAR Chart.

If the contractors excavate certain portion of the road and fail to concrete the same within the stipulated time limit, as per the programme they will be required to reinstate this excavated road portion With bituminous layers as specified and directed by the engineer. No payment will be made for such restoration.

- 20. The contractors should note that the work be required to be carried out in phase as permitted by the Traffic Police Dept., The contractors will have to obtain permission from the Traffic Police Dept. well in advance for closing down the road or part thereof for the execution of the work. The work will have to be carried out in stages depending upon the permission granted by the Traffic Police for closure of the road or part thereof. The contractors should therefore take this into account while quoting.
- 21. The contractors should also note they will have to modify if required the detailed programme submitted in the form of BAR Chart or PERT/CPM, Considering the permission obtained from Traffic Police before actual starting of the work at site so as to complete the same in the stipulated contract period.
- 22 Mix-design to give the specified strength as required in accordance with the relevant IRC/IS specifications shall be prepared. The same shall be obtained from IIT Madras or highways research station, Guindy by the contractors and checked by the Engineer, whenever the contractor brings fresh lot of aggregate at site, the same shalt be got checked. For this purpose, gradation analysis of coarse and fine aggregate shall be performed. The necessary correction shall be made in the mix design accordingly.
- 23 The mix design shall conform to one of the methods specified in IS 10262 or IRC 44; preferably the mix design should be done as per details given in IRC-44 of 1976. "Tentative guidelines for cement concrete mix design".
- 24. Before actual starting of M40 concreting work, the sand shall be checked for bulkage and moisture content Accordingly, quantity of water and sand shall be adjusted.
- 25 Minimum cement content shall be 350 kg / cum and maximum cement content shall be 450 K.G. / CU.m Each cement bag shall contain not less than 50 kg and the cement bags to be used, shall be weighed (not on the standard bag basis) while mixing No claim for excess cement used shall be entertained. If this minimum cement content is not sufficient to produce in the field, the concrete of the strength specified in the drawing / design. it should be increased as necessary without additional compensation under the contract.

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26. The water bound macadam base should be adequately watered on the previous day and .also two hours before starting lean concreting work so as to keep it in moist condition before starting the lean concreting work.
27. Double bulkheads for keeping the dowel bars in the proper alignment shall be provided as per drawing, and as directed by the Engineer. Tie bars should be aligned exactly perpendicular to finished concrete surface of the slab by means of suitable device as approved by the Engineer.
28. Dowel bars shall be deformed steel rounds in accordance with details/dimension as indicated in the drawings and free from oil dirt, loose rust or scale. They shall be straight, free of irregularities and the sliding ends sawn or cropped clearly with no protrusions outside the normal diameters of the bar. The dowel bars shall be supported on double bulkhead or chairs in prefabricated joint assembly position as approved by the Engineer prior to the construction of the 'slabs.
29. Unless shown otherwise on the drawing, dowel bars shall be positioned at the mix depth of the slab within the tolerance of ± 20 mm centered equally about intended lines of the joints within tolerance of ± 25 mm. They shall be aligned parallel to the finished surface of the slab to the centerline of the carriageway and to each other within the following tolerance.

For the bars supported on bulkhead prior to the laying of the slab.

- a. All the bars in a joint shall be within ± 45 mm per 300 length of the bar
 - b. $2/3$ rd of the bars shall be within ± 3 per 300 mm length of the bar
 - c. No bar shall differ in alignment from the adjoining bar by more than 3 mm per 300 mm length of the bar in either horizontal or vertical plane.
 - d. The dowel bars shall be covered by a sheath of high density polythene pipes of approved quality for half the length plus 50 mm for expansion joints. The sheath shat be tough, durable and of an average thickness, not greater than 125 mm. The end portion of the sheath shall be plugged with tin cap fitting properly tight having length of 100 mm.
30. All excavations, trenches obstructions, materials etc. taken kept or deposited in connection with the work should be sufficiently barricaded and lighted at night as directed by the Engineer to prevent against any damage or danger to the traffic. The contractors shall take all precautions to keep all the blinkers working throughout the night for the guidance of the traffic in the following manner. No extra payment will be made for the barricading as well as blinkers the contractors should take this in account while quoting for the tender.
 - i. All blinkers shall be red in colour
 - ii. At least two blinkers shall be provided across the direction of the traffic
 - iii. The contractors to take any other measures as may be directed by the engineer from time to time for the safety of the traffic as well as concreted slab etc.

In the event of contractors not complying with the provisions of this clause, the engineer may without notice to the contractors put up the barricade or improve upon the same or Improve up the lighting or adopt such other measure as he may deem necessary and all the cost of such procedure as may be adopted by the engineering shall be borne by the contractors. In addition, they shall be charged a penalty of Rs.200/- per day till compliance of these requirements.

31. All the trenches will be refilled as specified in the tender.

CONCRETE BATCHING, MIXING, LAYING AND COMPACTION

32. The laying of M 10 concrete in pavement will Have to be carried out with proper form work only. It shall be properly mixed with mechanical mixer compacted with vibrators and shall have smooth surface. It should have proper cross profile. The work will have to be carried out as directed by Engineer on site. Curing shall be done for 7 days or till the lean concrete is covered by M 40 cc slab, whichever is earlier, but not earlier than 48 hours.

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33. Weigh batching machine as specified in the list of machinery shall be used for batching, mixing and preparing the mix for every slab in M40. it shall be portable weight mixer of minimum 400 liters capacity and preparation of mix on volume basis will not be permitted unless and otherwise specific written order of Engineer are obtained in special circumstances in advance.
- 34 For the desired workability the concrete mix of M 40 will have a slump not more than 25mm without any admixture except Ready Mix Concrete (RMC)
- 35.1 All grades of concrete shall be vibrated suitably as directed and no extra payment will be made for the use of various types of vibrators.
- 35.2 M 40 cement concrete slab shall be laid in two layers and each layer shall be compacted with needle vibrators, plate vibrator and screed vibrator.
- 35.3 To achieve the proper consolidation of the concrete slab, the top layer of the concrete shall be compacted by needle vibrator and place vibrator in addition to screed vibrator If any depressions are observed on the surface of the concrete, fresh concrete is spread on the top, surcharged and got compacted with batten. Screed vibrator is again to be used for compaction as well as levelling.
- 35.4 The water cement ratio shall be strictly adhered to, as per the approved mix design and should be adjusted according to temperature variation during the day of casting of the slab, if found necessary. Care shall be taken to prevent the over vibration and appearance of water llaitance on top surface other slab. If any excess water is noticed on the surface of the slab, the same shall be removed by moving Hessian cloth on to surface and the concrete mix shall be immediately rectified as directed.
36. Plate vibrators shall be used for compaction of concrete mix in addition to needly and screed vibrator and as such contractors must have two numbers of each machine such as mixer, plate vibrator, needle vibrator, screed vibrator in working condition and an extra one of each as standby, for each site of work in moving condition.
37. The distance as well as time *lag* between bottom concrete layers and top layers during concreting operation shall not exceed 2.5 meters or 20 minutes whichever is lesser.
38. Whenever the needle vibrator is used, the mason must follow with a towel and punch to the portions of concrete from where the needle vibrator is withdrawn to ensure that no hollow portion remains in the stiff mass of concrete. Plate vibrating shall. also follow thereafter immediately.
39. Concrete pavement must be in proper cross profile as per camber prescribed by the Engineer
- 40.1 After the final regulation of the surface of the slab surface of concrete slab shall be brush-textured in a direction at right angles to the longitudinal axis of the carriageway.
- 40.2 The brushed surface texture shall be applied evenly across the slab in one direction by the use of a wire brush not less than 450 mm wide. The brush shall be made of 32-guage tape wires grouped together in tufts spaced at 10mm. Centers. The tufts shall contain an average of 14 wires and initially be 100 mm long. The brush shall have two rows of tufts. The rows shall be 20 mm, apart and the tufts in one row shall be opposite the centre of the gap between tufts in the other row. The brush shall be replaced when the shortest tufts wears down to 90 mm long.

The texture depth shall be determined by the sand patch test as described in clause 40.4. The test shall be taken at least once in a week or whenever the Engineer considers it necessary, at times after construction. 10 individual measurements of the texture depth shall be taken at least 2 mtr. Apart any where along the diagonal line across a lane width between points 50m apart. No measurements shall be taken within 30 mm of the longitudinal edges of the concrete slabs. The texture depth shall not be less than minimum required as per the table below, nor greater than a maximum average of 1.5 mm.

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Sl. No.	Time of tests	Minimum texture depth required
1.	Between 24 hrs and 7 days after the construction of the slab	0.75 mm for an average of 10 measurements with no single measurement less than 0.65 mm
2.	Not later than 6 weeks before the before the road is open to public traffic	0.65 mm for an average of 10 measurements with no single measurement less than 0.60mm

40.3 After the application of the brushed texture, the surface of the slab shall have a uniform appearance.

40.4 Where the texture depth requirements are found to be deficient, the Contractor shall, make good the texture across the full lane width over length directed by the Engineer, by

RETEXTURING THE HARDENED CONCRETE SURFACE IN AN APPROVED MANNER.

40.6.1 The following apparatus shall be used,

- 1.A cylinder container of 25 ml internal capacity
- 2.A flat wooden disc of 64mm diameter with a hard rubber disc, 1,5 mm thick, struck to one face, the revenue face being provided with a handle,
- 3.Dry natural sand with a rounded particle shape passing a 300-micron IS sieve and retained one a 150 micron IS sieve.

40.6.2 Method - The surface to be measured, shall be dried, any extraneous mortar and loose material removed and the surface swept clear using a wire brush both at right angles and parallel to the carriageway. The cylindrical container shall be filled with the sand tapping the base 3 times on the surface to ensure compaction, and striking off sand level with the top of the cylinder. The sand shall be poured into a heap on the surface to be treated. The sand shall be spread over the surface, working the disc with its face kept flat in a circular motion so that the sand is spread into a circular patch with the surface depressions filled with sand to the level of the peaks

40.6.3 The diameter of the patch shall be measured to the nearest 5mm. The texture depth of concrete surface shall be calculated from $31000 / (D \& D)$ mm where D is the diameter of the patch in mm.

- 41. It will be the responsibility of the contractor to give the required finish of riding surface, by checking with the straight edge and wedge gauge and any deficiency observed, shall be rectified as specified in the general specifications.
- 42. Curing of concrete shall be done as directed for a minimum period of 14 days from the date of casting cc slab.
- 43 The vertical sides of concrete are required to be tarred with hot bitumen of 80/100 grade before casting of the adjoining relevant bay.
- 44 The contractors shall have to cast runner beam, manholes, water tables etc. within 3 days from the date of casing of adjacent slab.
- 45. The cement concrete slab pavement in M40 is required to be carried out strictly as per the drawing, as regards thickness no claims on account of additional thickness other than that specified, if provided, will be entertained.
- 46. Casting of slab shall be closed at 6.30 PM or sunset whichever is earlier every day unless it is allowed by Engineer under special circumstances with proper adequate lighting arrangement

POST – CONCRETE CONSTRUCTION PHASES

47, The joints shall be cut to the specified depth within 48 hours from the casting of CC slab/bay as directed, failing which these will be got done at the contractor's cost and penalty will be levied as directed by Engineer, including

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withholding the full payment of entire slab for 5 years. The decision of Engineer shall be final and binding on the contractors.

48 The machine cut joints and expansion Joints must be cleaned first by using Raking tool and then air blown with compressor, so as to remove dust, sand particulars and foreign matter from the joints before filling them with hot 10/20 grade pavement grade bitumen after applying primer with pouring pot.

- 49 No separate payment for restoring battas before and after cutting of joints or damaged on any account shall be made. Such battas shall be restored immediately by the contractor.
- 50 The joints cut and cleaned should be got certified from the engineer before filing with 10/20-grade bitumen per as the specifications for sealing of joints in rigid pavements. The filled over bitumen Will be removed immediately The road thereafter shall be opened to traffic.
- 1.1 The regularity of the surface of the slab shall comply with the requirement of this clause.
- 1.2 Compliance with the requirements of this clause for surface regularity shall be measured using an approved 3m. Long straight edge and wedge in such a way as to reveal any and all irregularities. The maximum permitted number of surface irregularity of 5mm and *Imm* in a length of 300 m shall be zones.
- 1.3 Longitudinal regularity shall normally be measured along any lime or lines parallel to the edge of the slab.
- 1.4 Transverse regularity shall normally be measures along any line With the straight edge places at right angles to the centerline of the road
- 51 If deemed necessary by the Engineer, any section of the slab, which deViates from the specified levels and tolerance, shall be demolished and reconstructed at the Contractor's expenses.

BITUMINOUS ROAD WORKS

52. The prevailing bituminous roads specifications as per MORTH, IRC, IS, SSRB and circular prepared by Engineer from time to time, shall hold good for the flexible pavement portion of this tender.
- 53 The contractors shall note that in case of the failure of test samples, on receipt of test reports of the samples sent to the laboratory, the corresponding work to which such substandard results pertain, shall stand rejected provisionally and payment if any, made before shall be recovered from the contractor's bill. Acceptance of such work, with or without rectification, full/part release of the payment, shall be referred to the Engineer whose decision shall be final and binding on the contractors.

MAINTENANCE

54. There shall be a defect liability for 5 years period (60 months) for CC pavement. If during this period concrete road fails due to (1) development of cracks (2) spelling of edges (3) erosion of concrete surface etc. the action as decided by the Engineers shall be taken against the contractors. In case of development of structural cracks/full depth cracks, the panel between the contraction joints shall be replaced. In case of replaced slab, a defect liability of such works The decision of the Engineer will be final and binding on the contractor. The rectification of defects shall be carried out as directed by Engineer. During this period dressing of joints complete in all respect shall have to be done free of cost at lease once in a year, preferably in the month of April or May or as directed by the Engineer, under Municipal supervision.

55.GENERAL

- 55 The tenders shall submit a list of equipment, machinery possessed by them, which are required for execution of the works

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56. The contractor when called upon will take up the additional work in the vicinity of this work and complete the same at the rates, terms and conditions of this tender without claiming any compensation and work shall be completed within the time period allotted to this tender.
57. The labour huts for the CC road works may be permitted on work site in consultation with the respective Zonal Officers and subject to the following conditions.
- a. The labourers hutments will be completely isolated from the public by providing a tin sheet fencing around them.
 - b. They will be specifically identified by Corporation of Chennai staff by numbering them suitably
 - c. Adequate toilet and bathing facilities will be provided for them inside this fencing.
 - d. The contractors will strictly observe that labourers will use these toilets and bathing facilities and no 'un hygienic conditions are created at site.
 - e. In case, any of the above conditions is violated Such hutments will be removed by the division AE/JE without giving any notice to the contractor in consultation with the Executive Engineer in-charge of the work.
 - f.. Such hutments will be removed by the contractors with in seven days of the completion of the work
- 58 The tender shall submit PERT /CPM chart monthly progress reports
- 59 Diameter of the SWD pipe work and size of manhole provided in Bill Quantity of the tender are tentative and are likely to change at the time of execution according to the site conditions. Contractors shall have to carry out such extra items in SWD works as per prevailing SWD schedule rates of Chennai Corporations at the time of invitation of tender adjusted by rebate/premium quoted by the contractors and no fair rates will be admissible for the same
- 60 The contractor shall obtain and maintain an electric connection at their cost at the site for lighting as well as for operating machineries.
- 61 The contractor shall obtain and maintain the telephone at site at their cost
- 62 The tender shall submit PERT /CPM chart monthly progress reports
- 63 Diameter of the SWD Pipe work and size of manual provided in bill of quantities of the tender are tentative and or likely to change at the time of execution according to the site conditions. Contractor shall have to carry out such extra items in SWD works as per prevailing SWD schedule rates of Chennai Corporation at the time of invitation of tender adjusted by rebate/premium quoted by the Contractors and no far rates will be admissible for the same
64. The Contractor shall obtain and maintain an electric connection at their cost at the site for lighting as well as for operating machineries.
65. After completion of the work, the Contractors shall submit two sets of completion drawing showing therein the details of work executed including the details of SWD and their diameter, Water mains laid, locations of duct manhole and water entrances etc., as directed by Engineer such plans shall be mounted on canvas cloth.

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APPENDIX I

TABLE 1

INDIAN STANDARDS (IS AND IRC) FOR CONCRETE PAVEMENT CONSTRUCTION AND QUALITY CONTROL

1. MATERIALS

Items	Specifications	Method of test	Sampling
Cement	IS 8112 (Gr.43)	IS 4031 (Pt 1 to 14)	IS 4879
	IS 12269 (Gr.53)	IS 4032	
Aggregate coarse & Fine	IS 383	IS 2386 (Pt. 1 to 8)	IS 2340
Water	IS 456		
Admixture for concrete	IS 9103		
Performed fillers for expansion joints	IS 1838 (Pt. 1 & 2)	IS 10566	
Hot applied sealing compound for joints	IS 1834		
Poly sulphide base joint sealant One Part grade	IS 11433 (Pt.1)	IS 11433 (Pt.2)	
Two parts grade	IS 12118 (Pt.1)	IS 2118 (Pt.2)	
Standard sand for testing of cement	IS 650	IS 8142	
Test sieving			
Concrete mix design	IS 10262		
	IRC 44		
	IRC 59		
Concrete Strength			IS 516
Splitting tensile strength of concrete cylinders			IS 5816
Concrete sampling and analysis			IS 1199
Setting time			IS 8142
Permeability			IS 3085
Abrasion resistance accelerated			IS 9284

Strength testing			IS 9013
			IRC 85
Ready-mixed concrete	IS 4926		
1. MATERIALS			
Precast concrete kerbs	IS 5758		
Precast concrete cable cover	IS 5820		
Concrete porous pipe for under drainage	IS 4350		
II TEST APPARATUS AND EQUIPMENT			
Flow table for cement tests		IS 5512	
Vicat apparatus		IS 5513	
Lea Chatelier Apparatus		IS 5514	
Air permeability apparatus plain type		IS 5516	
Lea and Hurst type		IS 5536	
Jointing apparatus for testing cement		IS 10078	
Vibrating machine for casting standard cement mortar cubes		IS 10080	
Planetary mixer used in tests of cement and pozzolana		IS 10890	
Moulds for use in tests of cement and concrete		IS 1008	
Test sieves		IS 460 (Pt.1 & 2)	IS 430 (Pt.3)

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Items	Specifications	Method of test	Sampling
Aggregate crushing value 10% fines apparatus		IS 9376	
Aggregate impact value apparatus		IS 9399	
Machine for abrasion testing of coarse aggregate		IS 10070	
Measurement of length change of hardened cement paste, mortar and concrete		IS 9459	
Apparatus for determining constituents of fresh concrete		IS 7325	
Concrete slump apparatus		IS 7320	
Compaction factor apparatus		IS 5515	
Vee bee consistometer		IS 10510	
Table vibrators for consolidating concrete		IS 7246	
III CONSTRUCTION EQUIPMENTS			
Tools and equipments for concrete road construction		IRC 43	
Industrial sieves		IS 2405 (Pt 1 & 2)	
Portable swing weigh batcher for concrete		IS 2722	
CONCRETE MIXERS			
Batch Type		IS 1791	IS 4634
Pan mixers		IS 12119	
Transit mixers and agitators		IS 5892	
CONCRETE VIBRATORS			
Immersion type	IS 2505	IS 11389	IS 3558
Pan vibrators	IS 3366		
Screed board vibrators	IS 2506	IS 6923	IS 11993
Concrete batching & mixing plant	IS 4925		
Concrete spreaders	IS 7242		
Concrete paver	IS 7245		
Concrete finishers	IS 7251		
IV CONSTRUCTION			
Construction of concrete pavement	IRC 15		
Lean cement concrete base/sub-base	IRC 74		
Curing cement concrete pavement	IRC 84		
Installation of joints in concrete pavements	IS 6509		
Sealing of joints in concrete pavements	IRC 57		
Construction in hot weather	IRC 61		
	IS 7861 (Pt.1)		
Construction in cold weather	IRC 91		
	IS 7861 (Pt.2)		
Quality control for construction of Roads and Runways	IRC SP 11		

APPENDIX 1
TABLE 2

MINIMUM TEST FREQUENCIES FOR QUALITY CONTROL OF CONCRETE ROAD CONSTRUCTION

Item	Test	Control criterion	Frequency
APPROVAL OF SOURCE OF SUPPLY OF MATERIALS			
Cement	Physical and Chemical Test	IS 8112	Once for each source supply for approval of the source and subsequently when warranted by change in quality in case of doubt
Coarse & fine aggregates	-Do- (including soundness and alkali reactivity)	IS 383	-Do-
Water	Chemical Test	IS 456	-Do-
Expansion Joint Filler board		IS 1838	-Do-
Joint Sealing Compound		IS 1834	Do-
DURING CONSTRUCTION MATERIAL			
Cement Received	Strength	IS 8112	For each lot of cement
Coarse and fine aggregate	Gradation	IS 383	For each lot of aggregate received
	Moisture Content	IS 383	Regularly as required subject to minimum of 2 tests per day
Coarse aggregates	Los Angeles abrasion value /aggregate impact value	IS 383	Once on every change of source
Flakiness Index		IS 383	Do-
Elongation Index		IS 383	Do-
CONCRETE			
Workability Concrete strength		Three tests per day. Cube samples, as specified for each age of 7 days, and 28 days for every 50 Cu. M and Flexural strength to be carried out as per IRC Specification.	
Checking surface evenness with 3 mt.		Three longitudinal lines along the slap length one in the middle third and the two edge – third	

Straight edge and wedge edge		stripes, along the lines of maximum unevenness.	
DOWEL BARS			
Alignment (Being in a plane parallel to the surface of the base course, and being also parallel to the center line of the slab		Each dowel bar, after fixing in position.	
TIE BARS			
Mid-height positioning		Each tie bar.	

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APPENDIX 1		
TABLE 3		
ADDITIONAL QUALITY CONTROL CRITERIA AND TOLERANCES		
	Criteria	Tolerance
Sub grade / Sub base under Lean concrete base	Ful Compaction K Value 5.5 kg/m ³	No minus tolerance
Lean concrete base	Grade M 10	Tolerance level for characteristic strength assessment 1 in 15
	Surfacing unevenness under 3m straight edge Curing 7 days or till laying concrete slab is laid earlier	Not more than 10mm
Cement Concrete pavement	Quality concrete Grade M-40	Tolerance level for characteristic strength assessment in 15
	Workability 25mm (slump) maximum	No tolerance
	Curing 14 days curing by ponding with water and wet hessian cloth curing for the day of casting (prior to starting curing by ponding)	14 days curing by ponding with water.
Dowel Bar	Length and dia Placement with equal length vis-a-vis centerline of the joint	Should not be smaller than stipulated value = 4.5 m
	Horizontal & Vertical alignment including that of dowel cap	As specified in relevant item

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APPENDIX 1		
TABLE 4		
MINIMUM TEST FREQUENCIES FOR QUALITY ASSURANCE / ACCEPTANCE OF CONCRETE ROAD CONSTRUCTION		
	Lean Concrete Base	Cement Concrete Pavement
Strength recovering cores		Six 100mm dia cores per site as specified in relevant clauses
Surface evenness	3 longitudinal lines (as for quality control)	3 longitudinal lines (as for quality control) as specified in relevant clauses.
Surface defects / defects reflected on the surface	Full surface	Full surface

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TABLE 5		
ACCEPTANCE CRITERIA		
Parameter	On completion, before/within two months of opening to traffic	At the end of defect liability period of 5 years
Strength	Characteristic strength (28 days) of the test specimens analysed for the complete work to exceed the specified strength	Before the end of the defect liability period, the site will be jointly inspected as per Clauses No.55 of Special Conditions / Directions to the Tenderer for CC Road Works, along with the contractor's representative / Engineer & defects observed will be listed and the necessary rectification will be carried out as directed by Engineer in accordance with the relevant specifications and clauses mentioned in Special Directions / Conditions to the Tenderers.
	Individual core strength test results. Corrected forage, ratio and shape (cylinder to cube) upto the specified strength. The characteristic strength (28 days) to be not less than the specified strength (for a tolerance level of 1 in 15)	-
Thickness	At no point should the layer thickness be less than the specified thickness as checked from the levels	-
Surface	Maximum departure under 3 straight edge	-
Evenness	Within the following limits. No.of irregularities exceeding 5mm (but not exceeding 7mm)not exceeding maximum 20 such irregularities in 300m length	-
Surface defects / defects reflected on the surface		-
Cracks	As specified in the relevant clause	
Joint & Edge	Nil or if occurred they should be repaired	-
Spalls	With synthetic resin mortar after removing all weak concrete at the	-

	joints	
Potholes	Nil	

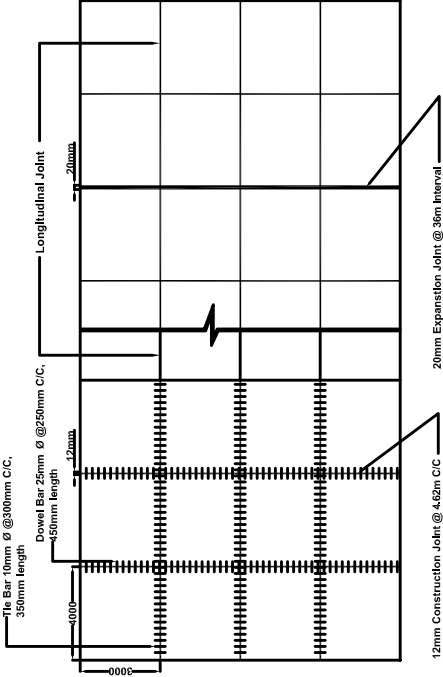
Signature of the Tenderer.

APPENDIX II

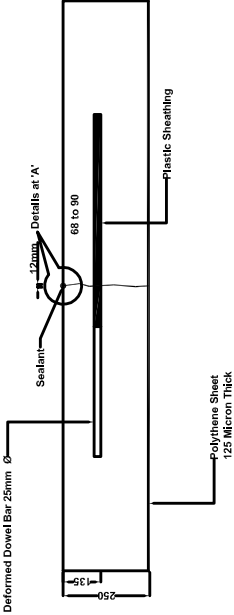
LIST OF MACHINERY REQUIRED (10 m, PROVIDE!) BY THE CONTRACTORS FOR CEMENT CONCRETE ROAD WORKS ON EACH WORK

1. One concrete mixer (Non tilting type with weigh batching arrangements) and / or concrete mixer (Non tilting type and separate arrangements) of Hopper Swing weigh batching (Double bucket) having each bucket capacity of at least 400 litres.
2. One ordinary mixers.
3. Screed vibrators 2 nos. as per drawing i.e. 8 for top layer vibration and 8 for bottom layer vibration.
4. 2 plate vibrators
5. 2 needle vibrators (60mm)
6. At least 2 water tanks of 10,000 ltr. Capacity each
7. 2 Steel battens of channel section of 4" width with proper handles at both the end
8. 2 Straight edges with scaled wedge
9. 2 golphies (edging tools) as per drawing each of 12mm and 25mm curvature
10. 2 plate vibrators for compaction of trenchless
11. 2 Joint cutting machines with two spare blades
12. M.S.channels minimum 100 MM in length Proper shape, line and level
13. 1 steel fabricated Carma for raising manholes
14. 1 portable air compressor
15. 1 template for checking camber
16. 6 cube moulds, 150mm X 150mm X 150mm
17. 1 slump cone with two additional measuring rods
18. Steel fabricated moulds for casting kerbs, water tables etc.
- 18.2 bitumen pouring pot
19. Three flexural beam moulds of size 700mm x 150mm x 150mm
20. 15mm dia. MS Pipes for straightening the tie bars
21. Two Nos. Steel wire brooms as specified
22. 1 no. of generator – 125 KVA
23. 1 no. dewatering pump. 10 HP
24. 3. nos. of trucks – 10 T

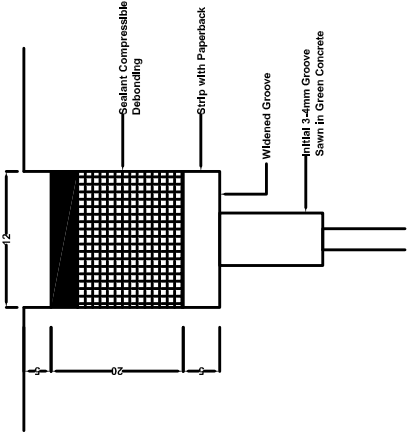
Signature of the Tenderer.



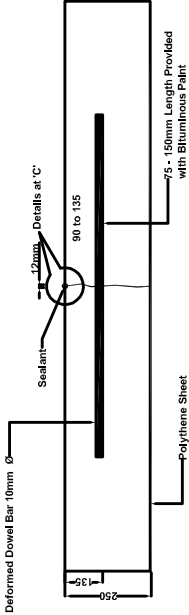
Joint Details for the Section - Kalmandapam Road



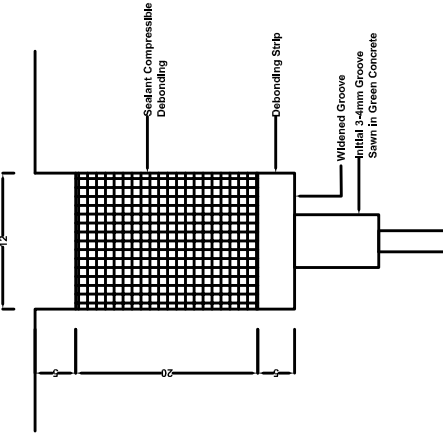
Construction Joint with Dowel Bar



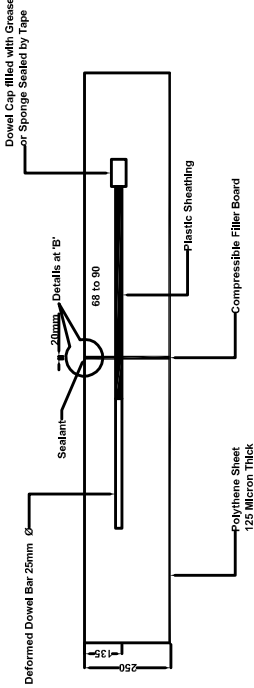
Details at 'A'
Sealing Details of Joint Groove



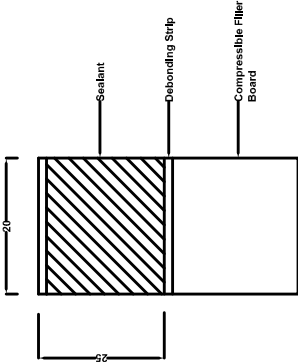
Longitudinal Joint with Tie Bar



Details at 'C'
Sealing Details of Joint Groove



Expansion Joint with Dowel Bar



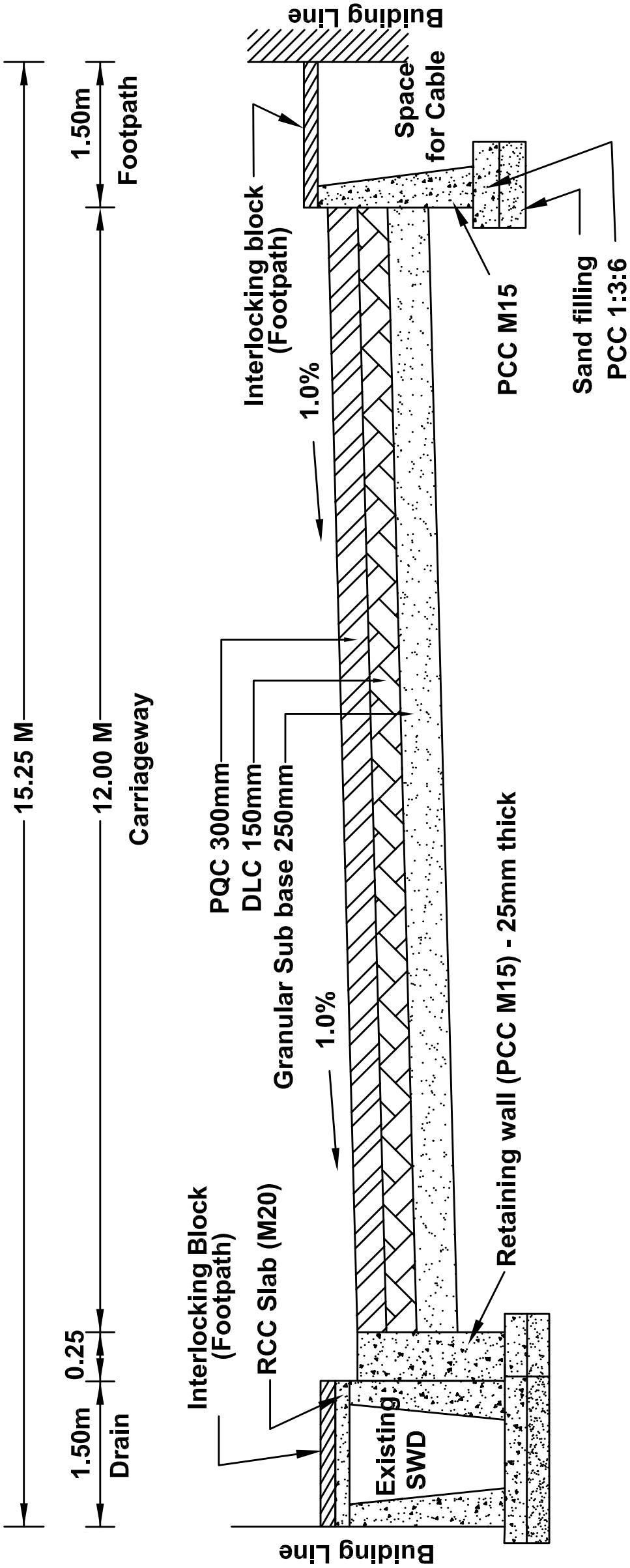
Details at 'B'
Sealing Details of Joint Groove

	DESIGNED		DATE	GOVERNMENT OF TAMIL NADU CORPORATION OF CHENNAI	DETAILS OF JOINTS,DOWEL AND TIE BAR A.A. SCHEME ROAD	REVISION CODE
	DESIGN CHECK					
	DRAWN					
	DRAFTING CHECK					
 The Gradient 100-4, 10th Avenue, 10th Floor, Anna Salai, Chennai - 600 002.						DRAWING NUMBER

TYPICAL CROSS SECTION FOR AA SCHEME ROAD

DIVISION : 36

ZONE : III



NOT TO SCALE