CORPORATION OF CHENNAI

BRIDGES DEPARTMENT/ZONE

FOR WORKS BELOW 2 CRORES

TENDER FOR ,**PROPOSED CONSTRUCTION OF STEEL FOOT OVER BRIDGE AND 2 NOS OF LIFT ROOM AT GANDHI IRWIN ROAD, NEAR EGMORE STATION IN DN.105, ZONE-VII.**

Letter of Tender, Schedule and Conditions

ZONE..... / ....BRIDGES DEPT *Zonal Officer*

DATED *S.E.BRIDGES DEPT*

Price: Rs.10,125/-(Rupees TEN THOUSAND ONE HUNDRED AND TWENTY FIVE ONLY inlusive of tax 12.5%)

(THIS TENDER DOCUMENT IS NOT TRANSFERABLE)

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CORPORATION OF CHENNAI
BRIDGES DEPARTMENT

TENDER NOTICE

Corporation of Chennai
Bridges Department

Sealed Tenders are invited for the following works as per details furnished below

The Tenderers may submit separate tenders for each of the following work/works mentioned below:

Sl. No.	Ref No	Name of work	Approx.value of work	EMD	Cost of Tender	Eligible Class	Last Date & Time of Submission
	Br.D..No.B3/0813/2010	Proposed Construction of Steel Foot Over Bridge and 2 Nos of lift room at Gandhi Irwin Road, Near Egmore Station in Dn.105, Zone-VII	Rs.43,01,400/-	Rs.43,100/-	Rs.10,125/-	Class –II	17.09.2010 up to 3.00p.m

The Tenders can also be downloaded from website http://tender.tn.gov.in and www.chennaicorporation.com or obtained at the Tender Sales Counter, Ripon Buildings. Tenders will be opened on 17.09.2010 at .3.30 p.m. Sale of tender will be closed 48 hours before the time fixed for submission of tender. The tender can be

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dropped in the tender boxes kept in any one of the offices viz., PRO, C.E.(GI),V.O and Tender Sales Counter.

NOTE: For all the tenders which are more than Rs.25.00 lakhs in value, the tender document can also be downloaded from the websites www.tntenders.gov.in or www.tenders.tn.gov.in. The downloaded tender document shall be submitted without cost of tender document. In case of deviation is found in the tender document submitted by the tenderer from the content mentioned in the websites, his tender shall be liable for rejection at any stage of the contract.

If due date of tender happens to be Public Holiday, the tenders will be received upto .3.00 P.M and opened by ..3.30.. P.M. on the next Working day.

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2. CONDITIONS OF CONTRACT

1. The Contractors having registration in the class specified in the tender notice and above in the concerned Department of Corporation of Chennai or intending Tenderer should be a registered contractor in any of the Centre / State Government Department / Government undertaking are eligible to participate in the Tender. Provisional Registration has to be done for the successful bidder if he is willing to abide by the Rules and Regulations of Corporation of Chennai and on payment of prescribed fees..

2. No one or non of a firm or company is eligible to participate in the tender if any one of his or any one or more of the director's of a firm or company is a blood relative of any one of an employee or a public representative of Corporation of Chennai.

3. Corporation of Chennai is not responsible for the risk or risk, cost and responsibility of participation for the tenderer to participate the tender. The tenderer has to participate the tender at the risk, cost and responsibility of his own.

4. The Tenderer, at the Tenderer's own responsibility and risk, is mandatory to inspect and examine the site of proposed tender and its surroundings and collect all information that may be necessary for the Tender prior to participation in the tender at the risk, cost and responsibility of the tenderer.

5. At any time after the issue of the Tender documents and before the opening of the Tender, the Tender inviting authority may make any changes, modifications or amendments to the Tender documents and has to send intimation of such change to all those who have purchased the original Tender documents. Prospective Tenderers has to promptly acknowledge the receipt thereof in person or by telex, cable or fax, e-mail,telegram, phonogram, post, courier or any other means of communications adopted and approved by Corporation of Chennai. The Tender has to submitted taking into account the addendum/amendments, if any, issued as mentioned above and any failure in doing so will lead to consequences including rejection of Tender.

6. The Tender submitted by the Tenderer has to comprise the following:

   (a) The Tender;

   (b) Earnest Money Deposit;

   (c) Priced Bill of Quantities;

   (d) Attested Copy of registration certificate;

   (e) Sales Tax clearance certificate for the current year obtained from the appropriate authority;

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and any other materials required to be completed and submitted by Tenderers, as specified by the Tender inviting authority.

7. The Tenderer must enclose Photostat copy of his or her registration certificate of respective class and nature of work along with the Tender or must produce the copy to the Tender opening officer for further processing of tenders.

8. In case of proprietary or partnership firm, it is mandatory to produce the certificate aforementioned for the proprietor or proprietors and for each of the partners as the case may be. If a certificate for the current year had already been produced by the Tenderer during the calendar year in which the tender is made, it will be sufficient if participate in tender. At the time of agreement an undertaken has to be produce with notary attestation that there is no change in the proprietory or partnership and that status will be continued till completion of works. In case of breach, all the monetary benefits are liable to be unpaid and forfeited by Corporation of Chennai.

9. The Contract has to be for the execution of full schedule quantities and not for any portion.

10. All duties, taxes, and other levies payable by the Contractor under the Contract, or for any other cause has to be included in the rates, prices, and total Tender price submitted by the Tenderer.

11. Tenders has to remain valid for a period of 90 days unless otherwise specifically mentioned by the Tender inviting authority.

12. Under unavoidable or In exceptional circumstances, the Authority may request that the Tenderers to extend the period of validity for a specified additional period as required in public/administrative interest. The request of the authority and the Tenderers' responses has to be made in writing and in approved means of communications as specified in the tender. A Tenderer may refuse the request without forfeiting the Earnest Money Deposit. A Tenderer agreeing to the request will not be required or permitted to otherwise modify the Tender, but will be required to extend the validity of Earnest Money Deposit for the period of the extension.

13. The Tenderer has to furnish, as part of the Tender, an **Earnest Money Deposit** (EMD) for an amount equal to 1% of the value of work. The Earnest Money Deposit has to be either in the form of Demand Draft/ Banker's cheque or Irrevocable Bank Guarantee from any Nationalised/Scheduled Bank in favour of the Commissioner, Corporation of Chennai; Banker's cheque or a challan by remitting cash into the Corporation Treasury, to the credit of deposits which do not bear interest. . Tenders not accompanied by the Earnest Money Deposit will be rejected. Bank guarantee from any Nationalized/Scheduled banks will be accepted, if the work value is more than rupees 25 Lakhs.

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14. The Earnest Money Deposit of the successful Tenderer will be discharged without interest when the Tenderer has signed the Agreement and furnished the requisite Security Deposit.

15. The Earnest Money Deposit will be forfeited:

(a If a Tenderer withdraws his Tender during the period of Tender validity.

(b)If a successful Tenderer fails to:

i) Execute the agreement or

ii) Furnish the necessary security deposit and sign the agreement within the specified time limit . 14 days from the date of receipt of letter of acceptance of his Tender.

c). If the Tenderer does not accept the correction of the Tender price, pursuant to Clause 25.

16. .The entries in the Schedule of the Tender has to be typed or written in legible ink and has to be signed by person or persons duly authorized to sign on behalf of the Tenderer. All pages of the Tender document has to be signed and also where entries or amendments have been made has to be signed by the person or persons signing the Tender.

17. The Tender has to not contain any alterations or additions, except those to comply with instructions issued by the Authority, or as necessary to correct errors made by the Tenderer, in which case such corrections has to be signed by the person or persons signing the Tender.

18. The Tenderer has to be responsible for properly super scribing and sealing the cover in which the Tenders submitted and Tender inviting authority has to not be held responsible for accidental/ misplacement/premature opening of the covers that are not properly super scribed and sealed before the time appointed for Tender opening.

19. The filled up Tender documents has to be submitted up to the last date and time of submissions as specified in the tender notice. Duly filled in Tender documents has to be put in any one of the Tender boxes provided at the Tender Sales Counter , Office of the Public Relation Officer, Office of Vigilance Department and Office of Chief Engineer/General in the Ripon Buildings, Chennai. Tenders can also be submitted by Post or Courier, provided that the Tender inviting authority has to not be held responsible for any delay in transit in such cases.

20. The Tender inviting authority may extend the last date of receiving tenders after giving adequate notice to all intending Tenderers.

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21. The Tenderers has to not amend/add/alter any of the Tender conditions, conditions of contract, specifications etc. of his own.

22. Any Tender received by the Authority after the deadline prescribed will be summarily rejected.

23. The Tenders will be opened at the time and date specified, in the presence of Tenderers /Authorized representatives who choose to attend. The Tenderers' names, and the presence or absence of Earnest Money Deposit, Quoted price of each Tenderer and such other details as the Authority may consider appropriate, will be announced by the Authority at the opening.

24. From the time of Tender opening to the time of contract award, if any Tenderer wishes to contact the Authority on any matter related to the Tender, it has to do so in writing.

25. Where there is a discrepancy between the amounts in figures and in words, the lowest will be taken in to grant and the amount stated in the Tender will be adjusted by the Authority in accordance with the above procedure for the correction of errors has to be considered as binding upon the Tenderer. If the Tenderer does not accept the corrected amount, the Tender will be rejected, and the Earnest Money Deposit will be forfeited.

26. The tendered rates for the items should be inclusive of all items of works required for the proper execution of the items in quality, quantity, safety and security in the interest of public as well as administration The rates to be mentioned in the tender has to be inclusive of sales tax and other applicable fees, levies, taxes in force.

27. The Authority reserves the right to accept or reject any Tender, and to cancel the Tendering process and reject all Tenders, at any time prior to the award of Contract in exercise of the power conferred by Section 12 (1) and (2) of Tamil Nadu Transparency In Tender Act,1998 subject to the provisions of subsection 1 and 2 of Section 12 of Tamil Nadu Transparency In Tender Act 1998, without thereby incurring any liability to the affected Tenderer/ Tenderers or any obligation to inform the affected Tenderer / Tenderers of the grounds for the Authority's action.

28. The Tenderer whose Tender has been accepted will be intimated by the Authority prior to expiration of the Tender validity period by cable, telex, or facsimile confirmed by registered letter. This letter (hereinafter and in the Conditions of Contract called the "Letter of Acceptance") will state the sum that the Authority will pay the Contractor in consideration of the execution, completion, and maintenance of the works by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

29. It shall be expressly understood by the tenderer that on receipt of written communication of acceptance of tender from the accepting authority, there

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emerges a valid right of 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, conditions of contract, negotiation, correspondences, written communications of acceptance of tender etc. has to constitute a valid contract and that will be the fundamental of the rights of both the parties of the contract. 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 conditions of the contract.

30. The Tenderer has to enter into an agreement with the Authority within 14 days from the date of receipt of letter of acceptance. The form of agreement should be stamped at the stamp office at the risk, cost and responsibility of the Tenderer.

31. Preliminary specification etc, in SSRB/TNBP will form part of the Agreement. The tenderer has to 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 has to be for finished work in situ. He has to 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 the hours on all working days, in the office of the SE/EE of concerned department/zone of Corporation of Chennai. 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 has to be used on the work, and the tenderer has to quote his rates accordingly.

32. Within 14 days after receipt of the Letter of Acceptance, the successful Tenderer has to deliver to the Authority a **Security Deposit**. Security Deposit will be 2% to 5 % as specified in clause 34 for the contract amount in the form of National Savings Certificate/ Small savings instrument/deposits/Accounts pledged in favour of Commissioner, Corporation of Chennai; irrevocable Bank Guarantee/warrantee. However it is open to the Commissioner to insist on higher deposit as per rules in force

33.1 As per the Council Resolution No. 584/86 dated 21.05.86, the percentages of security deposit to be fixed for various percentages of rebates are as following.

Percentage Rebate	**Percentage of Security Deposit to be fixed**
Up to 10 %	2%
10 to 20 %	3%

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20 to 30 %	4%
Above 30%	5%

33.2. As per Council Resolution N. 456/2002, Dt : 28-11-2002 the amount of **Additional Security Deposit** to be paid by the Contractor along with the tender for various percentage of rebate are as follows:

Percentage of rebate	**Amount of Additional Security Deposit payable in the form of**
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

33.2.1 The Contractors has to pay the Additional Security Deposit in the form of Demand Draft drawn in favour of Commissioner while submitting the tender documents. For more than 1 Lakh bank Guarantee will be accepted.

33.2.2 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.

33.2.3 The Demand Draft/Banker's cheque enclosed for the Additional Security Deposit by the unsuccessful Tenders will be returned after obtaining proper acknowledgement and absorbing official procedures..

33.2.4 If percentage of rebate is above 20% tenderer should furnish the break up details, risk, cost and responsibility analysis and produce documents to prove the previous experience and work on hand with performance certificate showing the satisfactory completion of works entrusted in order to substantiate that the quoted rate is workable for complete execution as detailed in tender..

34. The Tenderer has to observe high degree of legal and moral ethics during Tendering process and execution of the Project. The Authority will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question as described below:

(i) "Corrupt practice" means the offering, giving, receiving or soliciting of any thing of value to influence the action of a public official in exercising his official duty regarding the tender and its connected official activites.

(ii) 'Fraudulent practice' means a misrepresentation of facts in order to influence the selection t process or the execution of a contract in the detriment of the

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Authority and includes forming syndicate/consortium or any other collusive practice among the Tenderers during selection process to fix the prices artificial, non-competitive levels and to deprive the Authority of the benefits of free and open competition.

(iii) The Authority will reject a proposal for award if it determines that the Tenderer recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question.

35. The Tenderers who are themselves not professionally qualified, has to undertake to employ qualified technical personnel at their risk, cost and responsibility to execute the work.

36. For works costing Rupees One Lakh and above, preference in selection will be given to the Tenderers who are themselves professionally qualified or undertake to employ qualified personnel at their risk, cost and responsibility to supervise the work when price quoted are equal among the Tenderers should clearly state whether they are professionally qualified and or else produce the credentials of the technical personnel they intend to deploy for the work.

37. The Contractor has to employ technical personnel with qualification and experience specified in the following table at their cost to supervise the work. Penalty at the rate specified in the table has to be levied from the contractor if he fails to adhere to this condition.

Value of Contract in Indian Rupees	Minimum Qualification and Experience of The Technical Personnel to be Deployed for the work	Penalty for not deploying technical personnel with qualification specified in Column. 2
(1)	(2)	(3)
Up to 10 Lakhs	One Diploma holder in Civil Engineering or a Retired Supervisor (Civil) from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc.	Rs. 2000/- per month.
Above 10 Lakhs up to 30 Lakhs.	One B.E. (Civil) or an equivalent Degree holder in Civil Engineering with one year experience or Retired Civil Engineer from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc. not below the rank of an Assistant	Rs. 5000/- per month.

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	Engineer.	
Above 30 Lakhs up to 1 crore.	One B.E. (Civil) or an equivalent Degree holder in Civil Engineering with three years experience or Retired Civil Engineer from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc. not below the rank of an Assistant Engineer plus one One Diploma holder in Civil Engineering or a Retired Supervisor (Civil) from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc..	Rs. 5000/- plus Rs. 2000/- per month.
Above 1 crore up to 2 crore.	One B.E. (Civil) or an equivalent Degree holder in Civil Engineering with seven years experience or Retired Civil Engineer from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc. not below the rank of an Assistant Executive Engineer plus one One B.E. (Civil) or an equivalent Degree holder in Civil Engineering with one year experience or Retired Civil Engineer from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc. not below the rank of an Assistant Engineer plus two Diploma holders in Civil Engineering or two Retired Supervisors (Civil) from Government Service or an Autonomous body like Tamil Nadu Housing Board, etc..	Rs. 7000/- plus Rs. 5000/- plus Rs. 2000/Each supervisor, per month.

38. The Contractor has to comply with the provisions of the Apprentices Act, 1961 and the rules and orders issued there under from time to time. If the Contractor fails to adhere to this condition, the competent authority may at his discretion cancel the contract or invoke any penalty at his discretion.

39. The contractor has to, during the performance of the contract, engage apprentices in the categories mentioned in the table below and make payments as required under the Apprentices Act, 1961.

Value of Contract in Indian Rupees	Category of Apprentice	Number to be Engaged
Above 1 Lakh up to 3 Lakhs	1. Building Constructor 2. Brick Layer	1 1

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Above 3 Lakhs up to 10 Lakhs	1. Building Constructor 2. Brick Layer 3. Diploma Holder in Civil Engineering	1 1 1
Above 10 Lakhs up to 50 Lakhs	1. Building Constructor 2. Brick Layer 3. Degree holder in Civil Engineering	1 1 1

40. The contractor has to employ one ITI trained mason/electrician for every ten masons or part thereof. In case of non availability of ITI trained masons/electricians, the contractor has to obtain the prior approval of the Executive Engineer concerned before proceeding with the contract with the other kinds of masons/electricians.

41. If the Authority instructs the contractor not to engage any one or more of employee/worker who misbehaves, the contractor has to not engage such person/s with instant effect until the completion of the contract work.

42. The contractor has to commence the work within 7 days from the date of handing over of site to the contractor and has to complete the work within the time limit specified therein the contract agreement.

43. No part of the contract shall be sub-let without written permission of the Superintending Engineer of concerned Department in the case of capital in the case of Zone, the Zonal Officer and no transfer shall be made by power of attorney authorizing others of receive payment on contractor's behalf.

44. A detailed statement showing the particulars of equipments, resources and key personnel owned/hired by the tenderer required for the execution and completion of the work has to be enclosed with the tender.

45. The contractor has to make his own arrangement for all the tools, plants, machineries and man power required for the execution of the work. The corporation will not have any responsibility liability in this regard.

46. The contractor has to make his own arrangement in consultation with the authorities concerned for forming and maintaining traffic diversion that includes formation of diversion roads for free flow traffic during the execution of work and for that no additional payment will be made.

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47. As soon as the contract is accepted, the Contractor should give a programme of work based on CPM and PERT charts which he proposes to adopt for execution. The Contractor has to commence execution of the works on the start date and has to carry out execution in accordance with the Programme submitted by the Contractor, as updated with the approval of the authority, and complete them by the Intended Completion Date.

48. The Contractor has to submit the personal accident/general/medical/Insurance for the personnel/ machineries to be engaged by the contractor for execution of the work prior to commencement of the work and concerned insurances has to be kept in live condition until the completion of the work. Payment will not be made in case of the insurances are not kept in live condition.

49. The Contractor has to execute the works in accordance with the Specification and Drawings as approved by the authority.

50. The opening function expenses of the newly constructed structure by the Corporation of Chennai including the tablet stone has to be borne by the contractor concerned.

51. The Contractor is solely responsible for the quality, quantity , safety and security of all activities at the site of work as well as the locations connected with the work.

52. The Time Schedule will commence from the date of service of the work order or the time allowed by the authority in the work order issued to the contractor.

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53.1 Table for Time Schedule of various works-below 2 crores.

1	Bridges-below -2 crore	6 months
2	Roads-up to 15 lakh	1 month.
3	Roads-above 15 lakh to 30 lakh.	2 month
4	Roads- Above-30 lakh to 75 lakh	3 months
5	Roads- Above -75 lakh up to 2 crore.	Will be fixed by respective H.O.Ds depending on works
6	SWD-up to 15 lakh	2 months
7 .	SWD-above 15 lakh-up to 30 lakh	3 months
8	SWDE-above 30 lakh up to 75 lakh	5 months
9	SWD-above 75 lakh up to 2 crore	Will be fixed by Respective H.O.D's depending on works.
10	Buildings up to 15 lakh	4 months
11	Buildings- above 15 lakh up to 30 lakh	6 months
12	Buildings-above 30 lakh up to 75 lakh.	9 months
13	Buildings above 75 lakh up to 2 crore	Will be fixed by respective H.O.D's depending on works.

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Table for Forming works

Contract Amount.	**Forming Work of Roads**	**Foot-path.**	**Electrical**
Up to 15 lakh	2 months	2 months	2 months.
Above 15 lakh and up to 30 lakh.	3months	3 months	3 months.
Above 30 lakh and up to 75 lakh	5 mpnths	5 months.	5 months
Above 75 lakh and up to 2 crore	Will be fixed by respective H.O.D.s depending on works.	Will be fixed by respective H.O.D.s depending on works.	Will be fixed by respective H.O.D.s depending on works.

53.2 .If the contractor fails to complete the works as per and within the time schedule or extension of time allowed by the Authority, due to failure attributable to the contractor, the contractor has to pay or allow the Corporation to levy the amount mentioned in the table below as liquidated and ascertained damages for every day beyond the said date or extended time as the case may be during which the works has to remain incompleted. Liquidated and ascertained will be levied as detailed below.

Liquidated and Ascertained Damages

The liquidated damage and ascertained damages will be levied at the rate of 0.05% (zero point zero five percentage) of the contract value of the work per day till it reaches the maximum value of 5% (five percentage) of the contract value of the work. 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, besides debarring the contractor for a specified period by the competent Authority

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Table for Liquidated and Ascertained Damages per day.

Up to 15 lakhs	Rs. 500/-
Above 15 lakhs and up to 30 Lakhs	Rs. 750/-
Above 30 lakhs.	Rs. 1000/-

54. Non-tendered items: Non tendered items of work up to 25 % of contract value can be carried out without supplemental Agreement. 25% variation in the quantity at the tender awarded rate can be carried out, with the approval of the Commissioner.

For items of work for which the rates can be derived from the rates of 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 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 original agreement, the rates for payment will be as follows:

(i) 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 has to be the prevailing schedule of rates with the tender Premium or Discount applied.

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

55. The value of work executed has to be determined by the Authority. The value of work executed has to comprise the value of the quantities of the items in the Bill of Quantities completed. The Authority may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

56..**Payment** will be made to the contractor by preparing bills/part bills on request of the contractor at an interval not less than 14 days of previous bills subject to a maximum 90% of the complete value of work. Remaining 10% will be withheld and retained as security for the due fulfillment of the contract. Under the certificate to be issued by the Authority on the completion of the entire works the contractor will

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receive the final payment of the money due or payable to him under or by virtue of the contract as per condition 55 provided there is no recovery from or forfeiture by the contractor to be made under clause 57 of general conditions of contract of T.N.B.P. Payments has to be adjusted for deductions for retention and other recoveries in terms of the contract and deduction at source of taxes as applicable under the law.

57. **Maintenance Period: -** The contractor has to maintain the works executed by him in proper repair for the period as specified below:

(a) Cement Concrete Roads:

The contractor has to maintain the works executed by him in proper position by attending the repair for a period of 5 years from the date of completion of work, in satisfactory condition at his own risk, cost and responsibility 2.5% of the total value of the work has to be retained for a period of 5 years from the date of completion of work, in order to enable the department officers to observe the effect of work on all seasons up to five years.

(b) Buildings, Bridges & Storm Water Drains:

The contractor has to maintain the works executed by him in proper position by attending the repair for a period of 2 years from the date of completion of work, in satisfactory condition at his own risk, cost and responsibility. 2.5% of the total value of the work has to be retained for a period of 2 years from the date of completion of work, in order to enable the department officers to observe the effect of work on all seasons up to two years. An indemnity bond for a further period of 3 years has to be produced by the contractor in the form approved by the Government in G.O. Ms No. 654 dated 15-4-1988 of P.W.D.,

(c)Upgrading and/or strengthening Bus route roads and Interior roads, Private streets, Layout roads and Traffic Improvements:

. The contractor has to maintain the works executed by him for a period of 3 (three) years from the date of completion of work in satisfactory condition at his own risk, cost and responsibility . 2.5 percent of total value of work has to be retained for a period of 1 year from the date of completion of work in order to enable the department officers to observe the effect of work on all seasons. As per the Council Resolution No. 94/2007 dated 24.04.2007 , an Indemnity Bond for the period of 2 (Two) years should be obtained from the contractor in the form approved by the Government., so that the contractor has to 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 substandard materials used by the contractor in the execution of the work, at his own risk, cost and responsibility.

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(d) Laying / Relaying of wearing course for Bus route roads, Interior roads, Private streets and Layout roads:

The contractor has to 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 risk, cost and responsibility. 2.5% of the total value of the work has to be retained for a period of 1 (one) year from the date of completion of work, in order to enable the department officers to observe the effect of work on all seasons. As per the Council Resolution No. 94/2007 dated 24.04.2007 , an Indemnity Bond for the period of 2 (Two) years should be obtained from the contractor in the form approved by the Government.,

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/manufacturer has to furnish specific guarantee/warrantee for the vehicles/equipments/spares/materials/equipments/spares supplied which is applicable and acceptable by all State Government Departments of Tamil Nadu Government In addition to adequate pollution control norms and registrations if and as applicable. In addition to specific guarantee/warrantee period a maintenance period beyond of 6 months for vehicles/equipments/spares supplied beyond the guarantee/warrantee period has to be guarantee by the tenderer/supplier/manufacturer. Any failure/defects noticed within the guarantee/warrantee period as well as within the maintenance period, the company has to replace the supplied items/ at free of cost at the risk, cost and responsibility of the tenderer/supplier/ manufacturer. For any delay in effecting the supply beyond the delivery period a penalty of minimum Rs.100/-per day of delay has to 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 applicable higher of interest in force.

(f) Guarantee Period for Electrical Department

The entire installation bearing the fitting and lamp should cover a guarantee/warrantee period for 1 year. During this period any fault/failure noticed in the material supplied has to be replaced for rectified by the contractor within 48 hours of receiving such intimations in verbal or in writing whichever is eariler. 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 percentage of excise duty,

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sales tax, surcharge on S T. for the item offered if any extra has to be mentioned clearly in the offer. Any defects noticed within the said period of maintenance from the date of final super check measurements has to be made rectified by the contractor with his own personal arrangements.

58.a. Adjudicator.

The Commissioner will propose the person to be appointed as Adjudicator under the Contract and stipulated in the Letter of Acceptance.

58.b : Arbitration

In case of any dispute or difference between the parties to the contract either during progress or after the completion of the work or after the termination , 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 Authority as to the withholding by the Authority of payment of any bill to which the contractor may claim to be entitled, then either party has to forthwith give to the other, notice of such dispute or difference has to be referred to the Arbitrator and the award of such Arbitrator has to be Final binding on the parties, progress of work has to not be suspended or delayed on account of the reference of the dispute to arbitration under this clause.

Either faction within a period has to be fixed by the arbitration file before the arbitration statement of the case and also has to all documents relating to or having a hearing on the case The Arbitrator has to not be bound to observe the ordinary rules of procedure applicable to trails 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 Arbitrator has to 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 have in regard to the matters, expressly examined and to determine all matters in dispute which has to 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 has to be awarded by the Arbitrator in his discretion subject to the condition that the amount of expenses awarded to either party has to not exceed the limits set forth, irrespective of the actual expenses incurred by either party. The arbitrator 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 has to direct by whom and to whom and what manner the same has to be borne and paid.

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

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59 Compensation Events

The following are Compensation Events unless they are caused by the Contractor.

(a) The Authority does not give access to a part of the Site mentioned in the current milestone.

(b) The Authority modifies the schedule of other contractors in a way which affects the work of the contractor under the contract.

(c) Ground conditions are substantially more adverse than could reasonably have been assumed before issuance of Letter of Acceptance from the information issued to Bidders (including the Site Investigation Reports), from information available publicly and from a visual inspection of the Site.

(d) The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Authority, or additional work required for safety or other reasons.

(e) Other contractors, public authorities, Utilities or the Authority do not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

(f) The advance payment is delayed.

(g) The effect on the Contractor of any of the Authority's Risks.

(h) Other Compensation Events listed in the Contract Data or mentioned in the Contract.

If a Compensation Event would prevent the work being completed before the intended completion data, the intended completion date is extended. The Engineer has to decide by how much the intended completion date has to be extended.

As soon as information demonstrating the effect of each Compensation Event upon the Contractor's forecast. It is to be assessed by the Engineer. If the Contractor's forecast is deemed unreasonable, the decision of the Engineer is final binding on the contractor. The Engineer will assume that the Contractor will react competently and promptly to the event.

The Contractor has to not be entitled to compensation to the extent that the Authority's interests are adversely affected by the contractor not having given early warning or not having cooperated with the Engineer.

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CONTRACT DATA

3.1 The Authority is *[Insert Name, address, and name of authorized representative]*.

The name and identification number of the Contract is *[insert name and number as indicated in the Tender Notice]*

The works consists of *[insert brief summary of the works under the contract]*

The intended completion period for the whole of the works has to be *[Insert completion period]*

PROGRESSIVE STAGES

Sl. No.	Description of Work	Progress stage I (2 Months from Start Date)	Progress stage II (3 Months from Start Date)	Progress stage III (5 Months from Start Date)	Progress stage IV (6 Months from Start Date)
1	Foundation	100%	-	-	-
2	Erection of column	-	100%	-	-
3	Erection of steel Structure	-	30%	100%	-
4	Finishing work	-	-	50%	100%

The following documents also form part of the Contract: *[list documents]*

1

2

3

3.2 The maintenance period has to be *[~~Insert the maintenance period~~]*

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4. LETTER OF TENDER SUBMISSION

Ref. No.
Place:
Date:
From
…….
…….
…….
To
The ……
Corporation of Chennai,
Chennai.

Sub: Submission of Tender No. ……, for the Contract for the work of *"….[Insert Name of the work]……"*
Ref: Your Tender Notice No. *…[Insert tender notice no.]…* dated ……..

Sir,

1. I / We …… on behalf of,…….. as their duly authorized person(s) in my / our official capacity as ……. of the aforesaid firm, hereby submit this Tender for your consideration. I / We have read and understood all conditions of this document in full spirit and meaning. I / We hereby agree to accept all the conditions put forth in this document without any deviations or with the exceptions which may be expressly admitted and accepted by the Tender accepting authority before the award of work. The Tender submitted is fully in accordance with the Tender and I / we agree to all conditions specified in the Tender.

2. Attached herewith are the following:

i) Income Tax and Sales Tax clearance certificates for the current year issued by the appropriate authority.
ii) Copy of the class registration certificate for scheduled contractor.
ii) Demand Draft …….. towards cost of Tender documents in case the documents are downloaded.
iii) Earnest Money Deposit for Rs……. in the form of:

a) Demand Draft ……*(furnish details of the Demand Draft)……*
b) Challan ……*(furnish details of the Chalan)……*
c) Bank Guarantee *(Furnish Details*)
d) Any other relevant Form *(Furnish Details)*

3. The undersigned declare that the statement made and the information provided in the duly completed Tender are complete, true, and correct in every detail.

Yours faithfully,

(Office seal) Signature with Name & Designation

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5. DECLARATION BY THE TENDERER

I/We _____

hereby declare that I/We am/are not in any way related to any officer who is in charge of……..or having control of this work. I/We agree that if, at any stage, it is found that this declaration is untrue, the Earnest money Deposit/Security Deposit paid by me/us will be forfeited and the contract entered will stand cancelled at the risk and cost of contractor.

Signature of the Tenderer

Place:

Date:

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6. List of Equipment along with copies of attested documents for ownership *filled by the Contractor and submitted along with the tender as per Clause 44)*

6.1 Equipments

Sl. No.	Particulars of Equipment	Capacity	Number

6.A.Key Personnel to be deployed by the Contractor for the work.

6.2 Key Personnel

Sl. No.	Position	Qualification	Number	Total Experience	Experience in similar Works

6.3 Other Information if any

signature of the Bidder

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7. 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 has to 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 has to 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 appended 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 2 1/2% 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 2 1/2% 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 against the specifications mentioned in the tender 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 any defect noticed against the specifications mentioned in the tender in the execution of the 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:

Second Witness: Signature of the contractor

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8. SCHEDULES
SCHEDULE - A

SCHEDULE OF RATES AND APPROXIMATE QUANTITIES

a)The quantities given here are those upon which the lump-sum tender cost of the work is based but they are subject to alternations, omissions, deductions 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 or omissions according to the conditions of the contract, as set forth in the Preliminary Specification of the S.S.R.B/T.N.B.P. and other conditions or specifications of the contract.

b).It is to be expressly understood that the measured work is to be taken net (not **withstanding any custom or practice to the contrary) according to the actual quantities when** in place and finished according to the drawings or as may be ordered from time to time by the ---------- and the cost calculated by measurement or weight at the respective prices, without any additional charge for any necessary or contingent works connected therewith. The rates quoted are for works holistic and complete in every respect.

Item No.	Probable quantity*		Description of work	S.S.R.B/T.N.B.P. No.	Rate		*Unit in words	Amount
	Figures	Unit			Words	Figures		Figures
Separate Sheet enclosed								

Date ……..

***Note** – The Second Sub-division of this column (ie. column 3and 8) is for entering description of units in words such as numerals, area in square units, volume in cubic meter, weight in kg/ton etc.

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SCHEDULE.B.

List of Drawings			Supplemental List			
Note: All Drawings to be signed by the contractor as well as the officer entering in to the contract			As referred in the specifications (including the Preliminary specifications of the T.N.B.P/S.S.R.B			
Sl. No.	Drawing No.	Description	Sl. No.	Drawing No.	Description	Date on which the drawing was supplied
1 2 3 4 5 6 7 8 9	1 2 3 4 5 6 7 8 9	Site Plan Sectional Drawing Foundation Drawing Reinforcement Details Details of Steel column Truss Details Staircase Details Steps Details Floor Slab & Kerb Details				

signature of the Bidder

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SCHEDULE – C

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

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SCHEDULE – D

I/We do hereby agree to execute the works estimated as per the current office schedule of rates for the year ..... contained in this tender schedule with less or higher percentage quoted by me/us as detailed below:

Sl.No.	Name of work	Division /Unit /Zone	Less or higher percentage tendered both in figures and in words

I/We has/have pursued the schedule of rates attached herewith. This …….less or higher percentage of tendered rate by me/us has to 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 quoted rate in this tender is inclusive of all applicable taxes, levies and fees in force.

Important Note to the Tenderer

The Tenderer has to quote the percentage in both words and figures. The tenderer is required to quote up to two decimal points only. If there is any correction in the percentage, it has to be attested by the contractor and also by the officer at the time of opening the tender.

Chennai Signature of the Tenderer

Date: …… Address of the Tenderer

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9. AGREEMENT

This Agreement, made the *[day]* day of *[month]*, *[year]* between *[name and address of Authority]* (hereinafter called "the Authority") and *[name and address of Contractor]* (hereinafter called "the Contractor") of the other part.

Whereas the Authority is desirous that the Contractor execute *[name and identification number of Contract]* (hereinafter called "the Works") and the Authority has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein as per specifications contained in this contract.

Now this Agreement witnesseth as follows:

1. In this Agreement, words and expressions has to has the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to, and they has to be deemed to form and be read and construed as part of this Agreement.

2. In consideration of the payments to be made by the Authority to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Authority to execute and complete the Works and remedy any defects therein in conformity in all respects with the provisions of the Contract.

3. The Authority hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects wherein the Contract Price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the Contract.

In Witness whereof the parties thereto have caused this Agreement to be executed the day and year first before written.

The Common Seal of _____

was hereunto affixed in the presence of: _____

Signed, Sealed, and Delivered by the said _____

in the presence of: _____

Binding Signature of Authority _____

Binding Signature of Contractor _____

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10. SECURITY FORMS

FORM OF ADVANCE PAYMENT GUARANTEE

(Bank Guarantee)

(On non-judicial stamp paper of the appropriate value in accordance with stamp Act. The stamp paper to be in the name of Executing Bank. The executing Bank has to be from a Nationalized/Scheduled Bank in India having a net worth of more than Rupees Five billion)

Ref.No…….. Date……..

The Commissioner

Corporation of Chennai

Ripon Building, Periyar EVR Salai

Chennai – 600 003

Dear Sir,

Reg : Bank Guarantee- for the work ..... issued- Reg.

In consideration of Corporation of Chennai (hereinafter referred to as the "Authority" which expression has to, unless repugnant to the context or meaning thereof include its successors, administrators and assigns), having awarded to …….. (Name of the Contractor) …… (hereinafter referred to as the "Contractors" which expression has to unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), a contract by issue of Authority's Contract Agreement dated …….. and the same having been unequivocally accepted by the Contractor resulting in a Contract valued at …… for

Name of Work : ……..

(hereinafter called the "Contract") and the Authority having agreed to make (scope of work) an advance payment to the Contractors for performance of the above Contract amounting to …… (in words and figures) …… as an advance against Bank Guarantee to be furnished by the Contractors.

We, …… (Name of the Bank) ……, having its Head Office at (hereinafter referred to as the

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"Bank", which expression has to, unless repugnant to the context or meaning thereof, include its successors, administrators, executors and assigns), do hereby guarantee and undertake to pay the Authority immediately on demand and or, all monies payable by the Contractors to the extent of …… as aforesaid at any time up to ……. @* …… without any demur, reservation, contest, recourse or project and/or without any reference to the Contractors. Any such demand made by the Authority on the Bank has to be conclusive and binding notwithstanding any difference between the Authority and the Contractors or any dispute pending before any Court, Tribunal, Arbitrator or any other authority, we agree that the Guarantee herein contained has to be irrevocable and has to continue to be enforceable till the Authority discharges this guarantee.

The Authority has to have the fullest liberty without affecting any way the liability of the Bank under this guarantee, from time to time to vary the advance or to extend the time for performance of the Contract by the Contractors. The Authority has to have the fullest liberty without affecting this guarantee/warrantee, to postpone from time to time the exercise of any powers vested in them or of any right which they might have against the Authority and to exercise the same at any time in any manner, and either to enforce or to forebear to enforce any covenants, contained or implied, in the Contract between the Authority and the Contractors any other course or remedy or security available to the Authority. The Bank has to not be relieved of its obligations under these presents by any exercise by the Authority of its liberty with reference to the matters aforesaid or any of them or by reason of any other act of forbearance or other acts of omissions or commission on the part of the Authority or any other indulgence shown by the Authority or by any other matter or thing whatsoever which under law would but for this provision have the effect of relieving the Bank.

The Bank also agrees that the Authority at its option has to be entitled to enforce this Guarantee/warrantee against the Bank as a principal debtor, in the first instance without proceeding against the Contractors and notwithstanding any security or other guarantee the Authority may have in relation to the Contractors liabilities.

Notwithstanding anything contained herein above our liability under this guarantee is limited to …….. and it has to remain in force up to and including …… @* …… and has to be extended from time to time for such period (not exceeding one year), as may be desired by ……. (Name of the Contractor) …….

Dated this ……. day of …….. 20 at ……

WITNESS ……..…….. (Signature) ……	…… (Signature of authorized Bank Official) …… (Name) …….

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(Name) …… (Office Address) ……	…… (Designation with Bank stamp) ……... Power of Attorney (To be enclosed) Power of Attorney No …….. Date ……

@ The date will be ninety (90) days after the date of completion of Contract.

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FORM OF BID SECURITY (BANK GUARANTEE)

WHEREAS, …… (Name of Bidder) (hereinafter called "the Bidder") has submitted his bid dated …….. (Date) for the {Name of Work) ……(herei nafter called "the Bid").

KNOW ALL MEN by these presents that We …… (Name of Bank) of …….. (Name of Country) having our registered office at ……. (hereinafter called "the Bank") are bound unto ……. (Name of Authority) (hereinafter called "the Authority") in the sum of …….. for which payment well and truly to be made to the said Authority the Bank binds himself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this …….. day of …..…….. 20…….

THE CONDITIONS of this obligation are :

(1) If the Bidder withdraws his Bid during the period of bid validity specified in the Form of Bid: or

(2) If the Bidder does not accept the correction of arithmetical errors of his bid price in accordance with the instruction to Bidders: or

(3) If the Bidder having been notified of the acceptance of his Bid by the Authority during the period of bid validity :

a. Fails or refuses to execute the Form of Agreement in accordance with the instructions to Bidders, if required : or

b. Fails or refuses to furnish the Performance Security, in accordance with the Instructions to Bidders; or

c. Fails or refuses to furnish the Domestic Preference Security, where required.

We undertake to pay to the Authority up to the above amount upon receipt of his first written demand, without the Authority having to substantiate his demand, provided that in his demand the Authority will note that the amount claimed by him is due to him owing to the occurrence of all of one or more of the above conditions, specifying the occurred condition or conditions.

This Guarantee will remain in force up to and including the date of 162 days after the deadline for submission of bids as such deadline is stated in the Instructions to Bidders or as it may be extended by the Authority, notice of which extension(s) to the Bank is hereby waived. Any demand in respect of this Guarantee has to reach the Bank not later than the above date.

DATE…… SIGNATURE OF THE BANK……

SEAL OF THE BANK…… …SIGNATURE OF THE WITNESS……

Name and address of witness

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Definitions.

1. **Act** means the Tamil Nadu transparency in Tenders Act, 1998 (Tamil Nadu Act 43 of 1998).

2. **Rules** means The Tamil Nadu Transparency In Tender Rules, 2000

3. **Adjudicator:** The Commissioner will propose the person to be appointed as Adjudicator under the contract in the Letter of Acceptance.

4. **Arbitrator**: If a party is dissatisfied with the decision of the Adjudicator or no decision is given within the time set out the party may give notice of dissatisfaction and a dispute which has been the subject of a notice of dissatisfaction has to be finally settled by Arbitral tribunal. The Arbitrator can revise the decision of the Adjudicator. The Arbitral Tribunal consists of 3 Arbitrators, one each to be appointed by the Authority and the Contractor. The third Arbitrator has to be chosen by the two Arbitrators so appointed by the parties and has to act as presiding arbitrator. In case of failure of the two arbitrators appointed by the parties to reach upon a consensus within period of 30 days from the appointment of the arbitrator appointed subsequently, the Presiding Arbitrator has to be appointed by President of the Institution of Engineers (India).

5. **The Authority** (Commissioner) or his authorised representative is the party who Employs the Contractor to carry out the Works

6. **Earnest Money Deposit** means the amount required to be remitted by a bidder along with his bid indicating his willingness to implement the contract.

7. **Bill of Quantities** means the priced and completed Bill of Quantities forming part of the Bid.

8. **BIS** means Bureau of Indian Standards.

9. **Compensation Events** are those defined in Clause 59 hereunder.

10. **The Completion Date** is the date of completion of the Works as certified by the Superintending Engineer / Zonal Executive Engineer, in accordance with Sub-Clause 53.1.

11. **The Contract** is the Contract between the Authority and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 1.1.11 below.

12. **The Contractor** is a person or corporate body whose Bid to carry out the Works has been accepted by the Authority.

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13. **Tenderer Or Bidder:** Any person , firm or Corporation submitting a tender for the work contemplated, acting directly or through a duly authorized representative.

14. **The Contractor's Bid** is the completed bidding document submitted by the Contractor to the Authority.

15. **Bid Price** : The prices and discounts quoted by the bidder in the letter of bid and in the bill of quantities.

16. **The Contract Price** is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

17. **Days** are calendar days; months are calendar months.

18. **A Defect** is any part of the Works not completed in accordance with the Contract.

19. **The Defects Liability Certificate** is the certificate issued by Superintending Engineer upon correction of defects by the Contractor.

20. **The Defects Liability Period** is the period named **in the Contract Data and calculated from the** Completion Date.

21. **Drawings** include calculations and other information provided or approved by the Superintending Engineer for the execution of the Contract.

22. **The Authority** (The Commissioner) is the party who employs the Contractor to carry out the Works

23. **The Superintending Engineer** is the person named in the Contract Data (or any other) competent person appointed by the Commissioner and notified to the Contractor, to act in replacement of the Superintending Engineer) who is responsible for supervising the execution of the Works and administering the Contract.

24. **The Executive Engineer** is an Executive Engineer of Corporation of Chennai, who will be in charge of work in Corporation of Chennai.

25. **Equipment** is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

26. **The Initial Contract** Price is the Contract Price listed in the Authority's Letter of Acceptance.

27. **The Intended Completion Date i**s the date on which it is intended that the Contractor has to complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Superintending Engineer by issuing an extension of time.

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28. **Materials** are all supplies, including consumables, used by the Contractor for incorporation in the Works.

29. **Plant** is any integral part of the Works that has to have a mechanical, electrical, chemical, or biological function.

30. **The Site** is the area defined as such in the Contract Data.

31. **Site Investigation Reports** are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.

32. **Specification** means the Specification of the Works included in the Contract and any modification or addition made or approved by the Superintending Engineer.

33. **The Start Date** is given in the Contract Data. It is the latest date when the Contractor has to commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

34. **Subcontractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

35. **Temporary Works** are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

36. **Two-cover system** means a procedure under which the bidders are required to simultaneously submit two separate sealed covers, one containing the Earnest Money (Bid security) and the details of their capability to undertake the tender which will be opened first and the second cover containing the price quotation which will be opened only if the bidder is found qualified to execute the Bid

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PRELIMINARY SPECIFICATIONS FOR WORKS BELOW TWO CRORES

1. GENERAL

1.1 Definitions and Interpretations:

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

1-1-1. 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.

1-1-2: Employer:

The Employer (Commissioner)or his authorised representative is the party who Employs the Contractor to carry out the Works.

1-1-3 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 then duties and exercise all the powers specifically imposed or conferred on him

1-1-4 Superintending Engineer :

The Superintending Engineer who is, in-charge of the Department, Corporation of Chennai or his authorized representative limited by the particular duties entrusted to him.

1-1-5 : Executive Engineer is an Executive Engineer of Corporation of Chennai and who is in charge of work in the Corporation of Chennai.

1-1-6 Tenderer or Bidder :Any person, firm or Corporation submitting a tender for the work contemplated, acting directly or through a duly authorized representative.

1-1-7: 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 authorized representative.

1-1-8 :Plans :

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

1-1-9. Specifications: The body f 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.

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1-1-10: Tender Notice :

The official notice inviting tender proposals for the work contemplated.

1-1-11: 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 forms, schedule of approximate quantities, plans and specifications and the Descriptive specification sheet, Agreement etc.,

1-1-12. 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 handling over site, documents authorizing alterations and supplemental agreements.

1-1-13.Work : All performance required of the Contract or under the terms of the contract.

1-1-14.. 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.

1-1-15.: 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.

1-2.Conditions

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

1-2-2.'Day ' means a calendar day.

1-2-3 Party.

'Party' means either the Employer or the Contractor.

1-2-4. Cleaning up during Progress and for Delivery :

All rubbish shall be removed from the site as it accumulates. All works shall be leaned and put in a thoroughly complete, clean, sound and workmanlike state to the satisfaction of the Executive Engineer before the work is finally handed over, all surplus materials not required by Executive Engineer, having first been removed by the contractor. The contractor shall give notice in writing to the Superintending Engineer/Zonal Executive 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 / Zonal Executive Engineer.

1-2-5. Interpretation of Estimates :

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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 agrees 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 1-2-7.

Payment to the contractor will be made for the actual quantities only of the work, performed or materials furnished in accordance with contract, and Tender Accepting Authority shall be ordinarily permitted to vary the quantity finally ordered only to the extent of 25 % either way of the requirement indicated in the tender documents. The payment will be made as per originally approved rate.

1-2-6 : 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 Executive Engineer and above. 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 contract does not legitimately cover, he shall before proceeding with such work give notice in writing to this effect to the Executive Engineer. In the event of the Superintending Engineer/Zonal executive Engineer and Contractor failing to agree as to whether or not there is any excess rate to be fixed and the Executive Engineer and above deciding that the contractor is to carry out the said work, the contractor shall accordingly, do so, and the question whether or not there if any excess, and if so the amount there of being payable, 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 Executive Engineer and above 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 Executive Engineer and above , 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 thereon. 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/Zonal Executive Engineer for such further instructions, drawings or specifications as he requires, it being understood that the subject is to be dealt with

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under the building procedure of best modern practice. The Superintending Engineer/Zonal Executive 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.

1-2-7.. RATES TO INCLUDE The tendered rates for 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.

1-2-8. Examination of Plans, Specifications, Special Provisions and site of work : Tenderers, 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 assist that apply for extension of time for completion beyond the agreement date.

1-2-9.. Approximate, not to mean Deviation from Drawings Specifications and Specifications : The declaration of the approximate nature of the statement of quantities in Schedule 'A' dose 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.

1-2-10. The Contract Unit Prices : The contract unit prices entered in schedule 'A' shall be for furnished 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 as a 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.

1-2-11. Carriage : Rates for finished work shall always include the cost of conveyance and all leads lifts, loading uploading 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. Wherever the term "Carriage" or "Conveyance" is used it shall be taken to include all

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leads, lifts, loading, unloading and strong to the satisfaction of the Superintending Engineer /Zonal Executive Engineer.

1-2-12. 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 of appliances appear to the Superintending Engineer/Zonal Executive 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/ Zonal Executive Engineer 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 this 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.

1-2-13.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/Zonal Executive Engineer for keeping materials under cover. The contract 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/Zonal Executive Engineer shall order any departure form any arrangements made by the contractor and the contractor shall comply with such orders as the Superintending Engineer/Zonal Executive Engineer may issue to safeguard or accommodate the public.

The Contractor shall remove the Temporary Structure before handing over of the site after completion of the work and if the same is not done, the Executive Engineer of the respective work shall have the right to remove such temporary structure and the contractor cannot claim for any damage or loss of materials.

1-2-14. 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 as shall pay all charges therefore the use of the works and workmen. The Water for the works shall be free from earthy, vegetables or organic matter, and from salts or other substances likely to interfere with the setting of mortar or otherwise prove harmful to the work.

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1-2-15. 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.

1-2-16. Sun Protection, and removal of rain water. :

The contractor shall at his own expense arrange all requisite protection of the work and materials against sun and rain effects and pumping of excess water to the satisfaction of the Superintending Engineer /Zonal Executive Engineer for the purpose at his expenses.

1-2-17. Setting out of Works :

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.

1-3 PLANS AND SPECIFICATIONS

1-3-1 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.

1-3-2 Increased or decreased Quantities :

Supplemental Agreement will be required in case the total value exceeds by 25 %.

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.

Supplemental Agreements will be required in case the total contract value exceed by 25%

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 Payment to the contractor will be made for the actual quantities only of the work, performed or

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materials furnished accordance with the contract, and Tender Accepting Authority shall be ordinarily permitted to vary the quantity finally ordered only to the extent of 25 % either way of requirement indicated in the tender documents. The payment will be made as per originally approved rate

1-3-3 Copies of Drawings and Specifications :

Two copies of the available drawings and specifications shall be furnished free of cost of 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/ Zonal Executive Engineer shall at all times have access to them.

1-3-4 Omitted Items :

The right reserved to cancel the portion of the contract relating to any items or portions thereof in any stage of execution it 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.

1-3-5 Non –Tendered Items.

In connection with the work covered by the Contract the Superintending Engineer/Zonal Executive 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 form or outside the scope of the work of evidence by the plans, special provision 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 / Zonal Executive 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 ash not been authorized and not covered by Supplemental Agreement may be rejected.

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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 actual in conformity with clause.

1-3-6.Extra Work. If Extra work is to be performed on the basis of actual 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.

1-4 MATERIALS AND WORKMANSHIP

1-4-1 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 Assistant Executive Engineer in every detail. Only materials which conform to the requirements of these specifications shall be furnished or incorporated in the work. The contractor shall upon the request of the Assistant Executive Engineer, furnish him with the vouchers to prove that the materials are such as specified. Samples of materials with test certificates have to be furnished at the contractors expenses for the approval of the Assistant Executive Engineer prior to the execution of any work.

1-4-2. 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 storage 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 lien 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.

1-4-3. Tests :

All test of materials furnished by the contractor shall be done in accordance with commonly recognized methods of Indian or of other National Organization or such other methods and test as are prescribed in the specifications or are in use of

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conformity with the standard practices of the department and the charge there for will be borne by the Department, beyond the prescribed test.

Field test of materials will be made by the Asst. Executive 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/Zonal Executive Engineer's inspection test certificates by the suppliers for all materials furnished by the contractor.

1-4-4. Inspection of Materials :

The contractor shall provide proper facilities at all times for the inspection and testing of materials, and the Executive 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 the work and he shall afford such facilities as the Executive Engineer may require for collecting and forwarding samples and making inspection. The contractor shall not make use of or incorporate in the work the materials represented by the samples until tests have been made and the materials found to be in accordance with the requirements of the specifications.

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 place din storage or during storage.

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

1-4-5. Defective Materials :

All materials not conforming 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/ Zonal Executive Engineer. Upon failure on the part of the contractor to comply with any order of the Superintending Engineer/ Zonal Executive Engineer made under the provisions of this article within the time stipulated by the Superintending Engineer/Zonal Executive Engineer , the Superintending Engineer/ Zonal Executive 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/Zonal Executive Engineer. If the Superintending Engineer / Zonal Executive Engineer so decides, shall become the property of the Corporation and the Superintending

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Engineer shall disposes of such material in any manner without any further written notice to the Contract.

1-4-6. Storage of Materials :

The contractor shall deposit materials in such parts only at the ground as may be approved by the Superintending Engineer/Zonal Executive Engineer. He shall submit for the approval of the Asst. Executive 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. 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/ Zonal Executive 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 weatherproof sheds for the purpose. Stored materials shall be so located as to facilitate prompt inspection.

1-4-7.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 property constructed measuring boxes, or in such other manner as shall be instructed by the Superintending Engineer/Zonal Executive 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 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/ Zonal Executive Engineer. The cost of such measuring boxes and platforms and all the work referred to here in shall be borne by the contractor.

1-4-8. Authority of Superintending Engineer / Zonal Executive Engineer:

All works shall be done under supervision of the Superintending Engineer/ Zonal Executive Engineer and to his satisfaction. He shall decide all questions which arises as the quality and acceptability of materials furnished, work performed, manner of performance, rate of progress of the work, interpretation of plant and specifications, and acceptance of fulfillment of the contract. He shall determine the amount and quality of work performed and materials furnished and his decision and

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measurement shall be final. In all such matters and in any technical question which may arise touching the contract, the Superintending Engineer's/Zonal Executive Engineer's decision shall be final and binding in the contractor. The Superintending Engineer/Zonal Executive Engineer shall have power to enforce such decision and orders of the contractor fail to carry them out promptly. In case of failure on the part of the contractor to execute work ordered by the Superintending Engineer/Zonal Executive Engineer. The Superintending Engineer / Zonal Executive Engineer may give notice in writing to the contractor, and at the expiration of the reasonable period specified in the notice proceed to execute such work as may be deemed necessary and the cost thereof shall be recovered from the contractor. If any disputes arises, the decision of the Superintending Engineer/Zonal Executive Engineer , in all aspects will be binding

1-4-9. Departmental Representative :

The Executive 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 specifications in all respects. He shall communicate to the contractor the instructions and directions of the Executive Engineer on all questions relating to the work and the contract or shall comply with such instructions and directions.

He shall direct 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 in spite of his constructions and the contractor shall comply.

1-4-10.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/ Zonal Executive Engineer .The contractor shall, on request from the Superintending Engineer/Zonal Executive 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/ Zonal Executive Engineer. The decision of the Superintending Engineer/Zonal Executive Engineer is final upon any matter arising under this condition .The decision communicated in writing should be promptly complied forthwith by the contractor. Any violation will attract penal action.

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1-4-11. 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 Executive Engineer shall at his own expenses, rectify such error to the satisfaction of the Executive Engineer. The checking of any setting out by the Executive 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.

1-4-12. 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/ Zonal Executive Engineer and the contractor will be held strictly to the true intent of the specifications in regard to the quality of materials, workmanship and the diligent execution of the contract. The Superintending Engineer/ Zonal Executive Engineer shall be allowed excess 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.

1-4-13.Uncovering for Inspection :

No additional compensation shall be made for removing, uncovering and replacing any portion of the work in connection with routine inspection. The contractor shall, if the Superintending Engineer /Zonal Executive Engineer request, remove or uncover such portions of the finished work as the Superintending Engineer/Zonal Executive Engineer may direct before the final acceptance of the same. After such special examination, the contractor shall restore them to the standard required by the specifications. If no instructions of the Superintending Engineer/Zonal Executive 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 /Zonal Executive 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.

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1-4-14. Removal of defective and unauthorized work :

The Executive Engineer may reject at any stage before final acceptance of any work that he considers to be not inconformity 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 Executive Engineer under the provisions of these articles a written notice shall be issued by the Executive 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 Executive Engineer shall have authority to cause defective work to be remedied, or removed and replaced, or to cause unauthorized, 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 Executive Engineer may allow such work or materials to remain, provided the Superintending Engineer/ Zonal Executive 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 Executive Engineer.

1-4-15. Penalty for poor quality of work :

Not withstanding the provisions as contained in clause 1-4-14, 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 Executive Engineer which penalty will be deducted from any amount to the contractor by the Corporation of Chennai. The contractor will be required to remit the amount in the Corporation treasury immediately before proceeding with further work as per directions of the Executive Engineer, and remove substandard work/defective work.

1-5.RESPONSIBILITIES AND LAIBILITIES OF THE CONTRACTOR

1-5-1 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 from harm the Corporation and all its officers, agents, employees and servants against and claim or liability arising from or based on the variation 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.

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All scaffolding runways, hosts and other temporary construction shall comply with all pertinent requirements of Union and State laws, local law ordinances and regulations.

1-5-2 Public Safety :

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

The contractor shall furnish, erect and maintain such fences, barricades, and signs as are necessary to give adequate warning to the public at that construction is under progress and of any dangerous conditions to be encountered as a result there of in accordance with any departmental type designs or as directed by the Executive 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 other items when construction operations are suspended for any reasons, 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 there for.

1-5-3. 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 property 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 may workman employed by the contractor, he shall intimate in writing to the Superintending Engineer/ Zonal

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Executive 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 of or fines if any payable by the Corporation as a consequence of its failure to give notice under the Workmen's Compensation Act or other wise conform to the provisions of the said Act in regard to such accident.

1-5-4.Scafoldings: 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 mazdoor shall be engaged for holding the ladder and if the ladder issued for carrying materials as well, suitable footholds and hand holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1 (1/4 horizontal and 1 vertical)

Scaffolding or staging more than 3.6m (12 feet) above the ground or floor, swung or suspended from an overhead support or erected with stationary support shall have guard rail properly attached, or bolted, braced and otherwise secured at least 90 cm (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. 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 9 m (30 feet) in length while the width between side rails in rung ladder shall in no case be less than 28 cm (11 ½") for ladder up to and including 3 cm (10 feet) in length. For longer ladder this width should be increased at least ¼" for each exceed 30 cm (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 defence 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.

Working platforms 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 3.6 m (12 feet) above the ground level or floor level, they should be so closely boarded, should have adequate width and should as suitable fastened as described in 1-5-4 above.

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Every opening in the floor of a building or in a working platform should be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 90 cm (3 feet).

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 9 m (30 feet) in length while the width between side rails in rung ladder shall in no case be less than 28 cm (11 1/2:") for ladder up to and including 3 cm (10 feet) in length. For longer ladder this width should be increased at least ¼" for each exceed 30 cm (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.

1-5-5..Insurance: Group insurance policy should be kept alive at the time of issue of work order . If Insurance is not taken by the tenderer it will be deducted from the bill or EMD will be forfeited**.** Contractor shall have to provide All Risks Insurance Policy which provides complete protection against all types of civil construction risks. The Comprehensive insurance policy should provide complete protection against all types of construction works. All risks policy should cover against a vide range of perils such as Fire, Lightning, Explosion, Aircraft Damage, Riot, Strike, Flood, Inundation, storm cyclone, Land slides, Burglary, Human Errors, Short-circuiting, Collapses Etc. The policy should cover the legal liability falling on the insured contractor as a result of bodily injury or property damage suffered by a Third Party .All payments received from Insurers relating to loss or damage to the works shall be held jointly by the parties and used for the repair of the loss or damage or as compensation for loss or damage that is not to be repaired.

1-5-6. Remedy to Contractor's failure to insure.

If the Contractor fail to effect and keep in force the insurances referred to or any other insurance which he may be required to effect under the terms of the contract ,then and in any such case the Department may effect and keep in force any such insurance and pay such premium as may be necessary for the purpose and from time to time deduct the amount so paid by the Department as afore said from any moneys due or which may become due to the contractor or recover the same as a debt due from the Contractor

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1-5-7.Responsibility for Damage claims :

The contractor shall indemnify and save from harm 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 of an 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 claims or accounts 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.

1-5-8.Protection and Restoration of Property :

If corporate or private property interferes 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.

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 or all official survey monuments, bench marks, boundary stones, etc., until the owner or an unauthorized agent has witnessed or otherwise referenced their location or relocation. 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 in the acceptable manner.

If he fails to do so, the Superintending Engineer/Zonal Executive 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 form the contractor.

1-5-9. Contractor's Risk and Insurance :

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

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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 unswaped power of civil war

1-5-10. 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 / Zonal Executive Engineer and the Contractors shall comply with the provision of the Factories Act, if and so far as they are applicable.

The Contractor shall give prior information to the Police Department, if necessary, for carrying out the work during night hours.

1-6. Execution of work and progress

1-6-1 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 of 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/Zonal Executive 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.

1-6-2 Commencement of Work :

Within 7 days from the date of handing over of site or issue of work order which ever is later the contractor shall begin the work. He shall begin the work duly notifying the Superintending Engineer / Zonal Executive Engineer the date of such commencement. The contract time shall start 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 to the contractor. The contractor under no circumstances will be entitled to claim any damage from the Corporation if he incurs any expense or liabilities under the contractor before the date of commencement, defined above. He shall have the right to withdraw from the contract or obtain any refund of the earnest money and security deposit if intimation of handling over the site is delayed for more than a period of ninety days from the date of issue of work order by the competent authority.

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1-6.3. Commencement & Completion of work .

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 work further checks on the adequacy of the foundation by means of trial holes, plate bearing tests, etc., shall be made any defects noted shall be pointed out to the Executive Engineer who will issue instructions for the necessary remedial action to be ensured that a satisfactory foundation is available through the area to be resurfaces. 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 within the stipulated time to the satisfactory of the Executive Engineer or his representatives. If the rate of progress is poor as judged by the Executive Engineer or his authorized representative a fine not exceeding Rs 0.05 %-of work value per day shall be imposed on the Contractor

1-6-4 Suspension of Work :

The Superintending Engineer/ Zonal Executive 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 execution of the work, or for such time as is 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.

1-6-5 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.

a)The execution of any modification in additional work.

b) Delay caused by any written instructions issued by the Superintending Engineer

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c) Any act or default of the Superintending Engineer/ Zonal Executive Engineer including failure to issue necessary instructions upon written request from the contractor.

(d) Any of the accepted risks under Clause 1-5-6

(e) Any circumstances 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 /Zonal Executive Engineer within fourteen days of the commencement of the delay and he shall be allowed a reasonable extension of time for completion in respect of any delays caused by any of the above mentioned circumstances. The Superintending Engineer /Zonal Executive Engineer shall assess the period of delay, at twenty five percent in excess of the actual working period so last 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.

1-6-6. : 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 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/ Zonal Executive 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/ Zonal Executive Engineer the contractor will be unable to secure the completion of 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 Article 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

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(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 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. Provided further, that after the notice under condition 165-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.

1-6-7. Forfeiture and Partial Determination :

Not withstanding the failure of the contractor to comply with notice served on him under clause 1-6-5(a) herein, the Superintending Engineer/ Zonal Executive 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 his forfeiture may be modified or revoked by Commissioner.

It shall be further right of 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/ Zonal Executive 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 and conclusive.

1-6-8 -Provisions in case of Absolute Determination of Contract :

If the Commissioner shall in the exercise of the powers contained in Clause 1-6-7 and the value of such 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.

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(a) The earnest money, the security deposit, the total amount withheld under clause 1-6-7 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. He may employ other contractors to complete the same, and the contractor shall have no claim whatsoever in respect of such action by the Commissioner. The Commissioner has the authority to for taking steps for debarring the contractor in the future participation of Tenders or any dealing with Corporation Of Chennai.

(c) The contractor shall, if required by 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/ Zonal Executive Engineer

shall certify the cost of completion, which shall include :

(i) The cost of any materials purchased and labour provided to secure completion 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.

(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 the date is less than 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 up to 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

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(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 for the sole 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 other such excess has been met, there remains any residue of the proceeds of the sole of the plant, materials and equipment or any unsold plant, machineries and equipment shall be paid or returned to the contractor as the case may be.

(4) In the event of determination of the contract an account of the death, insanity, insolvency or imprisonment of the contractor, the notice determination of contract required under Clause 1-6-8 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 Articles shall then take affect, and payment shall be made and unsold plant, materials and equipment shall be refunded to the person or persons entitled to receive and give a valid discharge.

1-6-9. Special Powers of Debarring. :

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 Article.

(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 dispatch) as to all or any of the following matters, that is to say :

(i) The performance of the 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

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(v) The clearing of the site

(vi) Any other matter arising out of the contract with regard to which the Commissioner decide 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 contract vary any direction so given or give fresh directions as to all or any of the matter specified in the foregoing paragraph.

(d) In the event, of the determination of the contract under this condition there shall be paid to the contractor the net amount as ascertained in accordance with all the applicable provisions of Clause 1-7 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 1-8 thereof shall apply.

1-7 MEASUREMENT AND PAYMENT

1-7-1 Measurement of Quantities : All work to be paid for at a contract price per unit of measurement shall be measured by the Superintending Engineer/Zonal Executive Engineer in accordance with the methods set forth in the relevant specifications.

The contractor shall from time to time when the required on reasonable notice by the Superintending Engineer/Zonal Executive 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's/Zonal Executive Engineer's 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/Zonal Executive Engineer's representative, and the Superintending Engineer's/Zonal Executive Engineer's 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 fails to attend when so required, the Superintending Engineer/Zonal Executive Engineer shall have power to proceed by himself to take such measurements or check, measurements and that in case any decision of the Superintending Engineer/Zonal Executive Engineer shall be final and conclusive and the cost of any labour engaged for the purpose shall be recoverable from the contractor.

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1-7-2 Final Payment :

It shall be accepted as a condition of the contract that the payment of the final bill to the contractor deducting the withheld 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.

A minimum of 10 % of contract amount to be withheld.

1-7-3 .Non - Tendered Items : In case of items of works where 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 rate for the new item and by applying the prorate excess or discount for the item of work , from which the rates is delivered, 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 :

a).When schedule of rates were not changed during the period from the date of execution of the original agreement to the date of supplemental agreement then the rates for the supplement agreements shall be 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 new schedule of rates at the time of execution of supplemental agreements will be adopted with no tender premium applied or discount applied to this rate.

1-7-4 .Payment-Extra Items: If the Superintending Engineer/ Zonal Executive Engineer and the contractor fail to agree on a rate for payment of 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/Zonal Executive Engineer. To enable the Superintending Engineer /Zonal Executive Engineer to evaluate the extra work the contractor shall “furnish the Superintending Engineer/Zonal Executive Engineer with the 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/ Zonal Executive 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

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the amount involved in the extra payment is Rs.1,000 or less for each occasion on which such extra works are authorized.

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

Payment to the contractor will be made for the actual quantities only of the work, performed or materials furnished accordance with the contract, and Tender Accepting Authority shall be ordinarily permitted to vary the quantity finally ordered only to the extent of 25 % either way of requirement indicated in the tender documents. The payment will be made as per originally approved rate

1-7-5 Accounts, Receipts and Vouchers :

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

1-7-6 Fraud, Willful 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 willful neglect in the execution of the contract, or any willful or unauthorized deviation from the plans, specifications, instructions and directions for the time being upon him.

1-7-7 Unfixed Materials :

No payment or advance will be made for unfixed materials when the rates are for finished work “in situ ”. However payment may be allowed up to maximum 75% at the discretion of Superintending Engineer/Zonal Executive Engineer .

1-7-8 Payment and Certificates :

Payment will be made to the contractor under the certificates to be issued at reasonable frequent intervals by the Superintending Engineer/Zonal Executive Engineer. Within fourteen days of the submission of each certificate an intermediate payment will be made of a sum equal to 90 percent of the value of the work, as so certified and the balance of 10 percent will be withheld and retained as a security for the due fulfillment of the contract. Under the certificate to be issue by the Superintending Engineer/Zonal Executive Engineer. 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 1-6-6, 1-6-7, 1-6-8 and 1-6-9

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No certificate of the Superintending Engineer/Zonal Executive 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 the defects as provided by the contract, The contractor when applying form a certificate, shall prepare a sufficiency "A" to the satisfaction of the Superintending Engineer/Zonal Executive Engineer to enable the Superintending Engineer or the Zonal Executive Engineer, or the Assistant Executive Engineer to check the claim and issue the certificate.

1-7.9.Acceptance of Final Measurement :

The contractor agrees that before payment of the final bills shall be made on the contract, he will sign and deliver to the Superintending Engineer/Zonal Executive Engineer either in the measurement book or otherwise as demanded, a valid release and discharge from any and all claim and demands whatsoever for all mailers arising out of or connected with title 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/Zonal Executive Engineer in supplying the final measurement certificate, need not be bound by the processing measurements and payments. The final measurements of the Superintending Engineer shall be final conclusive and binding on the contractor.

1-7-10. 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.

1-8 : SAFETY CODE:

1-8-1. 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 mazdoor shall be engaged for holding the ladder and if the ladder issued for carrying materials as well, suitable footholds and hand holds shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1 (1/4 horizontal and 1 vertical)

1-8-2 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 30 m (100 feet) in length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 90 cm (3 feet) above the surface of the ground. The sides of the trenches which are 1.5 m (5 feet) or more in depth shall be stepped back to give suitable slope or securely held by timber branching, so as to avoid the danger or sides to collapse. The excavated materials shall not be placed

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within 1.5 m (5 feet) of the ages 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 under cutting shall be done.

1-8-3. Demolition :

Before any demolition work is commenced 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.

1-8-4.-Safety Equipments:

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 steps to ensure proper use of equipment by those concerned.

(a) Workers employed on mixing asphaltic 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 in welding works shall be provided with welder's protective eye shields.

(d) Stone breakers shall be provided with protective goggles and protective clothing seated 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.

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

Iv The contractor shall not employ 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.

1-8-5. First Aid Provision in Site.: 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.

1-8-6. Use of Hoisting Machines: 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 repair & in good working order.

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

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2. Every crane driver or hoisting appliance operator shall be property 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 hosting 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 market with the safe working load. In case of hoisting machine having a variable safe working load. In case of hoisting machine having a variable safe working 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.

1-8-7.Risk coverage of Machines in site. Motors, gearing, transmission, electric wiring and other dangerous parts of hosting appliances I 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 insulting 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,

1-8-8. Maintenance of Equipments : All scaffolds, ladders and other safely 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.

1-8-9.Saftey Measures on Display: These safely, 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.

1-8-10. Enforcement of Rules. 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.

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1-8-11-Contractor-No.Exemption:. Not withstanding the above clause from 1-8-1 to 1-8-11-there is nothing in these exempt the – contractor from the operations of any other Act or Rule in force.

1-9. Providing Insurance :The contractor shall have to provide a minimum insurance of man power and equipments. This insurances cover should start from the date of starting of work and should be valid upto the end of execution period. The responsibility of timely payment of the premium as well as that of lodging claims as and when situation arises will be that of contractor. All insurances which the contractor requires to enter into under the contract shall be effected with an insurer or insurers and in terms approved by the Superintending Engineer/Zonal Executive Engineer.

2. GENERAL CONDITIONS FOR ALL CIVIL WORKS

2-1 The item of works for repairing, relaying and doing patch works and other improvements are contained in detailed schedule of rates attached.

2-2 The total approximate value of works will be in all about Rs. Lakhs for each contract. This is only approximate to enable the tendered to have and idea in tendering and also for the purpose of fixing the security deposit.

2-3 The quantities of works specified are also approximate and are meant to enable the tenders to have an idea of the works while tendering.

2-4 The office schedule of rates for each item of work is noted in the attached schedule of rates and the tenderer shall carefully scrutinize 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 …….

……..……..…

..……..……..…

……..…… during the year ……. The tenderer's less or higher percentage offered for each contract will

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be one single less or higher percentage applicable to each of the items of works in the relevant zones.

2-5 .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 carry out 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.

2-6.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 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

2-7 –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 the contractor's cost. Any damage to work resulting from rains or from any other cause until the work is taken over by the Department, after completion will be made good by the contractor at his own cost.

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2-8.REMOVAL OF EXCAVATED EARTH, SURPLUS EARTH, DEBRIS

All materials excavated by the contractor including dismantled bricks etc (not re-useable) shall be disposed off by the contractor as directed by the Superintending Engineer/Zonal Executive Engineer Surplus earth shall be removed within 3 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.

2-9. Charges to be paid by the Contractor : 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 salt or other substances like to interfere with the setting of the mortar or otherwise prove harmful to the work.

2-10.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 shall be drawn clear off the road, the safety to the public all 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 neighbourhood 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 2-10 (a) a penalty of Rs 500- day will be imposed on the contractor.

2-11 If Cement and steel M.S. /R.T.S will be supplied to the Contractor by the Corporation, (If and when available) at the rate of Rs……./- per tonne, M.S. Rs……../- per Tonne R.T.S. Rs……/- per tone, respectively and the cost recovered from the bills of the contractor for the work. The Contractor will have to arrange for carting from the specified Corporation store yard at their own cost for carting the same to work site. The contractor's rate for the respective items involving cement and steel should inclusive the cost of conveyance from the source of

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departmental supply to the workspot. The contractor shall not claim any compensation for non-supply of cement and steel by the departments.

2-12 All works shall be executed in accordance with TNBP and S.S.RB unless otherwise specified. For road works as per MORTH Specifications

2-13 (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, Resets 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.

2-14 Sand Quarry : Only sand from P.W.D notified quarries shall be used.

2-15 The detailed dimensions of foundations, etc., and dimensions of all R.C. Works , all as per IS code, in the plans are subject to alteration during execution.

2-16 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".

2.17 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 insitu 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
8	0.39
10	0.62
12	0.89
16	1.58
20	2.47
25	3.85
32	6.32

signature of the Bidder

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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 will 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 stays and supported devices if and when required. However the weight of rods used in works may be weighed by the respective Assistant officers on a representative sample to make sure that the size and coefficients adopted for various sections do not differ from the one furnished above

2-18 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. In case 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.

2.19 In case of any discrepancy found between the quoted rates percentage in words and figures, the lower value only be taken.

2.20. In case 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.

2-21. 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, deducting 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.

2-22. 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.

2-23. 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.

2-24. 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.

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2-25. 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 Exe. Engineer ……..() may have them removed by the Contractor without any extra cost.

2.26. Any coins, curiosities or antiquities or treasure trove found during the constructions of the works shall be immediately delivered to the Executive Engineer on behalf of the Corporation.

2-27. The contractor at his own expense shall disinfect with chloride or lime or 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.

2-28. The contractor shall at his own cost after competition 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.

2-29. 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 is compulsory for renewal of the same.

2-30. The materials required for road works shall be supplied and stocked at the site, Measurements will be recorded then and there and check measured by the competent engineers before using them for works.

2-31. 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 whenever is found necessary during the time of execution as directed by the Exe. Engineer.

2-32. No correspondence from the tenderers will not be entertained after the opening of the tenders before the award of the contract, besides debarring the contractor for a specified period by the competent authority.

2-33. Tenders with conditions stipulated may not be considered.

2-34. In respect of bituminous course continuous record of the mixes shall be maintained at site/ plant site for tallying the proportions of the materials and ensuring the correct rate spread.

2-35.SITE INSTRUCTION BOOK

A site instruction book shall be kept at the Corporation of Chennai Office on the site of the work. As far 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

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cases, the Executive Engineer or the Superintending Engineer/Zonal Executive 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 Executive Engineer.

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2-36.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 of the Departmental A.E./ J.E.

Signature of Contractor **Signature of the E.E./ Superintending Engineer**

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3.GENERAL SPECIFICATIONS

3-1.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/ Zonal Executive Engineer/Executive 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 conform to the specifications referred to in this chapter.

3-1-1.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. Superintending Engineer/Zonal Executive 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.

3-1-.2 Storing :

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.

3-1-3 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.

3-2.COARSE AGGREGATE

3-2-1 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.

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b).Deleterious Substance :

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 set forth. 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 ½") size either a fine aggregate having a sufficiently greater percentage of the materials or a coarse aggregate having a small percentage of the materials shall be used if required by the Superintending Engineer/ Zonal Executive Engineer .

3-2-2.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.

3-3 L.C.C ratio shall be !:5:10.

3-4.FINE AGGREGATE

3-4-1.Fine aggregate for Portland cement concrete :

The term fine aggregate shall mean an aggregate most of which passes a 4.75mm (3/6") B.S.S. sieve and contains only so much coarser materials as is permitted for the various types described in this specification, and as notified by P.W.D. Fine aggregate 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 or rock. The particles shall be clean, hard, strong and durable.

(b) Deleterious Substance :

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

(c) Grading :

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Fine aggregate when tested by means of laboratory sieves having square opening, shall conform to the grading requirements set forth below :

Grading limits for fine aggregates for Portland Cement Concrete

Sieve (ASTM)	I.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 any one 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 samples 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 ½") in size, either a fine aggregate having a sufficiently greater percentage of the fine material or a coarse aggregate having a sufficiently smaller percentage of the fine aggregate shall be used.

3-4-2 Source

The sources for the Fine Aggregate is as notified by PWD..

3-4-3 – 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

The Sources for the fine aggregate is as notified by PWD.

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3-5 MORTAR SAND

3-5-1.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 is dirty, it mush be washed clean in water.

3-5-2 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)

3-5-3 .Source,

As notified by PWD**.**

3-5-4- 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

3-5-5.BRICKS

(a) Bricks shall be of first class and table moulded, of uniform size, shape and colour (generally deep red or copper) and mush be well burnt so as to given a clear ringing sound when struck. They shall not break when thrown on wall or 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, absorb more water than $1/5^{th}$ of their dry weight shall be rejected.

(c) Unless otherwise ordered or permitted by the Superintending Engineer/Zonal Executive 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 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 an 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.

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3-5-6.CEMENT

3-5-7.Requirements :

All Portland cement shall conform to the requirements of Indian Standard Specifications I.S. 269-1951.

3-5-8.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 /Zonal executive Engineer in such form as may be required.

3-5-9.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/Zonal Executive 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.

3-6.WATER

3-6-1.Source

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

3-6-2.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.

3-6-3.Approval of Source :

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

3-6-4.Containers :

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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.

3-7.STEEL

3-7-1.Description :

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

3-7-2.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

3-7-3.Steel List :

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

3-7-4.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.

3-7-5.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.

3-7-6.Bending :

Reinforcing steel shall conform accurately to the dimensions shown on the plans.Bars shall not be bent or straightened in a manner that will injure the materials. Bars with kinds 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

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two-thirds this value where conditions are such that there is no danger of splitting the concrete.

3-7-7.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 pacing and setting of concrete by wiring at intersections with S.W.G. No. 16 and 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 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 and indefinite period shall be protected from rusting by a think coat and neat cement grout.

3-7-8.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.

3-7-9.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 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. 4-21.

3-7-10.Inspection :

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No concrete shall be deposited until the Superintending Engineer/ Zonal Executive Engineer has inspected the placing of the reinforcement steel and given permission to place concrete. The concrete placed n 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.

3-7-11.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/Zonal Executive 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 weight 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.

3-7-12.Basis of Payment : Reinforcing steel placed as shown on the plans or as directed by the Superintending Engineer/Zonal Executive 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, lying and securing complete in place will all necessary stays and supporting devices as directed by the Superintending Engineer/Zonal Executive 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.

3-8.COVERS FOR CURING AND PROTECTING CONCRETE

3-8-1.Description :

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

3-8-2.Burlap :

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

3-8-3.Cotton or Jute mats :

Cotton or Jute mats for curing concrete shall be one / ply sheets of cotton felt or jets 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.

3-8-4.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 all times over the surface.

3-8-5.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.

3-8-6.Tarpaulins :

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.

3-8-7.Prohibited Materials :

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

3-9.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 objectionable.

3-10.EARTH FOR FILLING THE EMBANKMENT

3-11.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.

3-12. 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. 4-1 shall apply.

3-13.FOUNDATION EXCAVATION AND FILL

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3-14.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/Zonal Executive 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/Zonal Executive 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 of way within the limits of structure shall be included in the price bid for the various items of contract and no other payment will be made therefore.

3-15.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, as may be ordered by the Superintending Engineer/ Zonal Executive Engineer without extra payment.

3-16.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/Zonal Executive 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/Zonal Executive 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 made 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.

3-17.Inspection :

After each excavation is completed, the contractor shall notify the Superintending Engineer/ Zonal Executive Engineer and no concrete shall be placed until the

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Superintending Engineer/Zonal Executive Engineer has approved the depth of excavation and the character of the foundation material.

3-18.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 at least 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 excavation 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.

3-19..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 backfilling 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/Zonal Executive Engineer.

3-20.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/Zonal Executive 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.

3-21.Method of Measurement and Payment :

Payments for excavation shall be made at the unit rate agreed upon for the actual quantity excavated in conformity with the plans or directed by the Superintending Engineer/ Zonal Executive 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 mud, muck and other similar semi-solids.

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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 0.028m (1 cft.) and the total of 1 set nearest to the 0.28m3 (10 cft.).

When it is necessary in the opinion of the Superintending Engineer/Zonal Executive 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.

3.23.EMBANKMENT

3-24.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.

3-25.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.

3-26.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 147kg (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.

3-27.Construction Methods

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

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(a) Preparation of the Existing Services :

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 mush be removed from the surface to be covered and deposited outside the beds or disposed off as the Superintending Engineer/ Zonal Executive 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 6 " inches and leveled, 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/Zonal Executive Engineer and to guarantee a uniform dry density of not less than 1842.13 kg/m3 (115 lbs/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 layers shall be thoroughly compacted with mechanical or manual tampers.

3-28.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 computer 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.

3-29.BRICK WORK

3-30..Materials :

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

Bricks – Should conform to Clause No. 3-4

Cement – Should conform to Clause No. 3-5

Sand - Should conform to Clause No. 3-2

3-31.Construction Method :

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 indication of saturation being complete.

For ensuring thorough soaking of the bricks every one or two brick layers or more as necessary, shall be provided with tubs for use. The wall of structures shall be carried up regularly in all cases 1" when the nature of the work will admit of it not leaving any part 915mm (3 ft.) lower than another. Horizontal courses hall 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 mush be raked back in course unless otherwise directed and when new work is to be jointed to it the surface of unfinished work mush be cleaned and wetted. The bricks shall be laid by placing sufficient mortar on the wall and forcing every brick into it 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 bound 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/Zonal Executive 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

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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 Y 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.

3-32.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/Zonal Executive 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 incidental necessary to complete the work as specified.

3-33.BLUE GRANITE ROUGH STONE PACKING FOR REVETMENTS, ETC.

Gravel Backing:

The surface to receive the gravel backing shall be nearly trimmed to the proper slope free from all vegetations and profusely wetted and rammed before gravel is laid on.

Standard gravel shall then be mixed with water and worked with manvetties, 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.

3.34 .Rough Stone Packing:-

The stones shall be preferably 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 0.014m^3 (1/2c.ft).

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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 fail 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 chips possible of being picked up or removed by hand.

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CORPORATION OF CHENNAI

…….. DEPARTMENT/ZONE

Technical Specification Roads

for the work .....

Superintending Engineer(B.R.R)/Zonal Officer

Zone.....

signature of the Bidder

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SECTION-I

A. PARTICULAR TECHNICAL SPECIFICATIONS FOR ROADS

1 PREAMBLE

1.1 The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents.

1.2 Site Information

1.2.1 The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

1.2.2 The area in which the works are located is in ----------

1.2.3 General Climatic Conditions

1.2.3.1 The temperature in this region is as under:
i) During summer months, the average maximum temperature is 38.5°C.
ii) During winter months, the average minimum temperature is 19.2°C.

1.2.3.2 The average annual rainfall in the area is of the order of 1300mm.

1.2.4 Seismic Zone
The works are located in Seismic Zone III.

2 GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

2.1 General Technical Specifications
The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (Forth Revision, reprinted in September 2006), issued by the Ministry of Shipping, Road Transport & Highways, and Government of India and published by the Indian Roads Congress, henceforth called MORT&H Specifications.

2.2 Supplementary Technical Specifications
The Supplementary Technical Specifications shall comprise of various Amendments/ Modifications/ Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to above.

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2.2.1 The Additional Specifications shall comprise of specifications for particular item of works not already covered in General Technical Specifications.

2.2.2 When an Amended/Modified/Added Clause supersedes a Clause or part thereof in the said Specifications, then any reference to the superseded Clause shall be deemed to refer to the Amended/Modified/Added Clause or part thereof.

2.2.3 In so far as Amended/Modified/Added Clause may come in conflict or be inconsistent with any of the provisions of the said MOST Specifications under reference, the Amended/ Modified/ Added Clause shall always prevail.

3. AMENDMENTS /MODIFICATIONS/ ADDITIONS TO EXISTING CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS OF MOSRTH

Clause 102 DEFINITIONS

AASHTO : American Association of State Highway and Transportation Officials
ASTM : American Society for Testing and Materials
BS : British Standard published by the British Standards Institution
CBR : Californian Bearing Ratio
IRC : Indian Roads Congress
IS : Indian Standard published by the Bureau of Indian Standards
MORT&H : Ministry of shipping Road Transport & Highways
BIS : Bureau of Indian Specification

:

Clause 105 SCOPE OF WORK

Clause 105.1 This Clause shall read as under:
"The Corporation of Chennai or any of its successors, nominees, assign, hereinafter be referred as the “Employer” wishes to receive bids for the work of *“----------(insert name of work)*”, as described in these bidding documents, herein referred to as “works “.The bill of quantities furnished in the title head of Bill of Quantities.

Clause 106 Construction Equipment

Clause 106 a) “The trial run is to be carried out laying the relevant pavement and it is not to be part of the permanent works. The trial is to be carried out on prior approval of equipment by Engineer-in-Charge”.

b) All equipment provided shall be of proven efficiency and shall be got approved from the Engineer,

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c) All the plant/equipment to be deployed on the works shall be got approved from the Engineer for ensuring their fitness and efficiency before commencement of work;

d) Any material or equipment not meeting the approval of the Engineer shall be removed from the site forthwith;

e) No equipment will be removed site without permission of the Engineer; and

f) The Contractor shall also make available the equipment for site quality control work as directed by the Engineer.

Clause 108.4 "Identification of quarry sites and borrow areas shall be the responsibility of the Contractor. Materials procured from quarry sites and borrow areas identified by the Contractor and to be used in Works must comply with the requirements of quality as stipulated in the Technical Specification for particular item of work."

Clause 109 Setting Out

Clause109.1 The Contractor shall establish working Bench Marks tied with the Reference Bench Mark for the area shall be as indicated in the Contract Documents and the values of the same shall be obtained by the contractor fro9m the Engineer. The working Bench Marks shall be at the rate of four per km and also at or near all drainage structures, over-bridges and underpasses. The working Bench Marks/levels should be got approved from the Engineer. Checks must be made on these Bench Marks once every month and adjustments, if any, got agreed with the Engineer and recorded. An up-to-date record of all Bench Marks including approved adjustments, if any, shall be maintained by the Contractor and also a copy supplied to the Engineer for his record.

Clause109.2 The lines and levels of formation, side slopes, drainage works, carriageways and shoulders shall be carefully set out and frequently checked, care being taken to ensure that correct gradients and cross sections are obtained everywhere

Clause109.3 In order to facilitate the setting out of the works, the centre line of the carriageway or highway must be accurately established by the contractor and approved by the Engineer. It must then be accurately referenced in a manner satisfactory to the Engineer, every 50 m intervals in plain and rolling terrains and 20 m intervals in hilly terrain and in all curve points as directed by the Engineer, with marker pegs and chain age boards set in or near the fence line, and a schedule of reference dimensions shall be prepared and supplied by the Contractor to the Engineer These markers shall be maintained until the works reach finished formation level and are accepted by the Engineer..

Clause109.4 On construction reaching the formation level stage, the centre line shall again be set out by the Contractor and when approved by the Engineer, shall be accurately referenced in a manner satisfactory to the Engineer by marker pegs set at the outer limits of the formations.

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Clause109.5 no reference peg or marker shall be moved or withdrawn without the approval of the Engineer and any earthwork or structural work shall be commenced until the centre line has been referenced.

Clause109.6 The Contractor will be the sole responsible party for safeguarding all survey monuments, bench marks, beacons, etc. The Engineer will provide the Contractor with the data necessary for setting out of the centre line. All dimensions and levels shown on the drawings or shall be verified by the Contractor on the site and he shall immediately dimensions or levels. The Contractor shall, in connection with the staking out of the centre line, survey the terrain along the road and shall submit to the Engineer for his approval, a profile along the road centre line and cross-sections at intervals as required by the Engineer.

Clause109.7 After obtaining approval of the Engineer, work on earthwork can commence and the profile and cross-section shall from the basis for measurements and payment. The contractor shall be responsible for ensuring that all the basic traverse points are in place at the commencement of the contract and if any are missing, or appear to have been disturbed, the contractor shall make arrangements to re-establish these points. A 'survey File' containing the necessary data will be made available for this purpose. If in the opinion of the Engineer, design modifications of the centre line or grade are advisable, the Engineer will issue detailed instructions to the Contractor and the Contractor shall perform the modifications in the field, as required, and modify the ground levels on the cross-sections accordingly as many times as required. There will be no separate payment for any survey work performed by the Contractor. The cost of these services shall be considered as being included in the cost of the items of work in the Bill of Quantities.

Clause109.8 The work of setting out shall be deemed to be a part of general works preparatory to the execution of work and no separate payment shall be made for the same.

Clause109.9 Precision automatic levels, having a standard deviation of $\pm$ min per km, and fitted with micrometer attachment shall be used for all double run leveling work. Setting out of the road alignment and measurement of angles shall be don by using theologize with traversing target having and accuracy of one second. Measurements like Diatomite.

Clause109.10 "Before carrying out any survey work the Contractor shall submit to the Engineer for the approval a programmed and methodology for the calibration of all optical and electronic survey equipment to be used on site during construction of the works. The Contractor will maintain calibration records for all such equipment in his site office, available at all times for inspection by the Engineer."

Clause 110 Public Utilities

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Clause 110.2 The Contractor's programmer must take into account the period of notice and duration of diversionary works of each body as existing at site. The Contractor must also allow for any effect or these services and alterations upon the Works and for arranging regular meetings with the various bodies at the commencement of the contract and throughout the period of the works in order to maintain the required co-ordination. During the period of the works, the Contractor shall have no objection if the public utility bodies and their decisions in the execution of their proposal in terms of programmer and construction. Provided that in the opinion of the Engineer, the Contractor has revised reasonable notice thereof before the relevant alterations are put in hand.

Clause 111 Precautions for Safeguarding the Environment:

Clause 111.1 **General**

The Contractor shall take all precautions for safeguarding the environment during the course of the construction of the works. He shall abide by all laws, rules and regulations in force governing pollution and environmental protection that are applicable in the area where the works are situated.

The Contractor shall preserve existing trees, plants and other vegetation that are to remain within or adjacent to the works and shall use every prosecution necessary to prevent damage or injury thereto.

On completion of Works, all areas disturbed by the Contractor's construction activities shall be restored in their original condition, or as may be acceptable to the Engineer. The cost of these works shall be deemed to be included in the rates generally.

Clause 111.4 The Contractor shall carry out the works in such a manner that soil erosion is fully controlled, and sedimentation and pollution of natural water courses, ponds, tanks and reservoirs is avoided. The stipulations in Clause 306 shall govern.

"The Contractor is to ensure that there is good drainage at all construction areas, to avoid creation of stagnant water bodies, including water in old water bodies."

Clause 111.9 All existing highways and roads used by vehicle of the Contractor or any of his sub-contractors or suppliers of materials or plant, and similarly any new roads which arte part of the works and which, are being used by traffic, shall be kept clean and clear of all dust/mud or other extraneous materials dropped by the said vehicles or their tiers. Similarly, all dust/mud or other extraneous materials from the works spreading on these highways shall be immediately cleared by the Contractor.

Vehicles delivering materials to site shall be covered to avoid spillage of materials on public roads.

Clause111.12 Compliance with the foregoing will not relieve the Contractor of any responsibility for complying with the requirements of any Highway Authority in respect of the roads used by him.

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"The costs of compliance with Clause 111 shall be deemed to be included in the rates for items included in the Bill of Quantities.

Clause111.13 "The Discharge Standards promulgated under the Environment Protection Act, 1986 shall be adhered to strictly. All waste arising from the project is to be disposed off in a manner which is acceptable to the State Pollution Control Board and the Engineer." All vehicles and machinery employed in the execution of the works shall be regularly maintained to ensure that pollutant emission levels comply with the relevant requirements of current pollution control legislation. During routine servicing operations, the effectiveness of exhaust silencers must be checked and if found to be defective must be replaced. Not withstanding this requirement, noise levels from any item of plant must comply with the relevant legislation for levels of sound emission. Non complaint plant is to be removed from site. Vehicle maintenance and refueling shall be carried out in such a fashion that spillage of fuels and lubricants do not contaminate the ground or nearby watercourse. And "oil inspector" shall be provided for wash down and refueling areas. Fuel storage shall in proper bounded areas. All spilt and collected petroleum products shall be disposed off in accordance with the relevant legislation.

Clause111.15 All works are to be carried out in such a fashion that the damage or disruption to the flora and fauna is reduced to a minimum wherever possible. Trees or shrubs will only be felled or removed that impinge directly on the permanent works or necessary temporary works, after seeking approval of the Engineer.

Clause 112 Arrangement for Traffic during Construction

Clause 112.7 **Side Roads and Property Accesses**

"At all times the Contractor shall provide safe and convenient passage for vehicles pedestrians and livestock to and from side roads and property access connecting to the roadway. Work which affects the use of side roads and existing access shall not be undertaken without providing adequate provisions to the prior satisfaction of the Engineer."

Clause 112.8 **Plant and Equipment**:

"During the day, plant and equipment working in a position adjacent to traffic and having a projection beyond the normal width of the item, for example, a grader blade shall have a fluorescent red marker attached to the outer end of the projection. During poor light conditions an additional traffic controller within illuminated red marker shall direct traffic around such plant and equipment.

At night, all plant items similar obstructions shall be removed from the normal path of vehicles, to provide a lateral clearance of at least 6m where practicable, with a minimum clearance of 1.2m.

Plant and equipment within 6m of the normal path of vehicles, shall be lit by not less than two yellow steady lamps suspended vertically from the point of the obstruction nearest to a traffic lane, and yellow steady lamps at each end of the obstruction on the site farthest away from the traffic lane."

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Clause 301 Excavation for Roadway and Drains

Clause301.3.3 **Excavation – General**

All excavations shall be carried out in conformity with the directions laid here-in-under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available form excavation are satisfactorily utilized as decided upon beforehand.

While planning or executing excavations, the Contractor shall take all adequate precautions against soil erosion, water pollution etc. as per Clause 306, and take appropriate drainage measures to keep the site free of water in accordance with Clause 311.

The excavations shall conform to the lines, grades, side slopes and levels shown on the drawings or as directed by the Engineer. The Contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the Contractor with suitable material of characteristics similar to that removed and compacted to the requirements of Clause 305

All debris and loose material on the slopes of cuttings shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer and the resulting cavities filled with suitable material and thoroughly compacted in an approved manner.

, “The earthwork shall be carried out as per the sequences stated in this contract or as directed by Engineer-In-Charge.”

Clause301.3.12 **Back-filling**

Backfilling of masonry/concrete/Hume pipe drain excavation shall be done with approved material after concrete/masonry/Hume pipe is fully set and carried out in such a way as not to cause undue thrust on any part of the structure and/or not to cause differential settlement. All space between the drain walls and the side of the excavation shall be refilled to the original surface making due allowance for settlement. In layers generally not exceeding 150 mm compact thickness to the requir5ed density, using suitable compac6tion equipment such as mechanical tamper, rammer or plate compactor as directed by the Engineer?

“Density requirements for back-filling shall be in accordance with Table 300-2” of MORT&H.

Clause 305 Embankment Construction

Clause 305.2.2.2 **Borrow materials**

“No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for embankment and sub-grade as well as compliance to the different environmental requirements in respect of excavation and borrow areas as stipulated, from time to time, by the Ministry of Environment and

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Forest, Government of India and the local bodies as applicable shall be the sole responsibility of the Contractor."

SECTION 400 – SUB-BASES, BASES (NON-BITUMINOUS) AND SHOULDERS

Clause 401.4.2 **Spreading and Compacting**

"The thickness of the loose layers shall be so regulated that the maximum thickness of the layer after compaction does not exceed 150mm."

SECTION 500 – BASE AND SURFACE COURSES (BITUMINOUS):

Clause 501.8.2.4 **Profile Corrective Course and its application:**

I) any high spots in the existing surface shall be removed by a milling machine or other approved method, and all loose material shall be removed to the satisfaction of the Engineer.

ii) "The material for bituminous profile corrective course shall be laid independently of all other courses, adopting such construction procedures and using such equipment as may be appropriate to the specified type of material and thickness of the course manually / machine paid as approved by the Engineer-In-Charge. The method of providing profile corrective course shall be approved by the Engineer-In-Charge.

SECTION 900 – QUALITY CONTROL FOR ROAD WORKS

Clause 901.10 For bitumen, cut back, emulsion, mild steel, cement and other similar material where essential tests are to be carried out at the manufacture's plant or at laboratory other than the site laboratory, the cost of samples, sampling, testing, and furnishing of the test certificates shall be borne by the Contractor. The frequency of test regarding bitumen, cut back and emulsion in respect of its quality shall be as per the MORT&H specification.

2. GENERAL CONDITIONS

2-1 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 authorized by the Commissioner to call for such information

1. PAVER WORKS

a. Centralised Hot Mix plant per hour capacity – 30 / 40 Tonnes

b. Mechanical paver finisher – 2 Nos.

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c. Tippers – 6 Nos.

d. Lorries (to transport materials) – Sufficient Nos.

e. Road roller 8 to 10 tonnes – 1 No.

f. Vibrating Roller-8 -10 tonnes-1 No.

g. Front end loader – 1 No.

h. Mechanical Sprayer

i. Mechanical Brommer

j. LAB UNIT with all necessary equipments to conduct the test – 1 No.

2. FOR PORTABLE HOT MIX WORK

a. Portable Hot mix Plant – 1 No.

b. Road Roller 8 to 10 Tonnes – 1 No.

c. hear Master Boiler – 1 No.

3. FOR COLD MILLING WORK

1. Cold Milling plant equipment. 1 No.

NOTE :

" 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".

2-2 EQUIPMENTS AND PLANT

The contractor shall furnish, maintain and operate at his expenses all tools plants and equipments make it available always at the site viz., Machinery gauges, pyormeter 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 3 m length, 15 meter tape , Brooms, special tools and equipment for sprinkle water, sigh, 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.

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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 aggregate without exceeding the stone temperature.

- The mixer shall be pug mill 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 50 mm, 25 mm, 20mm, 16mm, 12.5 mm, 10 mm, 6.3 mm, 4.75 mm and 2.36 mm must be also available at the site for testing aggregate gradation

2-3 The tenderers shall clearly state their experience of road works, particularly about hot mix asphalt works mentioning the works carried out by them.

2-4 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.

2-5 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.

2-6 The contractor shall have a well equipped testing laboratory with competent laboratory staff. Daily tests shall be made by them in the presence of authorized Corporation staff of asphalt mixtures produced to ensure compliance with this specification and a copy of the test result shall be submitted to the Engineer for record. Tests shall include stability, flow, filler content, grading of Aggregate, bitumen content,

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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 testing done by them.

2-7 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 chalans and the charges for weighing shall be borne by the contractors.

2-8 EXECUTION OF WORK-REGULATIONS TO BE FOLLOWED

The preliminary specifications to the standard 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 contractor for executing works for the Corporation of Chennai.

Materials used for laying of roads and footpaths should be stacked by the contactor at his own cost and pre-check measures 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.C Chennai standard Specifications for Road and Bridge constructions of the Chennai Highway Manual copies of which are available for sale at Govt. press and or with the Chief Engineer, Highways. Chennai . The preliminary specifications of the SSRB shall apply into save in (1) Clause 7-1-1 the words "Corporation of Chennai will be substituted for the word "Government" (2) of

2-9 DEFECTS IN BITUMINOUS PAVEMENTS

The defect 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 sub grade and the deterioration of the asphalt pavement adjoining the cracks, provided that if such cracks, provided that if such cracking result from defective foundations, then Corporation will at their own cost carry out the necessary remedial work before the defects are rectified.

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(iii) Disintegration/traveling 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 than 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.

2-9		Defects as defined in MORT & H specifications with tolerance limit. If defects exceed tolerance limits action to be initiated.	

Permissible Variation from the Job Mix Formula

Description	Permissible Variation	
	DBM	SDBC/BC
Aggregate Passing		
19mm or larger	+ (or) - 8%	+ (or) – 7%
13.2 mm/9.5 mm	+ (or) – 7%	+ (or) – 6%
4.75 mm	+ (or) – 6%	+ (or) – 5%
2.36 mm 1.18mm, 0.6 mm	+ (or) – 5%	+ (or) – 4%
0.3 mm, 0.15 mm	+ (or) – 4%	+ (or) – 3%
0.075 mm	+ (or) – 2 %	+ (or) – 1.5 %
Binder Content	+ (or) – 0.3%	+ (or) – 0.3%
Mixing Temperature	+ (or) – 10^{o}C	+ (or) – 10^{o}C

(vi) 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

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from the road, divided into two approximately equal portions and retained for reference by the Exe. Engineer and by the contractor.

Note: 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 Engineer –in-charge.

3. Subgrade/ Granular Sub Base:

3-2. Scope:

The work shall consist of laying and compacting well graded material on prepared sub-grade in accordance with the requirements of these specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base here in after) as necessary according to lines , grades and cross-sections shown on the drawings or as directed by the engineer.

a) Materials

The material to be used for the work shall be natural sand, moorum, gravel, crushed stone, or combination there of depending upon the grading required. Materials like crushed slag, crushed concrete brick metal and kankar may be allowed only with the specific approval of the Engineer. The material shall be free from organic or other deleterious constituents and conform to one of the three gradings given in Table-1–below.

While the gradings in Table-1 are in respect of close-graded granular sub-base materials, one each for maximum particle size of 75 mm, 53 mm and 26.5 mm , the corresponding gradings for the course graded materials for each of the three maximum particle sizes are given at table -2. Below. The grading to beadoptedfor a project shall be as adopted in the contract.

b) Physical requirements.:

The material shall have a 10 % fines value of 50 KN or more (for sample in soaked condition) when tested in compliance with BS: 812 (part-111) . The water absorption value of the coarse aggregate shall be determined as per IS: 2386 (part-3) . If this value is greater than 2 % , the soundness test shall be carried out on the material delivered to site as per IS: 383. For grading II and III materials , the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density to a uniform air voids content of 5 %.

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Table-1 GRADING FOR CLOSE-GRADED GRANULAR SUB-BASE MATERIALS

IS sieve	Per cent by weight passing the IS sieve		
Designation	Grading-I	Grading-II	Grading-III
75.0 mm	100	…..	……
53.0 mm	80-100	100	……
26.5 mm	55-90	70-100	100
9.50 mm	35-65	50-80	65.95
4.75 mm	25-55	40.65	50-80
2.36 mm	20-40	30-50	40-65
0.425 mm	10-25	15.25	20-35
0.075 mm	3-10	3-10	3-10
CBR Value (Minimum)	30	25	20

Table-2 GRADING FOR COARSE GRADED GRANULAR SUB-BASE MATERIALS

IS sieve	Per cent by weight passing the IS sieve		
Designation	Grading-I	Grading-II	Grading-II
75.0 mm	100	……	……
53.0 mm	……	100	……
26.5 mm	55-75	50-80	100
9.50 mm	……	……	……
4.75 mm	10-30	15-35	25-45
2.36 mm	……	……	……
0.425 mm	……	……	……
0.075 mm	< 10	< 10	< 10
CBR. VALUE (Minimum)	30	25	20

Note: The material passing 425 micron (0.425 mm) sieve for all the three grdings when tested according to IS : 2720 (part-5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively.

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c) Strength of Sub-base

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished.

When directed by the Engineer , this shall be verified by performing CBR tests in the laboratory as required on specimens remoulded at field dry density and moisture content and any other tests for the " Quality" of materials, as may be necessary.

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

3-2. WBM Base:

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

3.3 Bituminous Constructions:

(a) For Bituminous constructions other than wearing course, wher 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 shal bo removed and replaced with fresh material and compacted to specifications.

(b) For wearing course, where the surface is high or low the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. In all case where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 metre and less than 1 land wide

4 MATERIALS FOR WATER BOUND MACADAM

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

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

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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.

4-1 Gravel :

The gravel shall be composed of large, coarse, silicious 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 mesh of 63mm (2YZ") side and wholly retained in every direction in screen of square mesh 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 ASTMC. (I.S. Sieve No. 8)

4-2 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.

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4-3. GRAVEL SOLING FOR EMBANKMENT

4-3-1. 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.

4-3-2 Materials:

The material shall be grave conforming to Clause 4-11

4-3-3. Conveyance :

Clause 4-1 shall apply

4-3-4. Tools, Plants and Equipments :

(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 ft.) length

Tape 30.48m (100 ft)

Straight edge 30.48m (100 ft) long

Brooms

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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 specifications of introducing refinements in construction methods and speeding up the progress of the work, subject to the approval of the Superintending Engineer.

4-3-5. Construction Method : -

(a) Spreading and Compacting :- The earth filling in the embankment shall be moistened and theatrical (Gravel) shall be spread upon it uniformly to the specified depth and in special layers by an approved method, but no material shall be dumped in piles on the embankment and spread there from. The material shall be dragged with a long base drag or other leveling device so as to secure uniform distribution and eliminate all unevenness. 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 4-191-5(c).

The material shall 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 such course shall 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 confirm to the line grade and cross-section 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 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 centre line of the road, and there shall be no depression visible below the straight edge, 12.5mm (half-an inch) or more in depth.

4-3-6. Joining the Old and New surfaces:

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During construction the contractor shall take all precautions to ensure a smooth and shock free junction between the old and new surfaces.

4-3-7. Method of Measurement:

Supplying, spreading and consolidation of materials will be measured by are 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.

4-3-8. 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, paint and equipment for the proper execution of the work.

5 METALLING THE ROAD

5-1 Description:

Metalled road shall consist of a layer of compacted aggregate constructed on a prepared base in accordance with the specifications confirming 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 75 mm(3") the surfacing shall be constructed in two or more courses as directed by the Superintending Engineer.

5-2 Conveyance shall confirm to Clause 4-1.

5-3 Tools, Plant and Equipment shall confirm to Clause 4-3-4.

5-4 Cambers shall confirm to Clause 4-3-5.

5-5 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.

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(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'/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 scalier 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 left in unspread 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 hoards with spirit level being constantly used in conjuction 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 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 out 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 to 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 raw of four or five persons for a twelve foot pavement. After the area between the 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. The 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 each forward and reverse trip maneuvering to get he roller into the correct position shall be done outside of the length under

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rolling either over the completed surface behind or over the incomplete surface ahead.

If three wheeler 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 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 91.4m(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 authorized 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 centerline 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

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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-half 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 sticking to them. The slurry shall be swept-up from the haunches to the crown and upgradient and no part 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 from 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.

(i) **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.

5-6 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.

5-7 Method of Measurement:

Supplying, spreading and consolidation of materials will be measured by area in m^2 (square feet), the length actually being taken along the

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centre line of the metalling and the width along the line at right angle to the centre line.

5-8 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.

5-9 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 grave 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.

5-10 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 (40mmIRC 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 100 mm. 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.

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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 (odd, in successive passes uniformly laping preceding tracks by at least one half width. During rolling slight sprinkling of water may be done if necessary. Compaction shall be done unitl the metals are thoroughly keyed. The rolled surface shall be cheked transversely and longitudinally with templates and any irregularities observed shall be corrected by loosening until the entire surface conform s to desired camber and grade.

(d) **Spreading Gravel:-** Gravel shall then be spread to a thickness a specified evenly over the metalled surface in successive thin layers in order to blind 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 150microns 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 contined 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 tonnes 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.

6 WET MIX MACADAM SUB-BASE/BASE (AS PER MORT&H SPECIFICATION)

6-1 Scope The Work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subgrade/sub-base/base or existing pavement as the case may be in accordance with the requirements of these specifications. The material shall be laid in one or more layers as

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necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be increased to 200mm upon approval of the Engineer.

6-2. Materials

Aggregates: Physical Requirements:

Course Aggregate shall be crushed stone. If crushed gravel is used , not less than 90 % by weight of the gravel pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregate shall confirm to the physical requirements set forth in table below.

Physical Requirements of Course Aggregates for Wet Mix Macadam for sub-base/Base Courses.

	Test	Test Method	Requirements
a)	Los Angeles Abrasion	IS:2386 (part-4)	40 % (Max)
	Value or		
	Aggregate impact value	IS: 2386 (Part-4)	30 % (Max.)
	or IS: 5640		
b)	Combined Flankiness and		
	Elongation indices (Total)	IS: 2386 (part-1)	30 % (Max.)

Notes: a) Aggregate may satisfy requirements of either of the two tests.

b) To determine this combined proportion , flaky stone from a representative sample
sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non –flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The value of flakiness and elongation index so found are added up.

If water absorption value of the course aggregate is greater than 2 % , the soundness test shall be carried out on the material delivered to site as per IS:2386 (part-5)

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6-3. Grading requirements :

The aggregates shall confirm to the grading given in the following table.

GRADING REQUIREMENTS OF AGGREGATES FOR WET MIX MACADEM

IS Sieve Designation	Percentage by weight passing the IS sieve
53.00 mm ……	100
45.00 mm ……..	95-100
26.50 mm …….	……
22.40 mm ……..	60.80
11.20 mm …….	40.60
4.45 mm …….	25.40
2.36 mm ……	15.3
600.00 micron ……..	8.22
75.00 micron ……	0.8

Materials finer than 425 micron shall have plasticity index (PI) no exceeding 6.

The final gradation approved within these limits shall be well graded from course to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

6-4 Preparation of Base

The surface of the sub grade /sub-base/base to receive the water bound macadam course shall be prepared to the specified lines and cross fall (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 surface is obtained if necessary by sprinkling water. Any sub-base/base/surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective courses.(leveling course).

As far as possible, laying water bound macadam course over an existing thick bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. It is desirable to completely pick out existing thin bituminous wearing course where water bound macadam is proposed to be laid over it. However where the intensity of rain is low and the interface drainage facility is efficient , water bound macadam can be laid over

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the existing thin bituminous surface by cutting 50 mm X 50 mm furrows at an angle of 45 degrees to the centre line of the pavement at one metre intervals in the existing road. The directions and depth of furrows shall be such that they provide adequate bondage and also serve to drain water to the existing granular base course beneath the existing thin bituminous surface

b) Provision of lateral confinement of Aggregates.

While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operation.

6-5 Compaction:

After the mix has been laid to the required thickness , grade and cross fall/camber

The same shall be uniformly compacted to the full depth with suitable roller. If the thicknessof single compacted layer does not exceed 100 mm , a smooth wheel roller of 80 to 100 KN weght may be used .For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 KN.or equivalent capacity roller. The speed of the roller shall not exceed 5 km/h.

The portions having unidirectional cross fall/super elevation , rolling shall commence from the lower edge and progress gradually towards the upper edge. There after , roller should progress parallel to the centre line of the road, uniformly over lapping each preceding track by at least one third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from the preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted . The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of roller or from any other cause shall be corrected at once as specified and/or removed and made good.

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Along forms, kerbs, walls or other places not accessible to the roller the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub-grade is soft or yielding or when it causes a wave like motion in the sub-base/base course or sub-grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 metre straight edge , the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall . In no case should the use of unmixed material be permitted to make up depressions.

Rolling shall be continued till the density achieved is at least 98 per cent of the maximum dry density for the material as determined by the method outlined in IS: 2720 (part-8)

After completion , the surface of any finished layer shall be well closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose , segregated or otherwise defective areas shall be made good to the full thickness of the layer and re-compacted.

a) Setting and Drying

After final compaction of wet mix macadam course, the road shall be allowed to dry for 24 hours.

b) Opening to Traffic

Preferably no vehicular traffic of any kind should be allowed on the finished wet mix macadam surface ill it has dried and wearing course laid.

c) Surface Finish

All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer subject to the tolerances directions in force.

d) Quality Control

Control on the quality of materials and works shall be exercised by the Engineer in accordance with the rules in force.

e) Rectification of surface irregularity.

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Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is other wise defective due to sub-grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, re-shaped with added premixed material or removed and replaced with fresh premixed material as applicable and re-compacted in accordance with construction operations .The area treated in the afore said manner shall not be filled up with unmixed and ungraded material or fines.

7. BITUMINOUS MACADAM/DENSE BITUMINOUS MACADAM

As per "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (Forth Revision, reprinted in September 2006), issued by the Ministry of Shipping, Road Transport & Highways, and Government of India and published by the Indian Roads Congress, henceforth called MORT&H Specifications.

8. TACK COAT:

8-1. 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/methods as specified by the engineer.

8-2. Application of Binder:-

Binder may be heated to the temperature appropriate to the grade of bitumen and approved by the engineer and sprayed, all as per MORT&H specifications.

The binder shall be applied uniformly so as to provide a uniformly unbroken spread of bitumen.

9-1 Bituminous Concrete / Semi Dense Bituminous Concrete

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9-2 Mastic Asphaltic Concrete :

As per "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" (Forth Revision, reprinted in September 2006), issued by the Ministry of Shipping, Road Transport & Highways, and Government of India and

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published by the Indian Roads Congress, henceforth called MORT&H Specifications.

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 rate the above points should be borne in mind.

10- 1 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 150^0-163^0C and that of aggregates in range of 155^0 - 163^0 C. Provided also that at no time shall the difference in temperature between the aggregates and binder exceed 14^0 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.

10-2 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 at the time of laying shall be in the range 120^0 C -160^0 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.

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10-3 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 super elevated portions, it shall progress from the lower to upper edge parallel to the centre line of the pavement.

When the roller has passed over the whole area 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 thereof 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 100^0 C

Roller shall not stand on newly laid material while there is a risk that it will be deformed thereby The edges along and transverse of the 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.

10-4 Opening for Traffic

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

10-5 Surface Finish of Work

The surface finish of construction shall conform to the requirements as follows.

10-6 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.

10-7 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

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25mm there from. The corresponding tolerance for edges of the roadway and layers of Pavement shall be 40mm.

10-8 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 conjuction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6mm.

10-9 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 canber boards at intervals of 10 meters

11 QUALITY CONTROL OF WORK

Control 00 the quality of materials and the works shall be exercised by the Engineer-in-charge as furnished below.

11-1 The materials supplied and the works carried out the contractor shall conform to the specifications prescribed in the proceeding clauses.

11-2 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 satisfy himself that the materials and works comply with appropriate specifications.

11-3 Tests procedures for the various quality control tests are indicated in the respective sections of the Specifications or for certain tests with 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.

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11-4 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 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.

11-5 Tests of Bituminous Construction

Sl. No	Type of Construction	Test	Frequency
1	Asphatic Concrete	(i) Quality of Binder	As required
		(ii) Aggregate impact value, Flakiness index and stripping Value of aggregate	One Test per 50-100m^3 of aggregate
		(iii) Mix Grading	One set of test on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a min of two sets per plant per day.
		(iv) Control of temperature of binder, 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 of stability, flow value, density, void contents, subject to a min. of two sets being tested per plant perday.
		(vi) Binder content and gradation in the mix Binder content test vide ASTM D-	One Test for each 100 tonnes of mix subject to a min. of two tests per day per plant.

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		2172	
		(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 m^3 of aggregate.

12. PLAIN CEMENT CONCRETE ROAD :

Coarse aggregate:

The material 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:

12-1. Mixing :

A suitable type of mixer for mixing the aggregates with cement shall be used. The metal and sand are loaded in to mixer in alternate layers with the cement for 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 covered 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 continuously sliced and packed with suitable rods to ensure removal of all air pockets from it. The mix is to be leveled to the toss 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 of 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.

12-2 Inishing and curing:

The surface is then finished properly by means of flcats 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 40 kg per cm2 of 28 days and controlled in the field on the basis of its flexural strengths.

12-3 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.

12-4 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,

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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.

12-5 Joint filling compound:

The sealing compound shall comply with the requirements of 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.

12-6 Design details of Dowel Bars

Design Loading	Slab Thickness (cm)	Dowell Bar Details		
		Diameter (mm)	Length (mm)	Spacing (mm)
4100 kg	15	25	500	200
	25	25	500	300

Note: The recommended details are based on the following values of different design parameters.

Permissible flexural stress in dowel bar = 1400kg/cm^2; permissible bearing stress in concrete = 100kg/cm^2; E Value for concrete = 3.0 x 1 05 kg/cm^2; poisson's ratio = 0.15 K-value of foundation = 8.3 kg/cm^2; maximum joint width = 20mm ; and design load transfer = 4- percent.

12-7 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.

12-8 Design Details of Tie Bars for Central Longitudinal Joint of Two- Lane Rigid Highway Pavements

Slab Thickness (mm)	Tie Bar Details		
	Diameter(mm)	Maximum	Minimum length (cm)

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		Spacing (cm)	Plain Bars	Deformed Bars
15	8	38	40	30
	10	60	45	35
20	10	45	45	35
	12	64	55	40
15	10	30	45	35
	12	45	55	40
	14	62	65	46

12-9 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 “Hand book of Quality Control for Construction of Roads and Runways (First Revision)” These are reproduced in Table below for ready reference.

12-10 TABLE QUALITY TESTS ON MATERIALS

Materials	Test	Test Method	Minimum Desirable frequencies
1. Cement	Pysical and Chemical Test	IS: 269/445/1489/8112	Once for each source of supply occasionally when called for in case of long and improper strorage
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 Contet	S:2386/Pt.(111)	Regularly as required subject to a minimum of one test per day for coarse aggregate and

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			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. (VI)	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. (VII)	-do-
4. Water	Chemical test	IS : 456	Once for approval of source of supply subsequently only in case of doubt

13 ARRANGEMENT OF TRAFFIC

13-1 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 in progress in continuous long stretches, passing places, at least 20 meters 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.

13-2 Passage of traffic along a Temporary Diversion:-

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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 the 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.

13-3 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 pointed with alternate black and white strips. Red lanterns of warning lights of similar type shall be mounted on the barricades of 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 old of pavement markings, pointed 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 lights.

On both sides, suitable regulatory / warning signs shall be installed for the guidance of road users. On each approach at least two signs shall be put up, one close to the point where transition of carriage way begins and other 120 metre away. The signs shall be of approved design and of reflectory type if so directed.

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13-4 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 traveled way shall be kept free of dust by frequent applications of water if necessary.

13-5 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 of passing places shall however be paid for as provisional sum.

13-6 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 conjuction with the General conditions of contract. The same shall not, however, apply in the case of lumpsum 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.

13-7 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 edge of the carriage way, and on single lane 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 let in the form of embedded bricks on either ends or by other means so that it is

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possible to locate the grid points for level measurements after each successive course is laid.

For pavement courses laid only over widening portions, at least one line of levels shall be taken on each strip of widening, or more depending on the width of widening as decided by the Engineer-in-charge. Notwithstanding the above, 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 leveling 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.

13-8 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 of regular intervals or other means as he may decide.

13-9 SCOPE OF RATES, FOR DIFFERENT ITEMS OF WORK

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 country, 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.

13-10 RESTORING THE ROAD-CUTS:

(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 t/le top 300mm only, if the soil at site is either sand or gravel. The fill must be well watered and consolidated.

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(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 or 100mm top finished level with road surface. For the binding 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 bindage, 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 binding 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.

13-11 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 proving new CC 1:2:4 slab 450mm x 450mm x 50mm 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.

13-12 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 grave 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 track coat using bitumen at 5kg / 10m^2, carting away the excavated earth to a lead as directed, etc. complete.

13-13 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 450 mm x 375 mm (200mm including pointing the joints with CM 1:3 to full depth, providing and laying C.C. 1;2:4 water table 250mm (or) 300 mm wide x 60mm thick including rendering the surface smooth with cement, clearing away the surplus excavated earth etc. complete.

We agree to execute the works in accordance with general conditions and general specifications enlisted above along with specifications for RMC.

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14-1 THE INTERLOCKING KERB AND INTERLOCKING FOOTPATH PAVEMENT WITH C.C. SLABS

The Interlocking kerb and interlocking blocks for footpath shall be precast and as per the specifications and sizes. The C.C Slabs, IRC Kerbs to be as per specifications and sizes.

Interlocking Kerbs and Interlocking Footpath: Cement concrete for kerbs shall be 1:2:4 mix using 20 mm. I.S.S.B.G Metal. Kerbs shall be of size 450 mmx375mmx200mm thick.

C.C.Slabs:- Cement concrete for slabs shall be 1:2:4 mix using 20 mm. I.S.S.B.G Metal.

14-2 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 shall 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 25 mm thick and 300mm or 250mm width

14-3 C.C. TRAFFIC KERBS AND SEGREGATORS

The cement concrete for C.C. Traffic Kerbs shall be 1:3:5 mix and for segreators shall be 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 size (304.8mm (254mm+154mm)/2x254mm) i.e. (1’0”x(0’10”+0’6”)/2x0’10”) and 457.1mmx228.6mmx63.25mm)ie., 1’6”x0’9”x0’2.5”) respectively. The surface of the traffic kerbs and segregators shall be rendered smooth with cement at 10kg./10m2.

14-4 FORMING OF CC TRAFFIC KERBS AND SEGRATORS

Traffic Kerbs:

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Picking up the existing road surface shall be made to the require depth and the kerbs shall be set on edge to the require 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 fltling 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.

14-5 PROVIDING CHUTE PIPES

150 mm 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 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 undistribed soil at least as wide at the external diameter of the pipe.

14-6 LAYING AND JOINTING S.W. PIPES

For conducts the stone ware pipes of 150mm and 250 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

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the same by inserting spun yarn. In the socket and pointing with cement as per MOSS No.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 MOSS shall be applicable.

14-7 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 1905mmx914mmx76mm.

(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 : 4-12 mm thick. The joints of R.C.C. railings shall be pointed with C.M. 1:3 to full depth including curning for sufficient time including 2 coats of white washing etc., complete.

14-8 FORMING FOOT-PATH

(a) Forming foot-path with C.C. Slat:- The foot-path shall be formed to proper alignment 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 leveling, 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 corning, 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

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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. The gravel shall be quarried form 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 earth 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. i.s.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 curning 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 leveling, 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.

(e) Forming 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 form 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"0 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 in proper level and consolidation the same as per new kerbs.

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14.9 CERTIFICATE FOR OWNING/POSSESSION OF EQUIPMENTS

BY THE TENDERER

(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.

1. PAVER WORKS

a. Centralised Hot Mix plant per hour capacity – 30 / 40 Tonnes

b. Mechanical paver finisher – 2 Nos.

c. Tippers – 6 Nos.

d. Lorries (to transport materials) – Sufficient Nos.

e. Road roller 8 to 10 tonnes – 1 No.

f. Vibrating Roller-8 -10 tonnes-1 No.

g. Front end loader – 1 No.

h. Mechanical Sprayer

i. Mechanical Brommer

j. LAB UNIT with all necessary equipments to conduct the test – 1 No.

2. FOR PORTABLE HOT MIX WORK

a. Portable Hot mix Plant – 1 No.

b. Road Roller 8 to 10 Tonnes – 1 No.

c. hear Master Boiler – 1 No.

3. FOR COLD MILLING WORK

1. Cold Milling plant equipment. 1 No.

SIGNATURE

NAME

DESIGNATION

OFFICE SEAL

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NB: The Certifying Officer shall personally verify before issuing the certificate and he should take responsibility for any discrepancy, mis-statement or untruth in the certificate.

signature of the Bidder

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CORPORATION OF CHENNAI

…….. DEPARTMENT

Technical Specification Bridges

for the work .....

Superintending Engineer(Bridges)

Bridges Department

signature of the Bidder

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Section VII

Technical Specification

B. Particular Technical Specification for Bridges

PREAMBLE

The Technical Specifications contained herein shall be read in conjunction with the other Bidding Documents as specified in Volume-I.

2.2 General

The Technical specifications covering the materials and the workmanship aspects as well as method of measurements and payments are included in this section. These specifications cover the items of civil and non-civil works coming under scope of this document. All work shall be carried out in conformity with the same. These specifications are not intended to cover the minute details. The works shall be executed in accordance with good practices followed for achieving high standards of workmanship, thus ensuring safety and durability of the construction. All codes and standards referred to in these specifications shall be the latest thereof, unless otherwise stated.

1.1.2 Inclusive Documents

The provisions of special conditions of contract, those specified elsewhere in the tender document, as well as execution drawings and notes, or other specifications issued in writing by the Engineer shall form part of the technical specifications of this project.

2.2.1 The attention of the contractor is drawn to those clauses of codes which require supporting specification either by the Engineer or by 'Mutual' agreement between the 'supplier and purchaser'. In such cases, it is the responsibility of the tenderer/contractor to seek clarification on any uncertainty and obtain prior approval of the Engineer before taking up the supply/construction. In absence of such prior clarification, the Engineer's choice/design will be final and binding on the contractor without involving separately any additional payment.

1.1.4 Measurement and Payment

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The methods of measurement and payment shall be as described under various items of the specification and in the Bill of Quantities. Where specific definitions are not given, the methods described in TNPWD/MORT&H specifications, B.I.S. Codes will be followed. Should there be any detail of construction or materials which has not been referred to in the Specification or in the Drawings and Bill of Quantities but the necessity for which may be implied or inferred there from, or which is usual or essential to the completion of the work in the trades, the same shall be deemed to be included in the rates and prices entered by the contractor in the Bill of Quantities.

Payment to the contractor will be made for the actual quantities only of the work, performed or materials furnished accordance with the contract, and Tender Accepting Authority shall be ordinarily permitted to vary the quantity finally ordered only to the extent of 25 % either way of requirement indicated in the tender documents. The payment will be made as per originally approved rate

1.1.5 Defective Works

All defective works are liable to be demolished, rebuilt and defective materials replaced by the contractor at his own cost. In the event of such works being accepted by carrying out repairs etc., as specified by the Engineer, the cost of repairs will be borne by the contractor.

1.2 Site Information

1.2.1 The information given hereunder and provided elsewhere in these documents is given in good faith by the Employer but the Contractor shall satisfy himself regarding all aspects of site conditions and soil, and no claim will be entertained on the plea that the information supplied by the Employer is erroneous or insufficient.

1.2.2 **General Climatic Conditions**

1.2.2.1 The variation in temperature in this region is as under:

1.2.2.2 The average annual rainfall in the area varies from ----------

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1.2.4 Seismic Zone

The works are located in Seismic Zone III as defined in IRC: 6-2000.

2. GENERAL REQUIREMENTS

The Technical Specifications in accordance with which the entire work described hereinafter shall be constructed and completed by the Contractor shall comprise of the following:

2.1 Part-I: General Technical Specifications

The General Technical Specifications shall be the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (Fourth Revision August 2001", Reprint, September 2006), and subsequent revisions if any, issued by the Ministry of Road Transport and Highways, Government of India and published by the Indian Roads Congress, henceforth called MORT&H Specifications and deemed to be bound into this document.

2.2 Part-II: Supplementary Technical Specifications

The Supplementary Technical Specifications shall comprise of various Amendments/Modifications/ Additions to the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS" referred to in Part-I above and Additional Specifications for particular item of works not already covered in Part-I.

2.2.1 A particular clause or a part thereof in "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (Fourth Revision August 2001, Reprint, March 2006)" referred in Part-I above, where Amended/Modified/Added upon, and incorporated in Part-II, referred to above, such Amendment/Modification/ Addition supersedes the relevant Clause or part of the Clause.

2.2.2 The Additional Specifications shall comprise of specifications for particular item of works not already covered in Part-I.

2.2.3 When an Amended/Modified/Added Clause supersedes a Clause or part thereof in the said Specifications, then any reference to the superseded Clause shall be deemed to refer to the Amended/Modified/Added Clause or part thereof.

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2.2.4 In so far as Amended/Modified/Added Clause may come in conflict or be inconsistent with any of the provisions of the said MORT&H Specifications under reference; the Amended/Modified/Added Clause shall always prevail.

2.2.5 The following Clauses in the "SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (Fourth Revision August 2001, Reprint, March 2006) have been Amended/Modified/Added upon:

Sr. No.	**Section No.**	**Section Title**	**Clause No.**
1.	100	General	102,105,106, 107, 108,109, 110, 111, 114,115,121 and 126
2.	200	Site Clearance	201 and 202
3.	300	Earthwork, Erosion Control and Drainage	301, 304,305,306 and 309
4.	400	Sub-base, Bases (Non-Bituminous) and Shoulder	401
5.	500	Bases and Surface Courses (Bituminous)	501, 502, 503, 504, 507 & 509
6.	800	Traffic signs, Markings and other Road Appurtenances	801
7.	900	Quality Control for Road works	903
8.	1000	Materials for Structures	1002,1006, 1007, 1008, 1009, 1010, 1012,1014 and 1015
9.	1500	Form Work	1501,1502,1503,1504, 1506, 1507, 1508,1509, 1510, 1513
10.	1600	Steel Reinforcement (Untensioned)	1602,1604,1605,1606 and 1607
11.	1700	Structural Concrete	1703,1704,1705,1706, 1707,1709,1710,1712, 1713 and 1715

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Sr. No.	Section No.	Section Title	Clause No.
12.	1800	Prestressing	1801, 1802, 1803, 1804, 1806, 1807, 1808 & 1815
13.	2000	Bearings	2001, 2004 and 2006
14.	2100	Open Foundation	2106
15.	2200	Substructure	2204, 2210
16.	2300	Superstructure	2305, 2306
17.	2500	River Training Work and Protection Work	2504, 2509, 2510
18.	2600	Expansion Joints	2601, 2606 and 2609
19.	2700	Wearing Coat and Appurtenances	2702, 2704,2706, 2708 and 2709

In the absence of any definite provisions on any particular issue in the aforesaid Specifications, reference may be made to the latest codes and specifications of IRC, BIS in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practice as approved by the Engineer.

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SUPPLEMENTARY TECHNICAL SPECIFICATIONS AMENDMENTS/MODIFICATIONS/ADDITIONS TO EXISTING CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS

SECTION 100 (MOST)

GENERAL

Clause 102.

.**The following abbreviations shall be added in this Clause:**

"MORT&H"	:	Ministry of Road Transport & Highways (Previously known as 'MOST', Ministry of Surface Transport)
""BIS"	:	Bureau of Indian Standards
"IRC"	:	Indian Road Congress
"BM"	:	Bituminous Macadam
"DBM"	:	Dense Bituminous Macadam
"GSBC"	:	Granular Sub Base Course
"BC"	:	Bituminous Concrete
"TNPWD"	:	Tamil Nadu Public Work Department
"ASTM"	:	American Society for Testing and Materials
"AASHTO"	:	American Association of State Highway and Transportation Officials
"CBR"	:	California Bearing Ratio
"WBM"	:	Water Bound Macadam
"WMM"	:	Wet Mix Macadam

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"TNPCB"	:	Tamil Nadu Pollution Control Board
"QA"	:	Quality Assurance
"BOQ"	:	Bill of Quantities

Clause 105 SCOPE OF WORK

Sub-Clause 105.3 :"The Contractor shall institute and operate a quality management system complying with IRC: SP-47 (Quality systems for road bridges) and IRC: SP-57 (Quality system for roads). The quality management system shall be described in a Quality Assurance Plan that shall be submitted to the Engineer for acceptance not later than 28 days after the Letter of Acceptance. The costs associated with preparing, implementing and monitoring the quality management system shall be deemed to be covered in the scope of the work. The Quality Assurance Plan shall cover the following items:

i. The Contractor's organization and management including:

- The definition of the Contract and its documentation;
- The organization of the Contract, including the line of command and communication links between parties involved in the Contract;
- Names, roles, responsibilities and authority of principles and key Technical personnel;
- Control of liaison and meetings with third parties;
- Identification of the Contractor's staff responsible for overseeing each major activity;
- Contractor's control of sub-contracts;
- Document control;
- Program for submission of method statements;
- Procedures for the preparation, review and adjustment of programmes for the effective progression of the Works;
- Procedures for the regular review and recording by the Contractor of the quality of the Works;
- Control of personal selection based on skill and experience;

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- Management review and audit to monitor and exercise adequate control over the implementation of the quality plan.

ii. The Contractor's detailed method statements and construction procedures for each major activity whether directly controlled or subcontracted including:

- Plant and materials to be used, safety measures, the requirement for skilled labour and/or special supervision and working space;
- Delivering, handling and storage of materials;
- Environmental control in respect of pollution, noise, dust, temperature, working hours, traffic control etc;
- Hold points i.e. the stages at which checks are necessary before continuing;
- Work instructions, quality control procedures, compliance testing, inspection procedures and work acceptance procedures.

iii. The Contractor's construction quality control including;

- A statement of the Contractor's organization for quality control;
- Control of test laboratories;
- Control of test, measuring and inspection equipment;
- Document control;
- Procedure for monitoring and recording the inspection, test and approval status of the Works;
- Procedures for the collation of quality records and provision of copies to the Engineer;
- Procedures for the receipt, examination and verification of certificates of conformity and test results for purchased products."

Clause 106 CONSTRUCTION EQUIPMENT

a) The Contract shall be required to give a trail run of the equipment for establishing their capability to achieve the laid down Spe- cification and tolerances to the satisfaction of the Engineer before commencement of the work;

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b) All the equipment provided shall be of proven efficiency and shall be operated and maintained at all times in a manner acceptable to the Engineer,

c) All the Plant/equipment to be deployed on the works shall be got approved from the Engineer for ensuring their fitness and before commencement of work;

d) Any material or equipment not meeting the approval of the Engineer shall be removed from the site forthwith;

e) No equipment will be removed from site without permission of the Engineer and

f) The Contractor shall also make available the equipment for site

Quality control work as directed by the Engineer.

g) Adequate standby equipment including spare parts shall be available.

h) All measuring devices and gauges shall be in good working condition. Measuring devices that can affect product quality shall be calibrated prior to use and at prescribed intervals against certified equipment. Calibration procedures shall be established, maintained and documented and corrective actions taken when results are unsatisfactory. Accuracy and fitness of measuring devices shall be ensured by proper maintenance.

i)

Clause 107 CONTRACT DRAWINGS

Sub-Clause 107.1 The Contract Drawing provided for tendering purposes shall be as contained in the Tender Documents and shall be used as a reference only. The Contractor should visualize the nature and type of work contemplated and to ensure that the rates and prices quoted by him in the Bill of quantities have due consideration of the qualitative and quantitative variations, as may be found at the site and complexities of work involved during actual execution /construction

After careful study of the drawings issued by the employer the contractor shall prepare where necessary all supplementary drawings and fabrication drawings with field/construction

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information and shall submit the same to the Engineer for approval prior to construction.
The tendered rates/prices for the work shall be deemed to include the cost of preparation, supply and delivery of all necessary drawings, prints, tracings and negatives which the Contractor is required to provide in accordance with the Contract Two copies of drawings, on the basis of which actual execution of the work is to proceed, shall be furnished free of cost to the Contractor by the Engineer progressively according to the work programmed submitted by the Contractor and accepted by the Engineer. Drawings for any particular activity shall be issued to the Contractor at least 30 days in advance of the scheduled date of the start of the activity.
Examination and/or approval by the Engineer of any drawings or other documents submitted by the Contractor shall not relieve the Contractor of his responsibilities under the Contract.

Clause 108 SITE INFORMATION

Sub-Clause 108.1. The information about the site of work and site conditions in the Tender Documents is given, in good faith for guidance only but the Contractor shall satisfy himself regarding all aspects of site conditions.

Clause 108.2. The location of the works and the general site particulars are as generally shown on the Site plan/Index plan enclosed with the Tender Documents

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Clause 108.3. Whereas the right of way to the bridge sites/road works shall be provided to the Contractor by the land required by him for site offices, labour camps, stores, etc

Clause 108.4 The quarry charts enclosed with the Tender Documents indicate the location of quarries and other sources from which naturally occurring materials are available, for guidance of the Contractor. The leads indicated in the said charts are only approximate. It is assumed that the Contractor has inspected the quarries, borrow areas etc., before quoting his rates for the work to assess the availability of construction materials in required quantity and quality.

“Identification of quarry sites and borrow areas shall be the responsibility of the Contractor. Materials procured from quarry sites and borrow areas identified by Contractor and to be used in Works must comply with the requirements of quality as stipulated in the Technical Specification for particular items of work.”

Clause 109 SETTING OUT

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Sub-Clause 109.1 the contractor shall establish working Bench Marks tied with the Reference Bench Mark in the area soon after taking possession of the site. The Reference Bench Mark for the area shall be as indicated in the Contract Documents and the values of the same shall be obtained by the Contractor from the Engineer. The working Bench Marks shall be at the rate of four per km and also at or near all drainage structures cyer-bridges and underpasses. The working Bench Marks/levels should be got approved from the Engineer. Checks must be made on these Bench Marks once every month and adjustments, if any got agreed with the Engineer and recorded. An up-to-date record of all Bench Marks including approved adjustments, if any shall be maintained by the Contractor and also a copy supplied to the Engineer for his record.

Sub-Clause 109.2 The lines and levels of formation, side slopes, drainage works, carriageways and shoulders shall be carefully set cut and frequently checked, care being taken to ensure that correct gradients and cross section are obtained everywhere.

Sub-Clause 109.3 In order to facilitate the setting out of the works, the centre line of the carriageway or highway must be accurately established by the Contractor and approved by the Engineer. It must then be accurately referenced in a manner satisfactory to the Engineer, every 50m intervals in plain and rolling terrains and 20m intervals in hilly terrain and in ail curve points as directed by the Engineer, with marker pegs and change boards set in or near the fence line, and a schedule of reference dimensions shall be prepared and supplied by the Contractor to the Engineer. These markers shall be maintained until the works reach finished formation level and are accepted by the Engineer.

Sub-Clause 109.4 On construction reaching the formation level stage, the centre line shall again be set out by the Contractor and when approved by the Engineer, shall be accurately referenced in a manner satisfactory to the Engineer by marker pegs set at the outer limits of the formation.

Sub- Clause 109.5 No reference peg or marker shall be moved or withdrawn without the approval of the Engineer and any earthwork or structural work shall be commenced until the centre line has been referenced.

Sub-Clause 109.6 the Contractor will be the sole responsible party for safeguarding all survey monuments, bench marks, beacons, etc. The Engineer will provide the Contractor with the data necessary for

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setting out of the centre line. All dimensions and levels shown on the drawings or mentioned in documents forming part of or issued under the Contract shall be verified by the Contractor on the site and he shall immediately dimensions or levels. The Contractor shall, in connection with the staking out of the centre line, survey the terrain along the road centre line and cross-sections at intervals as required by the Engineer.

Sub- Clause 109.7 after obtaining approval or the Engineer, work on earthwork can commence and the profile and cross-sections shall form the basis for measurements and payment. The Contractor shall be responsible for ensuring that alol the basic traverse points are in place at the commencement of the contract and if any are missing, or appear to have been disturbed, the Contract or t and if any are missing, or appear to have been disturbed, the Contractor shall make arrangements to re-establish these points. A “Survey File” containing the necessary data will be made available for this purpose. If in the opinion of the Engineer, design modifications of the centre line or grade are advisable, the Engineer will issue detailed instructions to the Contractor and the Contractor shall perform the modification in the field, as required, and modify the ground levels on the cross-section accordingly as many times as required. There

Will be no separate payment for any survey work performed by the Contractor. The cost of these services shall be considered as being included in the cost of these services shall be considered as being included in the cost of the items of work in the Bill of Quantities.

Sub-Clause 109.8 The work of setting cut shall be deemed to be a part of general works preparatory to the execution of work and no separate payment shall be made for the same.

Sub-Clause 109.9 Precision automatic levels, having a standard deviation of +2 min per km, and fitted with micrometer attachment shall be used for all double run leveling work.

“Setting out of the bridge alignment and measurement of angles shall be done by using Total Station. Levels shall be taken by Automatic levels with precision micrometer staff having least count of 1mm.”

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Clause 110 Encumbrances in Construction Area, including Trees and Utilities

Sub-Clause 110.1 the contractor shall be responsible to coordinate with service provider /concerned authorities for cutting of trees, shifting of utilities and removal of encroachments etc. and making the site unencumbered from the project construction area required for completion of work. This will include initial and frequent follow-up meetings/ actions / discussions with each involved service provider / concerned authorities. The bidder will not be entitled for any additional compensation for delay in cutting of trees, shifting og utilities and removal of encroachments by the service provider /concerned department shall be made by the Employer.

Sub-Clause 110.2 Drawings scheduling the affected encumbrances such as trees and services like water pipes, sewers, oil pipelines, cables, gas ducts, electricity lines, accessories, telephone poles and OFC cables etc. included in the contract document shall be verified by the contractor for accuracy of scope.

Sub-Clause 110.3 The Employer will make payments to the respective service provider / authorities for cutting of trees and shifting of utilities, wherever required. The contractor will obtain necessary approval from such Authorities after payments by the Employer and also in cases where payments are not required to be made for such shifting. The Employer will also write to all concerned departments / service provider organization for expediting and facilitating cutting of trees, shifting of utilities and removal of encroachment etc.

Sub-Clause 110.4 **any** services and properties affected by the works must be temporarily supported by the Contractor who must also take all measures reasonably required by the various authorities/persons to protect their services and properties during the execution of the works. It shall be deemed to be part of the Contract and no extra payment shall be made for the same.

The information on affected services is not exhaustive, the locations of services within ROW have been indicated based on the information furnished by different authorities and to the extent those authorities are familiar with. The contractor's work

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program must take into account the period of notice and duration of diversionary works, clearance of drawings from Railways and all other authorities for finalization of the work programmed.

Sub-Clause 110.5 The Contractor may be required to carry out certain works for and on behalf of the various bodies and he shall also provide, with the prior approval of Engineer, such assistance to the various bodies as may be authorized by the Engineer.

Sub-Clause 110. 6 Payment

For coordinating the work of cutting of trees, shifting of utilities and removal of encroachments, etc. no separate payment will be made and these will be incidental to the work

The Contractor may be required to carry out the removal or shifting of certain services/utilities on specific orders from the Engineer for which payment shall be made to him. Such works shall be taken up by the Contractor only after obtaining clearance from the Engineer and ensuring adequate safety measures.

Sub-Clause 111.1 General

The Contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the Works and all associated operations on site or off-site are carried out in conformity with statutory and regulatory requirements including those prescribed elsewhere in this document. The provisions specified in the Environment Management Plan Report shall be followed as guidelines.

The Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising for the execution of the Works. This shall wherever possible be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. All vehicles deployed for material haulage shall be spillage proof.

Haul roads shall be inspected at least once daily to clear any accidental spillage. In the event of any spoil, debris, wastes or any deleterious substance from the Site being deposited on any adjacent land, the Contractor shall immediately remove all such material at no cost to the Contract and restore the affected area to its original state to the satisfaction of the Engineer."

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Sub-Clause 111.2 Borrow Pits for Embankment Construction

"Prior approval shall be sought from the concerned State Authorities, and the Contractor shall comply with all local environmental regulations. For all borrow areas, the actual extent of area/zones to be excavated shall be demarcated with the signboards and the operational areas shall be access controlled.

In the case of borrow from the dry highlands, all borrow areas shall be reinstated by the formation gentle side slopes, re-vegetated and connected to the nearest drainage channel to avoid the formation of pools during/after the rainy seasons.

Plant and machinery used in the borrow areas shall conform to State noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards."

Sub-Clause 111.3 Quarry Operations

The Contractor shall obtain materials from quarries only after the consent of the Forest Department or other concerned authorities is obtained. The quarry operations shall be undertaken within the purview of the rules and regulations in force.

Sub- Clause 111. 4 Control of Soil Erosion, Sedimentation and Water Pollution

The Contractor shall carry out the works in such a manner that soil erosion is fully controlled, and sedimentation and pollution of natural water courses, ponds, tanks and reservoirs is avoided. The stipulations in Clause 306 shall govern.

Sub-Clause 111.5 Pollution from Batching Plant

"Concrete batching plants shall be located at least one (1) km away from the sensitive receptors (schools, hospitals, etc.) and at least 500m from urban settlements, unless otherwise required by the statutory requirements."

Sub-Clause 111.6 Substances Hazardous to Health

The Contractor shall not use or generate any materials in the works which are hazardous to the health of persons, animals or vegetation. Where it is necessary to use some substances which can cause injury to the health of workers, the Contractor shall provide protective clothing ort appliances to his workers.

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Sub-Clause 111.7 Use of Nuclear Gauges

Nuclear gauges shall be used only where permitted by the Engineer. The Contractor shall provide the Engineer with a copy of the regulations governing the safe use of nuclear gauges he intends to employ and shall abide by such regulations.

Sub-Clause 111.8 the Contractor must take all reasonable steps to minimize dust nuisance during the construction of the works.

Water tankers with suitable sprinkling system shall be deployed along the haulage roads and in the work sites. Water shall be sprinkled regularly all along the routes to suppress airborne dusts from truck/dumper movements particularly on unpaved roads. Actual frequency will be agreed with the Engineer to suit site conditions."

Sub-Clause 111.15 Equipment and Vehicles used for the Works

Equipments and vehicles deployed for the construction activities shall not be older than 5 years. Equipments used for road and bridge works shall be based on new technology and shall generate noise and pollutants not exceeding the limits specified by the relevant State Authorities. Vehicles and machineries used for road and bridge works are to be regularly maintained to conform to the National Air Quality Standards.

Sub-Clause 111.16 Air Quality

The Contractor shall device and implement methods of working to minimize dust, gaseous and other air-borne emissions and carry out the Works in such a manner as to minimize adverse impacts on the air quality. Construction camps shall have facilities for LPG fuel. The use of firewood shall not be permitted.

The Contractor shall utilize effective water sprays during delivery, manufacture, processing and handling of materials when dust is likely to be created, and to dampen stored materials during dry and windy weather. Stockpiles of friable materials shall be covered with clean tarpaulins, with applications of sprayed water during dry and windy weather. Stockpiles of materials or debris shall be dampened prior to their movement, except where this is contrary to the Specification.

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Any vehicle with an open load-carrying area used for transporting potentially dust-producing material shall have properly fitting side and tail boards. Materials having the potential to produce dust shall not be loaded to a level higher than the side and tail boards and shall be covered with clean tarpaulins in good condition. The tarpaulin shall be properly secured and extend at least 300mm over the edges of the side of the side and tail boards.

The Contractor shall monitor air-quality once weekly in all operational areas under the project and take the necessary steps to comply with the specified requirements. Air quality parameters will include SPM, RPM, SO_2, NO_X, HC and CO. operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stockpiles, borrow sites and spoil disposal sites.

Sub-Clause 111.17 Noise Control

The Contractor shall consider noise as an environmental constraint in the planning and execution of the Works.

The Contractor shall take all necessary measures so that the operation of all mechanical equipment and construction processes on and off the site shall not cause any unnecessary or excessive noise, taking in to account applicable environmental requirements. The Contractor shall use all necessary measures and shall maintain all plant and silencing equipment in good conditions so as to minimize the noise emission during construction works.

Any member of the work force likely to be exposed to beyond their threshold noise levels shall be provided with protective equipment, such as earplugs, and shall be rotated every four hours.

Construction operations shall be limited to daytime hours only, particularly in the settlement areas.

Sub-Clause 111.18 Vibration Control

The Contractor shall take measures during construction activities to control the movement of the work force and construction machinery/equipment, and to avoid/ minimize activities, which produce vibrations.

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Sub-Clause 111.19 Construction Camps

The area for the storage of polluted materials shall be stored on impervious floors and shall be surrounded by impervious ditches in order to avoid spilling of polluted material to surrounding areas.

Construction camps shall be properly arranged to avoid noise pollution to the nearby habitants and to avoid contamination of river and canals from wastewater drainage. To prevent such contamination, wastewater generated at the campsites shall be discharged in to soak pits. These shall be of sufficient capacity to contain 120% of estimated volume. These shall be regularly cleaned and maintained to be effective. Human excreta shall be treated though septic tanks prior to discharge and shall conform to directives and guidelines of the State. Water accumulated in tires, empty vessels and containers of all nature will be regularly cleaned to avoid the related health hazards.

Sub-Clause 111.20 Control and Disposal of Wastes

The Contractor shall control the disposal of all forms of waste generated by the construction operations and in all associated activities. No uncontrolled deposition or dumping shall be permitted. Wastes to be so controlled shall include, but shall not be limited to, all forms of fuels and engine oils, all types of bitumen, cement, and surplus aggregates, gravels, bituminous mixtures etc. The Contractor shall make specific provision for the proper disposal of these and any other waste products, conforming to local regulations and acceptable to the Engineer.

Spilling of oil and bituminous products during construction and transport shall be avoided to reduce the chances of contamination of surface as well as ground water.

Degraded materials shall be disposed of in a manner as approved by the Engineer and wastewater shall be disposed into septic tanks and soak pits etc. The Contractor shall make arrangements to cleanup spoil as soon as the work finishes in a stretch. If such sites are located outside the ROW, restoration of the site to a level acceptable to the land owner(s) will be carried out within a time period agreed between landowner(s) and the Contractor. Separators shall be used to separate POL materials from wastewater prior to discharging to the watercourses or as approved by the Engineer in conformance with directives and guidelines.

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Disposal of solid waste materials shall be outlined in a plan for which environmental clearances shall be obtained from State environmental regulatory authorities. Potential locations for solid waste disposal are the natural depressions and borrow areas. The areas used for dumping of uncontaminated debris shall be covered with 300mm soil and shall be planted. Contaminated debris shall be dumped in depressions whose bed must be impervious e.g., stone quarry sites or depressions made impervious with 450mm thick impervious floor apron as per MORT&H Technical Specifications. Each successive 1.0m layers shall be covered with 500mm thick soil layer, and the area will be covered with 300mm thick layer and planted.

Sub-Clause 111.21 Transport of Hazardous Materials

Transport of al hazardous materials, in bulk or in sealed containers, shall meet the requirements of the State regulations. Prior to ordering transport of hazardous material in bulk, the Contractor must obtain the approval of the relevant authority as well as of the Engineer. Precautionary measures and conformity with regulations shall be stated in a Method Statement for the approval of the Engineer. Sealed containers of hazardous materials shall be stored in a well-ventilated room, well guarded and secured.

Sub-Clause 111.22 Emergency Response

The Contractor shall plan and provide remedial measures to be implemented in the event of occurrence of emergencies such as spillages of oil or bitumen or chemicals. The Contactor shall provide the Engineer with a statement of the measures he intends to implement in the event of such an emergency, which shall include a statement of how he intends to provide personnel adequately trained to implement such measures.

Sub-Clause 111.23 Measurement

"For compliance of all provisions made in this Clause 111, it shall be deemed to be incidental to the work and no separate measurement shall be made. The Contractor shall be deemed to have made allowance for such compliance with these provisions in the preparations of his prices for items of work included in the Bills of Quantities and full compensation for such compliance shall be deemed to be covered by them"

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Clause114 **SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK**

Sub-Clause 114.2 A detailed resource based construction programmed including resources planning using computerized critical path network method/PERT in a form, which facilitates control of the progress of the works and consequences of any changes in terms of time. The programmed shall also include detailed network, activities for the submission and approval of materials, procurement of critical materials and equipment, fabrication of special products/ equipment and their installation and testing and for all activities of the Contractor that are likely to affect the progress of work etc. including updating all such activities on the basis of decisions taken at the periodic site review meetings or as directed by the Engineer. The Contractor shall submit data via electronic media to the Engineer in a form readily compatible with Engineer's planning system.

Testing of various finished items and material; including bitumen, cement, concert, bearings as required under these Specifications and furnishing test reports/certificates;
Monthly progress report will be submitted in a format acceptable to the Engineer. The report shall state the progress which has been achieved compared with the planned progress, illustrate delays in proportion to the progress planned, analyse the consequences and state planned corrective measures. Intermediate progress reports may also be required.
The first issue of the detailed construction programmed including the detailed description of the system and the procedures shall be submitted to the Engineer for acceptance not later than 28 days after the date of receipt of the letter of acceptance.

The contractor shall submit to the Engineer for approval & consent, the updated & revised programmed at every three months interval or as such as directed by the Engineer. The updated & revised programmed shall be submitted showing the actual progress achieved (physical & financial) and the effects of the progress achieved on the timing of the remaining work including any change to the sequence of the activities.

Clause 115 *METHODOLOGY AND SEQUENCE OF WORK*

Prior to start of the construction activities at site, the Contractor shall, within 30 days after the date of the Letter of Acceptance, submit to the Engineer for approval, the detailed construction methodology including mechanical equipment proposed to be used, sequence of various activities and schedule from start to end of the project. Programmed relating to pavement and

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shoulder construction shall be an integrated methodology and the sequence shall be so planned as to provide proper safety, drainage and free flow of traffic.

Sub-Clause 115.1 Submission of Method Statement

The Contractor shall submit methods statement for all items of work. The methods statement shall be submitted in two parts viz. General Part and Special Part.

The General part of the methods statement shall describe the Contractor's proposals regarding preliminary works, common facilities, and items that require consideration at the early stage of the contract. The General part shall be issued along with the first issue of the construction programmed and shall include information on

a) Sources of materials like coarse aggregate and fine aggregate, quantity and quality of materials available in different sources;

b) Sources of manufactured materials like cement, steel, reinforcement, wherever possible the Contractor shall identify at least two sources for each of the items; he shall also submit samples/test certificates of recently manufactured materials for the consideration of the Engineer.

c) Location of site facilities like batching plant etc.

d) Details of facilities/approaches for transportation of men, equipment and materials for construction of foundations and substructure in riverbed, and plan for free traffic flow and safe drainage.

e) Information on procedures to be adopted by the Contractor for prevention and mitigation of negative environmental impact due to construction activities.

f) Any other information required by the Engineer subsequent to the scrutiny of method statement submitted along with the bid.

The general part of the Q.A. Programme shall accompany the methods statement under Sub-Clause 105.3.

Special parts of the methods statement shall be submitted to the Engineer by the Contractor for each important item of work or any part of it or any activity related to work as directed by the Engineer. These statements shall be submitted at least 4 weeks in advance of the commencement of the activity or item of work, unless otherwise stipulated in the contract. The statement shall give information on

i) Details of personnel both for execution and quality control of the work.

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ii) Equipment deployment with details of number of units, capacity, standby arrangements

iii) Sequence of construction, details of temporary or enabling works like, diversions, formwork including specialised formwork for superstructure, details of borrow areas, method of construction of embankment and sub grade, concreting procedures, details of proprietary processes and products (e.g. details of prestressing systems, bearings, expansion joints, reinforced earth work, etc.) and details of equipment to be deployed. Wherever necessary, technical literature, design calculations and drawings shall be included in the methods statement.

iv) Testing and acceptance procedures including documentation.

v) Special part of the Q.A. Programme referred in Clause 105.3 for the particular item of work shall be submitted along with the methods statement for the concerned activity.

vi) Engineer shall examine and approve the methods statement or direct the Contractor to resubmit the statement with required modifications. The modified statement shall be submitted within 14 days of receipt of Engineer's comments.

The sole responsibility for the safety and adequacy of the methods adopted by the Contractor shall rest on the Contractor irrespective of any approval given by the Engineer**.**

Clause 115.2 Approval of proprietary products/processes/systems

Only proprietary products/process proven by International usage in comparable projects shall be permitted to be used. Fully authenticated details of licensing and collaboration arrangement shall be submitted by the manufacturer, where relevant.
Within 90 days of award of work the Contractor shall submit the following information for all proprietary products for approval by the Engineer.

i) Name of manufacturer and name of product/process/system
Complete details of the manufacturer of the product/ process/system shall be furnished. Details of projects where similar product/process/ system have been successfully used shall be furnished. Authenticated copies of license/collaboration agreement shall be furnished.

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ii) General features of the product/product process/system
Detailed write up with methods statements shall be furnished for each product/ process/ System. This shall include complete working drawings & installation drawings, technical specifications covering fabrication, materials, system of corrosion protection etc.,

iii) Details of product development and development testing

iv) Acceptance test and criteria
Manufacturer shall submit a quality assurance system document. Details of acceptance test and criteria of acceptance shall be furnished in this document.

v) Installation procedure.

vi) Maintenance procedure and schedule.

vii) Warranty proposal.

The Engineer may order any additional tests for the purpose of accepting the product. The facility for such additional tests shall be made available by the manufacturer. The charges of these additional tests shall be borne by the Contractor.

Sub-Clause 116 Where the terms crushed gravel/shingle, crushed stone, broken stone or stone aggregate appear in any part of the Tender Documents or Drawings issued for work, they refer to crushed gravel/crushed shingle/crushed stone aggregate obtained from integrated crushing plant having appropriate primary crusher, secondary crusher and vibratory screen.

Sub-Clause 117 APPROVALS OF MATERIALS
Approval of all sources or material for work shall be obtained in writing from the Engineer before their use on the project.

Sub-Clause 118 SUPPLIES OF QUARRY SAMPLES
Raw and processed samples of the mineral aggregates from the approved quarry shall be submitted by the Contractor at no extra cost.

Clause 121 FIELD LABORATORY

Sub-Clause 121.1 This facility will be provided and maintained by the Contractor, as incidental to work and no separate payment shall be made for this item.

Sub-Clause 121.2 Description

Replace the words “shown in drawings” in the first sentence of first paragraph of this Clause with the words “per provisions indicated in this Clause and at a location approved by the Engineer.”Replace “electric supply etc.” to the second sentence of

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first paragraph by “including uninterrupted power supply etc. ”.Delete the first sentence of second paragraph “ The floor space …….. In the drawing” and substitute the following: “The floor space required for the field laboratory shall be of adequate capacity. “

The fourth sentence of second paragraphs “The furnishing ……. in Table 100-2” shall read as under. “A good semi furnished office accommodation shall be provided to the Material Engineers of the Supervision Team as per the direction of the Engineer.” Add the following at the end of this Clause: “There shall also be provided a concrete paved area, for storing samples adjacent to the laboratory, of adequate capacity shall be suitably roofed with open sides giving protection against sun and rain. Within 14 (fourteen) days of the commencement date, the Contractor shall prepare and submit a layout plan and details of the laboratory building and make/supplier of the equipment to the Engineer for his approval.

The field laboratory to be provided under the Contract shall be handed over to the Engineer in finished and fully equipped condition not later than 2 months after the receipt of Notice to Commence Work, and the field laboratory with all equipment/ instrument shall be to the entire satisfaction of the Engineer. During the 2 month period starting from the Notice to Commence work, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.

Clause 121.3 **Laboratory Equipment**

Note: The laboratory set-up must be complete including a set of reference standards, adequately staffed and operational to the satisfaction of the Engineer not later than 2 months from the date of receipt of Notice to commence the works.

The Contractor shall be responsible for the provision of adequately experienced and qualified laboratory staff, in sufficient numbers to be able to meet all testing requirements to the approval of the Engineer, and for the supply of all transportation of staff, testing equipment and samples necessary to allow the testing to be performed in a time scale compatible with the needs of the Site.

Contractor shall arrange to maintain the laboratory in satisfactory manner and will keep stocks of spare equipment and laboratory consumables until the issue of Taking over Certificate.

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The contractor shall provide any other equipment required to check quality as per the requirement of specification in addition to the above.

Sub-Clause 121.7 Rate

The construction, supply, installation, maintenance, and operation including all consumables like chemicals & reagents etc., and all other expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid for separately

123 Providing and Maintain Wireless Communication System

Sub-Clause123.1 Scope

The work covers the provision and maintenance of wireless communication systems with necessary mobile/base trans-receivers and other accessories.

Sub-Clause123.2 Supply

The Contractor shall arrange to supply, install and commission the complete wireless system of approved quality suitable for a range of up to 65 km. The system shall consist of the following

(a) Mobile Trans-receiver suitable for mounting on 4 wheelers with Microphone assembly, Mobile Antenna with Cable and External Speakers assembly (3 W audio output) with all necessary fittings and accessories – 10 sets.

(b) Base Trans-receivers with Microphone assembly, suitable Antenna, external speaker unit (3 W audio out) with all necessary fittings and accessories – 10 sets.

(c) Hand held radio sets – 10 Nos.

The Contractor shall provide the complete wireless system within 12 months from the date of commencement of work of 8 months from the date on which frequency is allotted to him by the Govt. Department, whichever is later. He shall submit a guarantee for replacement of any defective trans-receiver/trans-receivers during the currency of the contract.

Sub-Clause123.3 Approval

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The Contractor shall arrange to obtain all necessary statutory approvals from various Government bodies for operating the system. He shall also fulfill the requirements laid down by various Government Departments and obtain the frequency to operate the wireless system.

Sub-Clause123.4 Maintenance

The Contractor shall arrange to maintain the entire wireless system including the mobile and base trans-receivers and all accessories until the issue of the Taking over Certificate for the complete work. He shall replace any Trans-receiver or accessory which goes out of order, at his own cost and provide all necessary spares and attend to all repairs necessary for keeping the complete system in satisfactory working condition. On issue of the Taking over Certificate after obtaining clearance from the Engineer, the Contractor shall dismantle the complete wireless system and hand over to the Engineer.

Sub-Clause123.5 Measurements for Payment

The measurement for supply and installation of wireless system shall be on lumps basis for the complete system as described in the preceding Para.

If the Contractor fails to commission and hand over the complete wireless system in the stipulated time, an amount of Rs. 10,000 per month or part thereof shall be debited to the Contractor's account

The measurement for maintenance of the wireless system shall be on maintenance months and shall be made on completion of satisfactory maintenance every month. If the Contractor fails to carry out the required maintenance as directed by the Engineer at any stage of work, an amount of Rs.5000 per month or part thereof shall be debited to the Contractor. In addition, the month/months during which the Contractor fails to carry out the required maintenance shall not be measured for payment. Or within granted extended time of completion, the maintenance of wireless system in accordance with Clause 123.4 shall be carried out made for the same. In case of any failure by the Contractor to do so, an amount of Rs.8000 per month or part thereof shall be debited to the Contractor's account.

Sub-Clause123.6 Rates

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The Contract unit rate for the supply and installation of wireless system shall cover all the expenses towards obtaining statutory approvals and operating frequency, erection, commissioning and handing over, guarantee for re3placement of the trans-recover/trans-receivers (which are found defective) during the currency of the Contract and all other incidentals.

The Contract unit rate for the maintenance of wireless system shall be payment in full for carrying out periodic servicing and checking of the system, replacement of components, attending to all necessary repair, payment of taxes, if any, and other incidentals to keep the complete system in satisfactory working condition.

Sub-Clause124 PROVIDING AND MAINTAINING VEHICLES FOR THE ENGINEER

Sub-Clause124.1 Scope

The work covers providing and maintaining of hard top passenger cars and/or hard top jeeps for use by the Engineer as described under the Bill of Quantities.

Sub-Clause124.2 Description

The passenger cars shall be petrol or diesel driven and may be Ambassador or equivalent having cylinder capacity of minimum 1400 cc. The hard top jeeps shall be 4 W Drive either petrol or diesel driven and may be Marti Gypsy Model MG-410, Mahindra Jeep provided by the Contractor shall be decided by the Engineer at various times, out of the total provision in the Bill of Quantities and indicated in writing.

The Contractor shall provide within one month from the date of order by the Engineer, vehicles as indicated above. The vehicles shall be provided and maintained until issue of the Taking over Certificate for the complete Work. Initially, new vehicles shall be provided. In case of vehicles of Indian make, a vehicle shall be replaced with a new vehicle after a maximum run of 75,000 km or two years whichever is earlier. In case of vehicles of foreign make approved by the Engineer, the vehicle shall be replaced with a new vehicle after a maximum run of 1, 00,000 km or three years whichever us earlier All necessary taxes for operating the vehicles shall be fully paid and all necessary papers shall be provided as required by prevailing Motor Vehicles Act with provided day and night as required by the Engineer. The Contractor shall also make

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available drivers having valid license at such times and for such duration as instructed by the Engineer.

Sub-Clause124.4 Withdrawal of vehicles

The Contractor shall withdraw particular vehicle/vehicles for the non-use by the Engineer if so directed by the Engineer. In such cases the instructions for non-use of vehicle shall be given in writing 15 days in advance and the withdrawal of vehicles shall not be for a period of less than 15 days continuously at a time.

Sub-Clause124.5 Measurements for payment

The payment of providing and maintaining vehicles shall be on vehicle day bases for actual number of days the vehicles were provided in satisfactory working order. No payment shall be made for the period of withdrawal as per Clause 124.4 irrespective of the fact whether vehicle was available or not.

Sub-Clause124.6 Rates

The Contract unit rate for providing and maintaining vehicles for Engineer shall include all expenses towards providing and keeping the vehicles in smooth running condition including taxes etc. mentioned in the preceding pares.

Sub-Clause125 SUPPLY OF COLOR RECORD PHOTOGRAPH AND ALBUMS

Sub-Clause125.1 Scope

The work covers the supply of photographs, negatives and albums to serve as permanent record of various stages/facets of the work needed for an authentic documentation as approved by the Engineer.

Sub-Clause125.2 Description

The Contractor shall arrange to take color photographs at various stages/facets of the work including interesting and novel features of the work as desired by the Engineer. The photographs shall be of acceptable quality and they shall be taken by a professionally competent photographer with camera having the facility to record the date of photographs taken in the prints and negative. The Contractor shall supply twp color prints or each of the photographs taken to the standard postcard size mounted in albums of acceptable quality. Also the negative in 35 mm size shall be supplied for each photograph. Each photograph in the album shall be suitably captioned.

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Sub-Clause125.3 Measurements for Payment

Supply of two copies of color record photographs mounted in the albums and the negative thereof shall be measured in number of record photographs supplied.

Supply of additional prints of color record photographs shall be measured in number of additional prints supplied.

Sub-Clause125.4 Rate

The rate for the supply of record photographs shall include the cost of taking the photographs, developing and obtaining color prints, of taking the photographs, developing and obtaining color prints, cost of album, mounting of photographs and captioning the same etc.

The rate for additional color prints shall similarly include all costs include The photographs and materials including negatives shall form a part of the records of the Department and the prints of the same cannot be supplied to anybody else of published without the written permission of Department. .

Clause 126 SUPPLIES OF DIGITIZED CD ROMS

In order to avoid sequencing of the construction work to be covered, it may be necessary that the digitized CD ROMS shall be taken at intervals for each activity from the commencement to the end of road or bridge structure. This sequence can be edited suitably at a later stage to reconstruct the activities for the purpose of training engineers as well as information and record for the posterity.

Sub-Clause 126.1 Description

The work consists of taking video films of important activities of the work as directed by the Engineer during the currency of the project and editing them to a video film of playing time not less than 60 minutes and up to 180 minutes as directed by the /engineer. It shall contain narration if the activities in English by a competent narrator. The edition of the video film and the script for narration shall be as approved by the Engineer. The video cassettes and CD ROMs shall be of acceptable quality and the film shall be capable of producing colour pictures

“In order to avoid sequencing of the construction work to be covered it may be necessary that the video film shall be taken at intervals for each activity from the commencement to the end of road or bridge structure. This sequence can be edited suitably at a later stage to reconstruct the activities for the purpose of training engineers as well as information and record for the posterity.

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Sub-Clause126.2 Measurements for payment

The measurement shall be by number of sets of edited master cassettes each with four copies thereof.

Sub-Clause126.3 Rates

The contract unit rate shall include all expenses for making video films with the help of a professionally competent photographer, editing, narration and supplying the final edited master cassette along with four copies thereof.

SECTION 200 SITE CLEARANCES

Clause 201 CLEARING AND GRUBBING

Clause 201.1 Scope

This work shall consist of cutting, excavating, removing, and disposing of all materials such as trees of girth up to 300 mm, bushes, shrubs, stumps, roots, grass weeds, rubbish etc. and top soil up to 150 mm, which in the opinion of Engineer is unsuitable for incorporation in the work including draining out stagnant water if any from the area of road land, drain, cross drainage structure and other area as specified in the drawing or instructed by Engineer. It shall include necessary excavation by harrow discs or any other suitable equipment, back filling of the pits by suitable soil, resulting from uprooting of trees & stumps and making the surface in proper grade by suitable equipment and compacted by power roller to required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material. Clearing and grubbing shall be performed less than one month in advance of earthwork operation and in accordance with requirement of these specifications.

Clause 201.2 Preservation of property/Amenities

Roadside trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all highway facilities within or adjacent to the highway which are not to be disturbed shall be protected from injure or damage. The Contractor shall provide and install at his own expense, suitable safeguards approved by the Engineer for this purpose

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion water pollution, etc, and where required, undertake additional works to that effect vide Clause 306. Before start of operations, the Contractor shall submit to the Engineer for approval, his work pain including the

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procedure to be followed for disposal of waste materials, etc, and the schedules for carrying out temporary and permanent erosion control works as stipulated in Clause 306.3.

Clause201.3 Methods, Tools and Equipments

Only such methods, tools and equipment as are approved by the Engineer and which will not affect the property to be preserved shall be adopted for the Work. If the area has thick vegetation/roots/trees, a crawler or pneumatic typed dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc, falling within excavation and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the sub grade. Also, all vegetation such as roots under-growth, grass and other deleterious matter unsuitable for incorporation in the embankment/sub grade shall be removed between fill lines to the satisfaction of the Engineer. On areas beyond these limits, trees and stumps required to be removed as directed by the Engineer shall be cut down to 1 m below ground level so that these do not present an unsightly appearance.

All branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

All excavation below the general ground level ar9sing out of the removal of trees, stumps, etc, shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding areas.

Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several meters, shall be suitably treated.

Sub-Clause 201.5 Clearing and grubbing for road embankment, drains and cross drainage structures shall be measured on area basis in terms of hectares. Clearing and grubbing of borrow areas shall be deemed to be a part of works preparatory to embankment construction and shall be deemed of works preparatory to embankment construction and shall be4 deemed of works preparatory to embankment construction and shall new deemed to have been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same. Cutting of trees up to 300 mm in girth including removal or stumps and roots, and trimming of branches of trees

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extending above the roadway shall be considered incidental to the clearing and grubbing operations. Removal of stumps left over after trees have been cut by any other agency shall also be considered incidental to the clearing and grubbing operation.

“Removal of stumps & roots of trees left over after trees have been cut by any other agency shall be considered incidental to the clearing & grubbing

Cutting, including, removal of stumps and roots of trees of girth above 300 mm and backfilling to required compaction shall be measured in terms of number according to the size given below:-

i)	Above	300	mm	to	600	mm
ii)	Above	600	mm	to	900	mm
iii)	Above	900	mm	to	1800	mm
iv)	Above	1800	mm			

For this purpose, the girth shall be measured at a height of 1 meter above ground or at the top of the stump if the height of the stump is less than one meter from the ground.

Sub-Clause 201.6 Rates

Sub-Clause 201.6.1 The Contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labor, materials, tools, equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300 mm in girth as well as stumps left over after cutting of trees carried out by another agency, excavation and back-filling to required density, where necessary and handing, salvaging, piling and disposing of the cleared materials with all lifts and up to a for all needs and lifts.

Sub-Clause2011.6.2 The Contract unit rate for cutting (including removal of stumps and roots) of trees of girth above 300 mm shall include exaction and backfilling to required compaction, handling, salvaging, piling and disposing of the cleared materials with all lifts and up to a for all leads and lifts.

Sub-Clause201.6.3 Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the

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earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

LAUSE 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS

Sub-Clause202.1 Scope

This work shall consist of removing, as hereinafter set forth, existing culverts, bridges, pavements, kerfs and other structures like guard-rails, fences, utility services, manholes, catch basins, inlets, etc., which are in place but interfere with the new construction for are not suitable to remain in place, and of salvaging and disposing of the resulting materials and back filling the resulting trenches and pits.

Existing culverts, bridges, pavements and other structures which are within the highway and which are designated for removal, shall be removed up to the limits and extent specifies in the drawings or as indicated by the Engineer.

Dismantling and removal operations shall be carried out with such equipment and in such a manner as to leave undisturbed, adjacent pavement, structures and any other work to be left in place.

All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to the start of new work.

Sub-Clause202.2 Dismantling Culverts and Bridges

The structures shall be dismantled carefully and the resulting materials so removed as not to cause any damage to the serviceable materials to be salvaged, the part of the structure to be retained and any other properties or structures nearby.

Unless otherwise specified, the superstructure portion of culverts/bridg4es shall be entirely removed and other parts removed below cause to the new construction. Removal of overlying or adjacent material if required in connection with the dismantling of the structures shall be incidental to this item.

Where existing culverts/bridges are to be extended or otherwise incorporated in the new work, only such part or parts of the expiring structure shall be removed as are necessary and directed by the Engineer to provide a proper connection to the new work. The connecting edges weakening or damaging any part of the

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structure to be retained. Due care should be taken to ensure that reinforcing bars which are to be left in place so as to project into the new work as dowels or ties are not injured during removal of concrete.

Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes.

Steel structures shall, unless otherwise provided, be carefully dismantled in such a manner as to avoid damage to members thereof. If specified in the drawings or directed by the Engineer that the structure is to be removed in a condition suitable for re-erection, all members shall be match-marked by the Contractor with white lead paint before dismantling; end pins, nuts, loose plates, etc., shall be similarly marked to indicate their proper location; all pins, pin holes and machined surfaces shall be painted with a mixture of while lead and tallow and all loose parts shall be securely wired to adjacent members or packed in boxes.

Timber structures shall be removed in such a manner as to avoid damage to such timber of lumber as is designated by the Engineer to be salvaged

Sub-Clause202.3 In removing pavements, kerfs, gutters, and other structures like guard-rails, fences, manholes, catch basins, inlets, etc., where portions of the existing construction are to be left in the finished work, the same shall be removed to an existing join or cut and chipped to a true line with a face perpendicular to the surface of the existing joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer.

All concrete pavements, base courses in carriageway and shoulders etc., designated for removal shall be broken to pieces whose volume not exceed 0.02 cu. M. and stockpiled at designated locations it the material is to be used later or otherwise arranged for disposal as directed (see Clause 202.5).

Sub-Clause202.4 Back-filling

Holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved materials and compacted required density as directed by the Engineer.

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Sub-Clause 202.5 Disposal of Materials

All materials obtained on dismantling/milling shall be the property of Employer. The contractor shall give / quote rebate for such dismantled material in his bid proposals. After the rebate the contractor is permitted subject prior approval of Engineer to dispose off the materials with all lifts and leads. The contractor may use suitable materials satisfying the required standards in the works with approval of the Engineer.

Sub-Clause 202.6 Measurements for Payment

The work of dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable:

(I)	Dismantling brick / stone masonry / plain concrete / reinforced concrete including reinforcement.	Cum
(ii)	Dismantling pavement structures such as Sub base / Base Course, Bituminous wearing course, Concrete wearing course	Cum
(iii)	Dismantling pipes, guard rails, road kerfs, gutters and fencing	Linear Meter
(iv)	Dismantling of railing kerb	Linear meter
(V)	Dismantling of Stone pitching/ boulder apron/ brick soling/ stone soling	Cum
(VI)	Dismantling of Steel Superstructure	Ton

Sub-Clause 202.7 Rates

The Contract unit rates for the various items of dismantling shall be paid in full for carrying out the required operations including full compensation for all labor, materials, tools, equipment, safeguards and incidentals necessary to complete the work. These will also include exaction and backfilling where necessary to the required compaction and for handling, salvaging, piling and disposing of the dismantled materials within all lifts and up to all leads of 1000m.

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The contract unit rates for various items of rebate shall be on the full quantities obtained from dismantling taking into account all the operations for reuse of salvaged materials and disposal of the balance of material within all leads and lifts.

Section 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

Clause 304 EXCAVATION FOR STRUCTURES

304.1 Scope

Excavation for structures shall consist of the removal of material for the construction of foundations for bridges, culverts, retaining walls, headwalls, cutoff walls, pipe culverts and other similar structures, in accordance with the requirements of these Specifications and the lines and dimensions showing on the drawings or as indicated by the Engineer. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal; all necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

304.2 Classification of Excavation

All materials involved in excavation shall be classified in accordance with Clause 301.2

304.3 Construction Operations

Sub-Clause 304.3.2 Excavation

Exaction shall be talent to the width of the lowest step of tooting and the sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of personnel and works and to the satisfaction of the Engineer.

The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expense, install temporary or permanent sheet

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piles, coffer dams, shoring or similar as support or protection to the satisfaction of the Engineer."

Sub-Clause 304.4 Measurement for Payment

Excavation for structures shall be measured in cu. M. for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer. Excavation over increased width, cutting of slopes," insert the words "protection/support to existing structures," the Contractor in exc3cutting the work and shall be measured and paid for separately.

Sub-Clause 304.5 Rates

Sub-Clause 304.5.1 The Contract unit rate for the items of excavation for structures shall be p[payment in full for carrying out the required operations including full compensation for

j) setting out;

ii) construction of necessary cofferdams, cribs, sheeting, shoring and bracing and their subsequent removal;

iii) removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundation including pumping when no separate provision for it is made in the Contract;

iv) foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;

v) backfilling, clearing up the site and disposal of all surplus material within all lifts by leads unto 1000 m or as otherwise specified; and

vi) All labour, materials, tools, equipment, safety measures, division of traffic and incidentals necessary to complete the work to Specification.

Clause 305 EMBANKMENT CONSTRUCTION

Sub-Clause 305.2 Material and General Requirements

Sub-Clause 305.2.1 Physical Requirements**:**

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Sub-Clause 305.2.1.2 Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 per cent when tested as per IS: 2720 – Part 40) shall not be used as a fill material. Where expansive clay with acceptable "free swelling index" value is used as a fill material, sub grade and top 500 mm portion of the embankment just below sub grade shall be non-expansive in nature.

"Soils having medium and high swelling potential shall be defined on the basis of Liquid Limit, Plastic Limit, Shrinkage Limit, Gradation, Free swelling Index, Field dry Density and Field Moisture Content and types of Clay minerals present in the soil and as directed by the Engineer. The location and the extent of these soils with medium to high swelling potential should be defined as directed by the Engineer."

Sub-Clause 305.2.1.4 The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when being placed in the embankment and 50 mm when placed in the sub-grade. The maximum particle size shall not be more than two-third of the compacted layer thickness.

Sub-Clause 305.2.2.2 Borrow Materials

:"No borrow area shall be made available by the Employer for this work. The arrangement for the source of supply of the material for embankment and sub-grade as well as compliance to the different environmental requirements in respect of excavation and borrow areas as stipulated, from time to time, by the Ministry of Environmental and Forest, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. If permitted by the 8 m width should be left at intervals no0t exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut and imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth within the offset width from the toe of the embankment re3quired as per the consideration of stabilit5y with a minimum width of 10 m.

Table 300-2

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Compaction Requirements of Embankment and Sub-grade

S. No.	Type of Work/Material	Relative Compaction as %age of maximum laboratory dry density as per IS 2720 (Part 8)
1	Sub-grade and earthen shoulders	Not less than 97%
2	Embankment	Not less than 95%
3	High Embankment (Height >6m)	Not less than 97%
4	Expansive clays	Not allowed

The contractor shall at least 7 working days before commencement of construction of embankment and the sub-grade; submit the following to the Engineer for approval:

(i) The values of maximum dry density and optimum moisture content obtained in accordance with ARE: 2720 (Part 8) for each fill material proposed to be used in the construction of embankment and sub grade.

(ii) The graphs of Density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.

Sub-Clause 305.3 Construction Operations

Sub-Clause 305.3.4 Compacting Ground Supporting Embankment/Sub-grade

"Where necessary the original ground shall be leveled, scarified, mixed with water and then compacted by rolling to facilitate placement of first layer of embankment so as to achieve minimum dry density as given in Table 300-2".

In case where the difference between the sub grade level is less than 0.5 m and the ground does not have 97 per cent relative compaction with respect to the dry density as given in Table 300-2, the ground shall be loosened up to a level 0.5 m below the sub-grade level, watered and compacted in layers in accordance with Clauses 305.3.5 and 305.3.6 to not less than 97 per cent of dry density as given in Table 300-2.

"Backfilling layers in pits, trenches and below the original ground are to be compacted to the relative natural ground density. The natural ground density shall be determined by conducting field density tests at three widely spaced locations along the central

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line of the proposed additional carriageway at a depth between 0.5m to 1.0m. Samples of natural ground are collected at each location, and are tested in accordance with IS: 2720 (Part 8). The relative density (i.e. the percentage of the field dry density to the laboratory maximum dry density) is assessed for each sample, and the greatest relative density obtained is selected as the "natural ground density". If the natural ground density is less than 85% then these are to be compacted after necessary watering so as to achieve not less than 85% of relative compaction".

"Where necessary to facilitate compaction of the sub grade to 97% relative compaction as stated above, a further depth of maximum thickness of 0.2m shall be loosened, watered and compacted in accordance with Sub Clause 305.3.5 and 305.3.6 to not less than 95% of dry density determined in accordance with IS: 2720(Part-I)".

Sub-Clause 305.3.5.2 Moisture content of each layer of soil shall be checked in accordance with IS: 2720 (part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with ID: 2720 (part 7) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the west side of the optimum moisture content obtained from the laboratory compaction curve.

Sub-Clause 305.3.6 Compaction

"Vibratory roller of not less than 80-100 KN static weight with plain or pad foot drum or pneumatic tyre roller of 300 KN weight having tyre pressure of at least 7 kg/sqcm shall be used for compaction."

Sub-Clause 305.4.6

In section / reaches where embankment has to be constructed on marshy or boggy / water logged soils, coarse sand blanket layer (>75 micron) of minimum 500 mm thickness shall be laid before taking up the construction of embankment. The provision of this blanket layer of sand is payable separately.

Sub-Clause 305.8 Measurement for Payment

"Earth embankment/sub-grade construction shall be measured separately by taking cross sections at intervals after clearing and grubbing and if necessary compaction of original ground before the embankment work starts and after its completion and

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computing the volumes of earthwork in cubic meters by the method of average and areas."

Sub-Clause 305.9 Rates

Sub-Clause 305.9.1 The Contract unit rates for the items of embankment and sub grade construction shall be payment in full for carrying out the required operations including full compensation for:

i) Cost of arrangement of laid as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;
ii) Setting out;
iii) Compacting ground supporting embankment/sub-grade except where removal and replacement of unsuitable material removal and replacement of marshy soil or loosening and recomposing is involved;
iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and sub-grade as applicable;
v) Cost of watering or drying of material removal of topsoil in borrow areas and/or embankment and sub-grade during construction as required;
vi) Spreading in layers, bringing to appropriate moisture content and compacting to specification requirements;
vii) Shaping and dressing top and slopes of the embankment and sub-grade including rounding of corners;
viii) Restricted working at sites of structures;
ix) Working on narrow width of embankment and sub-grade;
x) All labor, materials, tools, equipment and incidentals necessary to complete the work to the specifications;
xi) Dewatering; and
xii) Keeping the embankment/completed formation free of water as per Clause 311.

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL

Clause 306.4 **Measurement for payment**

"All temporary sedimentation and pollution control works shall be deemed as incidental to the earthwork and other items of work and as such no separate payment shall be made for the same."

Clause 306.5 **Rates**

CLAUSE 400 **SUB-BASES, BASES (NON BITUMINOUS) AND SHOULDERS**

General

Clause405.7.1 The Contract unit rate for crushed cement in full for carrying out the base/base course shall be payment in full for carrying out the required operations including full compensation for:

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l) breaking the cement concrete slabs, crushing, sieving and recompacting the slab material as sub-base/base course;

ii) all labour, tools, equipment and incidentals to complete the work to the specifications;

ii) carrying out the work in part widths of road where directed.

CLAUSE 401 GRANULAR SUB BASE

Sub-Clause 401.2 Materials

Sub-Clause 401.2.1 "The material shall be free from organic or other deleterious constituents and conform to the Grading 1 given in Table 400-1 with the percentage passing 0.075mm size restricted to 5%. The portion of the total aggregate passing 4.75 mm sieve shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS: 2720 (Part – 37)."

Sub-Clause 401.2.2 Physical Requirements

The Contractor shall, at least 21 working days before the commencement of the construction of the sub-base course, submit to the Engineer, the results for approval of the laboratory testing on the physical properties defined above. The construction of the sub-base course shall be taken up only upon the Engineer's approval of the material.

Sub-Clause 401.3

It shall be ensured prior to actual execution that the material to be used in the sub-base has a minimum CBR value of 30% and other physical requirements when compacted and finished.

When directed by the Engineer, this shall be verified either by performing CBR tests in the laboratory or by conducting DCP test. The CBR tests shall be conducted on specimen soaked for 4 days and compacted to 98% of the maximum dry density as per IS:2720 (Part 8).

When decided by the Engineer – Dynamic Cone Penetration (DCP) tests shall be performed in-situ as per TRRL (UK) Road Note No. 31 and in situ CBR calculated by co-relation given by TRRL.

CLAUSE 500 Base and Surface Courses (Bituminous)

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General

Clause501.8.8.2 Rate for premixed bituminous material: The contract unit rate for premixed bituminous material shall be payment in full for carrying out the required operations including full compensation for, but not necessarily limited to:

i) Preparation of the surface to receive the material

ii) Providing all materials to be incorporated in the work including arrangement for stock yards, all royalties, fees, rents where necessary and all leads and all leads and lifts;

ii) Mixing, transporting, laying and compacting the mix, as specified.

iv) All labour, tools, equipment, plant including installation of hot mix plant, power supply unites and all machinery, incidental to complete the work to these specifications;

v) Carrying out the work in part widths of the road where directed;

vi) Carrying out all tests for control of quality; and

vii) The rate shall cover the provision of bitumen at the rate specified in the contract, with the provision the variation in actual percentage of bitumen used will be assessed and the payment adjusted accordingly.

viii) The rates for premixed material are to include for all wastage3 in cutting of joints etc

ix) The rates are to include for all necessary testing, mix design, transporting and testing of samples, and cores. If there is not a project specific laboratory, the Contractor must arrange to carry out all necessary testing at an outside Laboratory. approved by the Engineer, and all costs incurred in the rate quoted for the material.

x) The cost of all plant and laying trials as specified to prove the mixing and laying methods is deemed to be included in the Contractor's rates for the material.

Clause502.8 The contract unit rate for prime coat with adjustments as described in Clause 502.7 shall be payment in full for carrying out the required operations including full compensation for all components listed in Clause 401.8 (i) to (iv) and as applicable to the work specified in these prime coat at an application. Payment shall be made on the basis of the provision of prime coat at an application rate of 0.6kg per squarre metre, with sdjustment, plus or minus, for the variation, between this amount and the actual amount approved by the Engineer after the preliminary traials referred to in Clause 502.4.3.

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The provision “clause 501.8.8.2 (I) to (xi) be read as clause 501.8.8.2 (I) to (x)” in the following clauses.

504.8, 505.8, 506.8, 507.9, 508,9, 509.9, 510.8, 511.1.8, 511.2.9, 512.8, 513.8, 515.9, 516.9, 517.11, 518.9, 519.2.8, 519.3.7, 520.9, 521.7 and 522.8

Sub-Clause 501.6 Compaction

Intermediate rolling shall be done with a Pneumatic roller of 150-250KN weight having a tire pressure of at least 0.7Mpa; the finish rolling shall be done with 6 to 8 tones smooth wheeled tandem rollers.

Where compaction is to be determined by density of cores the requirements to prove the performance of rollers shall apply in order to demonstrate that the specified density can be achieved. In such cases the Contractor shall nominate the plans, and the method by which he intends to achieve the specified level of compaction and finish at temperatures above the minimum specified rolling temperature. Laying trials shall then demonstrate the acceptability of the plant and method used.

Bituminous materials shall be rolled in a longitudinal direction, with the driven rolls nearest the pavers The roller shall first compact material adjacent to joints and then work from the lower to the upper side of the layer, overlapping on successive passes by at least on-third of the width of the rear roll or, in the case of a pneumatic-tyred roller, at least the nominal width of 300mm.

In portions with super-elevated and unit-directional camber, after the edge has been rolled, the roller shall progress from the lower to the upper edge. Rollers should move at a speed of not more than 5km per hour. The roller shall not be permitted to stand on pavement which has not been fully compacted, and necessary precautions shall be taken top prevent dropping of oil, grease, petrol or other foreign matter on the pavement either when the rollers are operating or standing. The whelks of rollers machine shall be in good working order, to prevent the mixture should be used. Surplus water shall not be allowed to stand on the partially compacted pavement.

CLAUSE 502 PRIME COAT OVER GRANULAR BASE

Sub-Clause 502.2.3 Choice of Primer

"Primer: The primer used for prime coat shall be bitumen emulsion complying with IS: 8887 and CSS – I Grade conforming to ASTM D 2397/AASHTO M 140, and shall be refinery produced. The

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particular grade to be used for the work shall be 80/100 and got approved by the Engineer."

CLAUSE 503 TACK COAT

Sub-Clause 503.2 Materials

"Binder: The binder used for tack coat shall be bitumen emulsion complying with IS 8887 and CSS – I Grade conforming to ASTM D 2397/AASHTO M 140, and shall be refinery produced. The particular grade to be used for the work shall be 80/100 and got approved by the Engineer."

Clause 511 OPEN GRADED PREMIX SURFACING

Sub-Clause 511.1.2.1 The binder shall be operation bitumen of "grade of 80/100"

Sub-Clause 511.1.8 the contract unit rate for open-graded premix surfacing shall be payment in full for carrying out the required operations "except for item of prime coat and tack coat" after the words "required operations"

CLAUSE 800 TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

CLAUSE 801 TRAFFIC SIGNS

Sub- Clause 801.1 General

Sub- Clause 801.1.2 "The signs shall be refectories. They shall be retro-refectories type and made of encapsulated lens type reflective sheeting vides Clause 801.3, fixed over aluminum sheeting as per these specifications."

Sub-Clause 801.2.6 "The aluminum sheet used for signs shall be 2mm thick."

Sub- Clause 801.3 Traffic Signs Having Retro-reflective Sheetings

Sub-Clause 801.3.1 General Requirements

The retro-reflective sheeting used on the sign shall consist of the white or colored sheeting having a smooth outer surface which has the property of retro-reflection over its entire surface. It shall be weather-restart and show color fastness. It shall be new and unused and shall show no evidence of cracking, scaling, printing, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for two years and its having passed these tests shall be obtained from a reputed laboratory, by the manufacturer of the sheeting. The

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reflective sheeting shall be either of the reflective sheeting shall be of High intensity grade with encapsulated lens".

CLAUSE 1000 MATERIAL FOR STRUCTURES

Clause 1002 Sources of Material

The Contractor shall notify the Engineer of his proposed sources of materials prior to delivery. If it is found after trial that sources of supply previously approved do not produce uniform and satisfactory products, or if the product from any other source proves unacceptable at any time, the Contractor shall furnish acce3ptable material from other sources at his own expense.

Samples of materials from the identified sources shall be tested, in the presence of Engineer's representative, for conformity to specifications. It shall also be ensured that the variation in test results of different samples is within acceptable limits. If the product from the approved source proves unacceptable at any time, the Contractor shall identify new sources where materials conforming to specifications are available.
For manufactured items like cement, steel reinforcement, prestressing strands, . the Contractor shall intimate the Engineer details of the source (plant where the material is manufactured), testing facilities available with the manufacturer and arrangements for transport and storage of material at site. If directed by the Engineer, the Contractor shall furnish samples and test results of recently manufactured material. The Engineer, at his discretion, may require the Contractor to test the materials in an independent laboratory approved by the Engineer, and furnish test certificates. The cost of these tests shall be borne by the Contractor. The sampling and test procedures shall be as laid down in Indian Standards or where these are not available as per the directions of the Engineer. Only material from the sources approved by the Engineer shall be brought to the site. If the material from the approved sources proves unacceptable at any time, the contractor shall identify new sources for these materials.
For proprietary items like prestressing anchorages, bearings, expansion joints refer clause 115.1

Clause 1006 CEMENT

"Cement to be used in the works, shall be any of the following with the prior approval of the 'Engineer':
a) Ordinary Portland Cement 43 grade, conforming to IS:8112.

b) Ordinary Portland Cement 53 grade, conforming to IS:12269.

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Manufacturer's test certificate shall be submitted to the Engineer by the Contractor for every consignment of cement. The certificate should cover all the tests for chemical requirements, physical requirements and chloride content as per the provisions of IS:12269.

Independent tests of samples drawn from each consignment shall be carried out at the site laboratory or in an independent laboratory approved by the Engineer, immediately after delivery. The following properties shall be tested.

i) Setting Time
ii) Compressive Strength

The cost of the tests shall be borne by the Contractor. In case the cement is stored beyond 90 days from the date of delivery at site, the following tests shall be carried out at the site laboratory before the cement is used.

i) Setting Time
ii) Compressive strength.

Lot size for independent testing of cement at site shall be the quantity received at site on any day subject to a maximum of 500 t.

Clause 1007 COARSE AGGREGATES

The contractor shall submit for the approval of the Engineer, the entire information indicated in Appendix a of IS: 383. "Costs of all tests shall be borne by the Contractor."

"Integrated stone crusher with Primary and Secondary (Cone or Impact Type) crushers shall be employed for getting proper size and grading of coarse aggregates."

The alkali aggregate reactivity should be measured and reported for getting approval for the source aggregates at the beginning of the work using methods given in IS: 2386. The tests may be repeated if the source, or the type of rock being exploited for winning aggregates, changes.

Clause 1008 SAND/FINE AGGREGATES

"The alkali aggregate reactivity with the fine aggregates shall be measured and reported for getting the approval of the source at the beginning the work in accordance with methodology described in IS:2386".

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Clause 1009 STEEL

Clause 1009.3 Reinforcement/ Unmentioned steel

Single grade of bar Grade Fe 415 conforming IS :1786 shall only be permitted to use. No surface coating process (Fusion bonded epoxy coating, CECRI coating or any other) shall be employed.

"No re-rolled steel shall be incorporated in the work"

Clause 1010 WATER

Water used for mixing and curing shall be clean and free from injurious amounts of oils, acids, alkalis, salts sugar, organic materials or other substances that may be deleterious to concrete or steel. Potable water is generally considered satisfactory for mixing concrete. Mixing and curing with sea water shall not be permitted. Mass guide, the following concentrations represent the maximum permissible values:

(a) To neutralize 200 ml sample of water, using phenolphthalein as an indicator, it should not require more than 2ml of 0.1 normal NaOH

(b) To neutralize 200 ml sample of water, using methyl orange as an indicator, it should not require more than 10 ml of 0.1 normal HCL.

(c) The permissible limits for solids shall be as follows when tested in accordance with IS: 3025

	Permissible Limits (max)
Organic	200mg/lit
Inorganic	3000mg/lit
Soleplates (SO_4)	500 mg/lit
Chlorides (Cl)	500 mg/lit*
Suspended mater	2000 mg/lit

In case of structures of lengths 30_m and below. The permissible limit of chlorides

May be increased upto 1000 mg/lit.

All samples of water (including potable water) shall be tested and suitable measures taken whjere necessary to ensure conformity of the water to the requirements stated herein.

(d) The pH value shall not be less than 6

Clause 1012 CONCRETE ADMIXTURES

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Clause 1012.1 Concrete admixtures are proprietary items of manufacture and shall be obtained only from established manufacturers with proven track record, quality assurance and full fledged laboratory facilities for the manufacture and testing of concrete.

“Admixtures shall not impair the durability of concrete; they shall not combine with the ingredients to form harmful compounds or endanger the protection of reinforcement against corrosion. Only chloride free admixtures shall be used.”

“For all admixtures being used the packing shall be marked with the name of the supplier/manufacturer, brand name (name of the product) and main effect. A certificate for the admixture in question shall be submitted. The certificate shall include the following information;

A) General

a) Chemical name of the active component in the admixture.
b) Values of dry material content, ash content and relative density of admixture, which can be used for uniformity tests.
c) Chloride ion content expressed as a percentage of weight of cement.
d) Ph value and colour.
e) Normal side effects e.g. whether the admixture leads to air entrapment at recommended dosage and if so to what extent.
f) Side effects when overdosed
g) If two or more admixtures have to be used in one mix, their compatibility.
h) Increase in risk of corrosion to reinforcements and embodiments due to the use of admixture.
i) Latest date of test and name of test laboratory.

B) Storing

a) Shelf life.
b) Maximum and minimum allowable temperature.
c) Other instructions (e.g. requirements of stirring).

C) Dosage

Maximum and minimum to be specified as percentage of weight of cement

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After selecting a few acceptable brands and types of admixture based on the manufacturers' data/literature, independent acceptance tests should be carried out for the same using the approved combinations of cement/sand/aggregates intended for the use in the project. After establishing the basic acceptability using strength criteria (compression and tensile strengths) a number of trial mixes be designed using different proportions of admixtures/cement/water etc., to establish the data bank on the behavior of the admixture for the project site conditions. A spectroscopic signature of accepted product should be obtained and preserved for comparison for acceptance of the productions lots.

Retrials should be conducted with change in source/ type of cement.

Workmanship
The dosage should be finalized on the basis of field trial and special mechanical devices should be used for dispensing the admixture in the batching/mixing plant. No addition of admixture after dosage is permitted (including addition in transit mixers)

Manufacturer's experts should be available for consultation /trouble-shooting of problems associated with their product. The conditions of storage, shelf life etc. as specified by the manufacturer's Quality Assurance Plan during process of production should be obtained and filed for reference /record.

Clause 1014 STORAGE OF MATERIALS

Clause 1014.3 Aggregates

"Aggregates shall be stored or stockpiled in such a manner that segregation of fine and coarse sizes will be avoided and also that the various sizes will not become intermixed before proportioning. They shall be stored, stockpiled and handled in such a manner that will prevent contamination by foreign materials."

CLAUSE 1015 TESTS AND STANDARDS OF ACCEPTANCE

Independent testing of pre-stressing steel shall be carried out by the Contractor for each consignment from each source at site in the laboratory approved by the Engineer before use. The tests shall be carried out for the properties as listed in clause 7.2.1 of BS- 5896:1980. These tests are in addition to the tests carried out by the Manufacturer.

CLAUSE 1500 FORM WORK

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Clause 1501 The Contractor shall prepare a formwork mobilization and utilization plan and submit the plan for Engineer's approval at least 28 days before the commencement of construction of structures. The requirement of formwork shall be worked out considering the overall construction programmed of all the structures in the contract. Sufficient formwork shall be mobilized, to enable the structure to be cast in one or more stages, as specified in the drawings. The plan shall take into account the time required for erection of formwork, retention in position, stripping, removal and subsequent use in the next and subsequent structures.

Notwithstanding Engineer's approval of mobilization plan, if due to any reason, Contractor has to arrange additional formwork, to meet the requirements of the construction program, it shall be done by the Contractor without any extra cost to the Employer.

Clause 1502 Materials

"All materials shall comply with the requirements of IRC-87.

Materials and components used for formwork shall be examined for damage or excessive deterioration before use / reuse and shall be used if found suitable after necessary repair.

Only steel formwork shall be used. The steel used for forms shall be of such thickness that the forms remain true to shape. All bolts should be countersunk. The use of approved internal steel ties or plastic spacers shall be permitted. Structural steel tubes used as support for forms shall have a minimum wall thickness of 4 mm."

Clause 1503 DESIGN OF FORMWORK

Sub-Clause 1503.1 The Contractor shall furnish the design and drawing of complete formwork (i.e. the forms as well as their supports) for approval of the Engineer before any erection is taken up. If proprietary system of formwork is used, the Contractor shall furnish detailed information as per Appendix 1500/I ti the Engineer for approval.

Notwithstanding any approval or review of drawing and design by the Engineer, the Contractor shall be entirely responsible for the adequacy and safety for formwork. "The work of formwork shall not commence without approval of the Engineer"

Clause 1503.2

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"For distribution of load and load transfer to the ground through staging, an appropriately designed base plate must be provided which shall rest on firm sub-stratum".

Clause 1504 WORKMANSHIP

The loading from the formwork shall be distributed to the soil or the permanent works below (e.g. pile cap) in such a manner that any total or differential settlements are within acceptable limits.

Clause 1506 PRECAUTIONS

(vii) Adequate support against sideway and lateral loads due to construction operations and wind shall be provided.

In case cantilevers are supported directly from the ground, the supports for cantilevers shall be removed simultaneously with main supports only after approval for the same from the Engineer.

(viii) Forms shall be rigid and of adequate section to reduce deflections. Forms shall have sufficient rigidity to resist horizontal pressures caused by flowing concrete resulting from use of super plasticisers. The formwork shall resist the lateral pressure caused due to fast rate of placement by concrete pumps.

Clause 1507 PREPARATION OF FORMWORK BEFORE CONCRETING

The Contractor shall give the Engineer due notice before placing any concrete in the forms to permit him to inspect and approve the formwork, but such inspection shall not relieve the contractor of his responsibility for safety of formwork, men, machinery, materials and finish or tolerances of concrete. Concreting shall not commence without approval of the Engineer”

Clause 1508 REMOVAL OF FORMWORK

Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as possible after the concrete has set, in order to avoid cracking due to shrinkage of.

For priestesses units, the side forms shall be released, as early as possible and the suffix forms shall permit without restraint deformation of the member, when prestress is applied. Form supports and forms for cast in situ members shall not be removed until sufficient prestress has been applied to carry the dead load and any formwork supported by the member and anticipated construction loads.

Clause 1509 RE-USE OF FORMWORK

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"After forms are stripped, all materials to be reused shall be thoroughly cleaned. Holes bored through sheathing for form ties shall be plugged by driving in common corks or foamed plastics. Patching plaster may also be used to fill small holes. After cleaning and before refixing, each formwork shall be got approved from the Engineer.

Formwork and staging shall be so used so as to maintain quality of the exposed surface. However, if in the opinion of the Engineer, any particular panel/member has become unsatisfactory for use at any stage, the same will be rejected.

All bent steel props shall be straightened before reuse. The maximum deviation from straightness is 1/600 of length. The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition.

Clause 1510 SPECIALISED FORMWORK

For climbing form work the rate of slipping the formwork shall be designed for each individual case taking into account various parameters including the grade of concrete, admixtures, etc. In the case of segmental construction, the concrete admixtures, etc. In the case of segmental construction, the concrete mix shall be normally designed for developing high early strength so that the formwork is realised as early as possible.

In order to verify the time and sequence of striking/removal of specialised formwork, routine field tests for the consistency of concrete and strength development are mandatory and shall be carried out before adoption.

For specialised formwork, the form lining material may be either marine plywood of steel sheet of appropriate thickness. Marine plywood is preferred where superior quality of surface is desired, whereas steel sheeting is normally used where large number of repetitions is involved.

Clause 1513 RATE

The unit rate of the Plain Concrete or Reinforced Concrete or Prestressed Concrete as defined in respective sections shall be deemed to cover the costs of all formwork, including cost of all materials labour, tools and plant required for design, construction and removal of formwork and supervision as described in this section including properly supporting the members until the concrete is cured, set and hardened as required.

“The unit rate shall include all costs for preparation of erection scheme, designs of false work and formwork and their approval.”

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CLAUSE 1600 STEEL REINFORCEMENT (UNTENSIONED)

Clause 1602 GENERAL

Reinforcements may be either mild steel/medium tensile steel or high strength deformed bars. They may be uncoated or coated with epoxy or with approved protective coatings.

"Reinforcements shall be high strength deformed bars of grade S415 conforming to IS: 1786. Only uncoated steel shall be used as reinforcement .

Clause 1604 Bending of Reinforcement

The reinforcement shown on the drawings shall be considered merely symbolic representations of the shape and position and shall not be used by the Contractor to justify any deviation from the stipulated requirements. Bar bending schedules and any supplementary drawings as may be required shall be furnished by the Contractor and got approved by the Engineer before start of work. The bending schedules shall state the number, shape and length of bar and weight in respect of each type. System of bar referencing should be coherent and systematic. A separate bar bending schedule shall be prepared for auxiliary bars like spacers chairs etc.

Clause 1605 PLACING OF REINFORCEMENT

Cover blocks shall be made of concrete or cement mortar with the same durability properties as the surrounding concrete and with the same type of constituents. In visible surfaces, the cover blocks shall be of the same colour and texture as the surrounding concrete. The Contractor's proposal for cover blocks shall be submitted to the Engineer for acceptance.

Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concrete is deposited.

(f) Tolerances:

1. Tolerance of cover: Deviation shall not exceed +10 mm. No negative tolerance is allowed.

2. Tolerance in position: Tolerance for deviation from the positions shown in the drawings shall not exceed the following:

Structural depth d (mm)	Tolerance(mm)
d < 1000	< 10

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1000 < d < 2000	< 0.01d
2000 < d	< 20

Clause 1606 BAR SPLICES

Clause 1606.1 To the extent possible, all reinforcement shall be furnished in full lengths as indicated in drawings.

The location of joints in continuous reinforcing bars, not shown in drawings, shall be submitted to the Engineer for acceptance. If nothing contrary has been specified, the number of bars to be joined in any cross-section shall not exceed one-third of the total.

Sub-Clause 1606.2 Welding

Sub-Clause 1606.2.1 While welding of reinforcement will be permitted only if detailed on the drawing or approved by the Engineer. Weld shall develop an ultimate strength equal to or greater than that of the bars connected.

In prestressed concrete members, when welding of untensioned reinforcement is permitted by the Engineer, it shall be carried out before insertion of the prestressing tendons/sheathing.

Clause 1607 TESTING AND ACCEPTANCE

The fabrication, furnishing and placing of reinforcement shall be in accordance with these specifications and shall be checked and accepted by the Engineer.
Manufacturer's test certificate regarding compliance with Indian Standards for each lot of steel shall be obtained and submitted to the Engineer. If required by the Engineer, the Contractor shall carry out confirmatory tests in the presence of a person approved by the Engineer. Cost of these tests shall be borne by the Contractor. The sampling and testing procedure shall be as laid down in I.S.1786-1985. However if any test piece selected from a lot fails, no re-testing shall be done and the lot rejected.

CLAUSE 1700 STRUCTURAL CONCRETE

CLAUSE 1703 GRADES OF CONCRETE

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Sub-Clause 1703.2 The lowest grades of concrete in bridges and corresponding minimum cement contents and water-cement ratios shall be maintained as indicated in Table 1700-2 and 1700-3.

TABLE 1700-2 For all major bridges (bridges with total length 60m and above, ROB,s, Flyovers, Grade Separators) and minor bridges (bridges with total length less than 60 m & Underpasses)

(A) Minimum cement content and maximum water cement ratio:

Structural Member	Min. cement content (kg/cum)		Max. water cement ratio	
	Major Bridges	Minor Bridges	Major Bridges	Minor Bridges
PCC Members	360	310	0.45	0.45
RCC Members	400	400	0.45	0.45
PSC Members	400	400	0.40	0.40

(B) Minimum strength of concrete:

Member	Major Bridges	Minor Bridges
PCC Members	M25	M15
RCC Members	M30	M20
PSC Members	M35	M35

Notes:

1. The minimum cement content is based on 20mm aggregate (nominal max. size). For 40mm and larger size aggregates, it may be reduced suitably but the reduction shall not be more than 10 per cent.
2. For under water concreting, the cement shall be increased by 10 per cent.

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The cement content shall be as low as possible but not less than the quantities specified above. In no case shall it exceed 540 kg /cu.m.

Clause 1704 PROPORTIONING OF CONCRETE

Prior to the start o construction, the Contractor shall design the mix in case of “Design Mix Concrete: and submit to the Engineer for approval, the proportion of materials, including admixtures to be used. Water-reducing admixtures (including plasticisers or super-plasticisers) may be used at the Contractor’s option, subject to the approval of the Engineer. Other types of admixtures shall be prohibited, unless specifically permitted by the Engineer.

"In proportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the manufacturer's weight per bag, a reasonable number of bags shall be weighed separately to check the net weight. Where cement is weighed from bulk stock at site and not by bag, it shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in a clean and serviceable condition. Their accuracy shall be periodically checked".

"It is most important to keep the specified water- cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined as frequently as possible, frequency for a given job being determined by the Engineer according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For the determination of moisture content in the aggregates, IS: 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weight of aggregates to allow for the variation in weight of aggregates due to variation in their moisture content".

Clause 1704.4 Additional requirement

“Design mix concrete is only permitted to be used in structural element for this project.” Additional requirements shall also

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consist of thje following overall limits of deleterious substances in concrete:

a) The total chloride content of all constituents of concrete as a percentage of mass of cement in mix shall be limited to values given below:

- Prestressed Concrete
  "0.06%"per cent
- Reinforced concrete exposed to chlorides in service "0.06%"per cent
  (e.g. structures located near sea coast)
- Other reinforced concrete construction
  "0.1% per cent

b) The total sulphuric anhydride (SO_3) content of all the constituents of concrete as a percentage of mass of cement in the mix shall be limited to 4 per cent

Clause 1704.6 Materials for pumped concrete:

Materials for pumped concrete shall be batched consistently and uniformly. Maximum size of aggregate shall not exceed one-third of the internal diameter of the pipe.

Grading of aggregate shall be continuous and shall have sufficient ultra fine materials (materials finer than 0.25 mm). Proportion of fine aggregates passing through 0.25mm shall be between 15 and 30% and that passing through 0.125 mm sieve shall not be less than 5% of the total volume of aggregate. Admixtures to increase workability can be added. When pumping long distances and in hot weather set retarding admixtures can be used. Fluid mixes can be pumped satisfactorily after adding plasticisers and super plasticisers. Suitability of concrete shall be verified by trial mixes and by performing pumping test.

Clause 1705 ADMIXTURES

"Duly tested admixtures/additives conforming to IS:6925 and IS:9103 (without replacement of cement) may be used subject to satisfactory proven use, with the approval of the Engineer. Admixtures generating Hydrogen or Nitrogen and containing chlorides, nitrates, sulphates, sulphates and any other material liable to affect the steel or concrete shall not be permitted"

"The general requirements, physical and chemical requirements shall be as per Clause 1012."

Clause 1706 SIZE OF COARSE AGGREGATE

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Table 1700-7 in this clause shall read as under:

Sl. No.	Components	Maximum Nominal Size of Coarse Aggregate (mm)
i)	Reinforced concrete pile cap, pier abutment return wall approach slab, plain concrete filling	40
ii)	All reinforced concrete except those listed in i) All prestressed concrete	20

Clause 1707 EQUIPMENT

"Unless specified otherwise, equipment for production, transportation and compaction of concrete shall be as under":

a) For production of concrete

"Batching and mixing of the concrete shall be done in a concrete batching and mixing plant fully automatic with a minimum capacity of 15 cum. per hour. The plant shall be approved by the Engineer".

Para 3 of this clause shall read as under:

Measurement of cement ± 3 percent of quantity of cement in each batch

Measurement of water ± 3 percent of quantity of water in each batch

Measurement of aggregate ± 3 percent of quantity of aggregate in each batch

Measurement of admixture ± 3 percent of quantity of admixture in each batch.

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Clause 1709 TRANSPORTING, PLACING AND COMPACTION OF CONCRETE

When concrete is conveyed by chute3, the plant shall be of such size and design as to ensure practically continuous flow. Slope of the chute shall be so adjusted that the concrete flows without the use of excessive quantity of water and without any segregation of its ingredients. The delivery end of the chute shall be as close as possible to the point of deposit. The chute shall be4 thoroughly flushed with water before and after each working period and the water used for this purpose shall be discharged outside the formwork.

"For placing Concrete with Pumps**:** Pipe Lines from the pump to the placing area should be laid out with a minimum of bends. For large concrete placements standby pumps shall be available. Suitable valves (air release valves, shutoff valves etc.) shall be provided as per site needs. The pumping of concrete shall be preceded by a priming mix to lubricate the pump and pipeline. A rich mix of creamy consistency shall be required for lubricating the pipelines. Continuous pumping shall be done to the extent possible. After concrete has been placed the lines and all related equipment shall be cleaned immediately. A plug sponge ball shall be inserted in the end near the pump and shall be forced through the line by either water or air pressure. Pipes for pumping should not be made from materials which can harm concrete; aluminum alloy pipelines shall not be used."

Clause 1710 CONSTRUCTION JOINTS (Refer Appendix 1700/1 - Preparation of the Surface of the Joint)

Laitance shall be removed before fresh concrete is cast. The coarse aggregate shall be made visible to a depth of 5mm to 10mm. If concrete has partially hardened, it shall be treated by wire brushing or with a stiff water jet followed by drying with air jet immediately.

“Preparation of the Surface of the Joint

“Bush hammering is not permitted since it loosens the coarse aggregate and results in extensive micro cracks.”

Concreting of Joints:

For a vertical construction joint, a stopping board shall be fixed previously at the predetermined position and shall be properly stayed to prevent its displacement or bulging when concrete is compacted against it. Concerting shall be continued right up to

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the board.

"At vertical construction joints, a fine mesh on the inner surface of the stopping board shall be placed, if directed by the Engineer, to facilitate removal of laitance."

Clause 1712 ADVERSE WEATHER CONDITIONS

Clause 1713 PROTECTION AND CURING

Clause 1713.1 Water Curing

Water for curing shall be as specified in Section 1000

"Wherever possible, use of water sprinklers or perforated pipes should be encouraged for curing of concrete. Such arrangement must be maintained for a minimum period of 21 days after concreting."

Clause 1715 TOLERANCES

Tolerance for dimensions/shape of various components shall be as indicated in these specifications or shown on the drawings or as directed by the Engineer.

Clause 1715.1 Sectional Dimensions

"In the absence of any information in drawings or specifications, for particular cases, the following limitations shall apply.

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Dimension (mm) 'a'	Tolerances (mm) '$?_a=(a_{nominal} - a_{actual})$'
Beams, columns, walls	
a $\leq$ 200	$\|\delta a\| < 5$
200 < a $\leq$ 2000	$\|\delta a\| < 3.5 + 0.008\ a$
2000 < a	$\|\delta a\| < 175 + 0.001\ a$
Slabs	
a $\leq$ 200	$-10 < \delta a < 6$
200 < a $\leq$ 2000	$-20 < \delta a < 4 + 0.010\ a$
2000 < a	$-30 < \delta a < 20 + 0.002\ a$

Clause 1715.2 Deviations from Position, etc.

a) Deviation from specified position in plan ±10 mm

b) Variation in levels at top ± 10 mm

c) Variation of reduced levels of bearing areas ± 5 mm

d) Variation in plumb over full height of piers ± 10 mm

e) Surface irregularities measured with 3 m straight edge
   i) all surfaces except bearing areas ± 5 mm
   ii) bearing areas ± 3 mm

f) Variation in length of superstructure - overall and

   length between bearings ± 10 mm

   or +0.1% of the

length, whichever is lesser

CLAUSE 1800 PRESTRESSING

Clause 1801 GENERAL

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Concrete and unmentioned steel for the construction of priestesses concrete members shall conform to the requirements of sections 1700 and 1600 for structural Concrete and steel Reinforcement respectively in so as the requirements of these section apply and are not specifically modified by requirements set forth herein..
Prestressing system shall conform to FIP Recommendation- "Recommendations of acceptance of post-tensioning systems" June 1993.

Clause 1802 MATERIALS

Clause 1802.2.1 the joints between the ends of the coupler and the duct shall be sealed with adhesive sealing tape to prevent penetration of cement slurry during concreting. The couplers of adjacent ducts should be staggered wherever practicable.

"The joint between the end of coupler and duct shall be sealed with heat shrink tape to prevent penetration of slurry during concreting. The couplers of adjacent ducts should be staggered at least 300 mm apart."

Clause 1802.2.2. The internal area of the sheathing duct shall be in accordance with the recommendations of the system manufacturer and shall be about three times the area of the tendons. In case of 6T13, the inner diameter of the sheathing shall not be less than 50 mm, 75 mm and 90 mm respectively or those shown in the drawing, which ever is greater.

Couplers and splices shall be larger in diameter than ducts joined.

Clause 1802.2.3 Pull-in or push-in of prestressing strands shall be mechanised.

Strands shall not be placed in the ducts before concreting. The ducts shall be sealed at the ends by plastic caps to prevent water from entering.

Cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing, or the sheathing shall be stiff ended by other suitable method during concreting. The sheathing supports shall be such as to prevent floatation of empty cable duct during concreting.
In severe environment. Cables shall be threaded after concreting. In such cases a temporary tendon shall be inserted in the sheathing or the sheathing shall be stiffened by other suitable method during concreting.

Clause 1802.2.4 Corrugated HDPE sheathing ducts

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When high-density polyethylene (HDPE) sheathing ducts are specified, the material for the ducts shall be with more than 2 percent carbon black to provide resistance to ultraviolet degradation and shall have the following properties:

Specific Density : 0.954 g/cm^3 at 23 °C

Yield Stress : 18.0 N/mm^2

Tensile Strength : 21.0 N/mm^2

Shore Hardness D-3 sec. Value : 60

-15 sec. Value : 58

Notch impact strength at 23 °C : 10 KJ/m^2

- 40 °C : 4 KJ/m^2

Coefficient of Thermal Expansion for

20 °C - 80 °C : 1.50 x 10^{-4} KJ/m^2

The thickness of the wall shall be 2.3 $\pm$ 0.3 mm as manufactured and 1.5 mm after loss in the compression test, for duct size upto 160 mm OD.

The ducts shall be corrugated on both sides. The ducts shall transmit full tendon strength from the tendon to the surrounding concrete over a length not greater than 40 duct diameters.

These ducts shall be joined by adopting any one or more of the following methods, as convenient to suit the individual requirements of the location, subject to the satisfactory pressure tests, before adoption.

- Screwed together with male and female threads.
- Joining with thick walled HDPE shrink couplers with glue. This can also be used for connection with trumpet, etc.
- Welding with electro fusion couplers.

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The joints shall be able to withstand an internal pressure of 0.5 bar for 5 minutes as per test procedure given in Appendix-1A of IRC: 18 - 2000.

Clause 1802.3 Heading of the clause shall be “Anchorages and Tendon couplers”

Clause 1802.3.1 The word ‘Anchorages’ shall be replaced by the words ‘anchorages and couplers’ in sentence 1 of the paragraph.
The sentence “Anchorages shall conform to BS:4447” in the second line of first paragraph is deleted.
Add the following after the words “furnished to the Engineer” in sentence 3 of paragraph 1 of this Clause:
“Couplers which connect two tendons to form a continuous tendon, should be tested in the same way as anchorages formed by mechanical means.”
The tests and test certificated referred here shall be valid only for the approval of the prestressing system and shall in no way be deemed to substitute or supplement the acceptance testing of anchorage or anchorage elements covered by 1803.

Clause 1804.3.2
CLAUSE 1803 TESTING OF PRESTRESSING STEEL AND ANCHORAGE

All samples shall be representative of the lot and in the case of wire or strand shall be taken from the same master roll. At least 5.0m length shall be selected from each lot for testing. Also two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be tested. Testing of anchorage - cable assemblies shall be carried out in accordance with procedures in FIP document "Recommendations for the acceptance of Post Tensioning systems”, June 1993.

The frequency of such tests should be as follows:

1) For acceptance of the tendon at the stage of submission of tendons, the manufacturers certificate together with the data of previously conducted and most recent test results of "Acceptance Testing" is acceptable subject to further testing as given below.

2) Acceptance Testing for the works

a) Static load test for tendon-anchorage assembly

- A series of three tests using the proposed combination of anchorage systems and the

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prestressing strand/wire/bars. All the tests should meet the following requirements.

- Residual deformations of anchorage components after the test should confirm the reliability of the anchorage.
- The increase in the displacements between the anchorage components as well as between the prestressing steel and anchorage components should not be disproportionate to the increase in tendon force.
- The above relative displacements during the 0.8Fpk load stage should stabilize within the first thirty minutes of the load duration of 1 hour.
- The mode of failure of tendon should be by the fracture of the prestressing steel. Failure of the tendon should not be induced by the failure of anchorage components.
- The measured anchorage efficiency should be:(Refer CEB/FIP Guidelines for details).
- The total elongation εu in free length of the tendon under the load Ftu should be εu > 2%

b) Dynamic load test with tendon/ anchorage assembly

This test is to be carried out for every new combination of type of anchorage and tendons. A series of three successful tests shall be carried out for acceptance of the systems. This test is considered as essential for both unbounded and bonded cables as per FIP document.

Requirements:

Each test result should meet the following requirements

- Fatigue failure of anchorage components should not occur.
- The minimum fatigue strength of post-tensioning system should be Δσp min = 80 MPa
- The fatigue strength is defined as the stress range (Δσp), which is endured for 2 million

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cycles without failure of more than 5% of the initial cross-section of the tested tendon at beginning of the test.

Clause 1804.5 Protection of Prestressing Steel

Prestressing steel shall be continuously protected against corrosion, until grouted. The corrosion prot6ector shall have no deleterious effect on the steel or concrete or on the bond strength of steel to concrete. Grouting shall conform to these specifications or as directed by the Engineer.

Mixture of water-soluble oil such as Dromas - B and Water is to be flushed through empty metallic ducts before threading of cables, and after threading of cable at frequency of at least once in a month. The layer of oil formed on sheathing / prestressing steel shall be fully flushed out by using clean water before final grouting by cement grout.

Clause 1806 Tensioning Equipment

The heat-shrink tape is suppied in the form of bandage rolls which can be used for all diameters of sheathing ducts. The bandage is coated on the underside with a heat sensitive adhesive so that after heating the bandage material shrinks on the sheathing duct and ensures formation of a leak-proof joint. The heating is effected by means of a soft gas flame.

Jack and Pump shall be calibrated by an approved laboratory prior to use and than at intervals not exceeding three months.

“Before initial use & subsequently at suitable intervals the prestressing equipment shall be checked to determine any variation from the normal values during use.

So far as these variations depend upon external influence (e.g. temperature in the case of oil jacks) they shall be taken into account”.

Clause 1807 The difference between calculated and observed tension and elongation during prestressing operation shall be regulated as follows:

Parallel measurement by load cell in combination with direct reading of Pressure gauge shall be preferred. In any case such parallel measurements by load cell shall be made for at least 10% of the cables stressed during any tensioning operation

a) If the calculated elongation is reached before the specified gauge pressure is obtained, continue tensioning till attaining the specified gauge pressure, provided the elongation does tot exceed 1.o5 times the calculated elongation. If 1.05 times the calculated elongation is reached before the specified gauge pressure is attained,

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b) If the calculated elongation has not been reached at the specified gauge pressure, continue tensioning by intervals of 5 kg/s.q.c.m. until the calculated elongation is reached provided the gauge pressure does not exceed 1.05 times the specified gauge pressure.

c) If the elongation at 1.05 times the specified gauge pressure is less than 0.95 times the calculated elongation, the following measures must be taken, in succession, to determine the cause of this lack of discrepancy:

i) Check the correct functioning of the jack, pump and leads.

ii) De-tension the cable. Slide it in its duct to check that it is not blocked by mortar which has entered through holes in the sheath. Retention of the cable if free.

iii) Re-establish the modulus of elasticity of steel for the particular lot from an approved laboratory.

If the required elongation is still not obtained, further finishing operations such as cutting or sealing, should not be undertaken without the approval of the Engineer.

The Contractor shall submit fabrication drawings, detailing of prestressing cables, anchorages, couplers, chairs and supports, templates or forms holding anchorage assemblies etc. for Engineer's approval at least one month before commencement of work in superstructure. Stressing schedules shall be prepared by the Contractor and submitted to Engineer for approval.

Clause 1808 Grouting of Presstressed Tendons.

Grouting shall conform to Appendix 1800/III. A record of grouting operations shall be maintained in the format given in Appendix 1800/IV

Where directed by the Engineer the Contractor shall perform full scale site test to determine the adequacy of grout mix, equipment and grouting method. The Contractor shall submit a method statement detailing the test procedure.

Special Attention is directed to Appendix 1800 / III of the Standard Specifications. Contractor shall arrange for testing of all grout components and of the mix, prior to the start of grouting and whenever the source of any component is changed, to ensure that the grout is free of anything that could promote shrinkage or cracking of the grout or corrosion in the tendons. Further samples of grout and its components shall be obtained for each day of grouting at each site where grouting is carried out and a full chemical analysis shall be performed on the samples.

Clause 1815 RATE

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The cost of anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grout, non-prestressed steel reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing samples for testing shall all be included in the unit rate. Rate shall also include payments if any to be made to the supplier of the prestressing system who has to monitor, ensure and certify the correctness of all operations.

Cost of fixing anchorages / sheathing for dummy cables and future prestressing cables shall be incidental to work and shall not be measured / paid extra. No additional cost shall be payable for stressing of cables for compensation of shortfall of prestress or for any other reason.

CLAUSE 2000 BEARINGS

Clause 2001 Description

The work shall consist of furnishing and fixing bearings in position in accordance with the details shown on the drawings, to the requirements of these specification or as directed by the Engineer.

Within 90 days of award of work, the Contractor shall submit detailed specifications, designs and drawings including installation drawings and maintenance manual, for the approval of the Engineer. Designs shall also include review and modifications of designs and drawings of bearing pedestals and other elements required for installation. The installation of bearings shall be carried out under the supervision of the manufacturer of the bearings. The Contractor shall provide a warranty for 30 years and the bearings shall be repaired or replaced free of cost by the Contractor, if any defects are observed during this period. The Employers decision regarding replacement/repairs shall be final and binding.

In addition to routine testing of the materials and bearings at manufactures premises, the Contractor shall arrange at his own cost testing of random samples of 1 % (Minimum 1 no. of each type) of bearings from independent agencies, other than manufactures' own facilities, duly approved by the Engineer. The bearings shall be selected by the Engineer / his authorised representative and duly sealed in his presence for dispatch to the independent agency.

Clause 2004 Special Bearings

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Clause 2004.1 Spherical Bearings: Spherical Bearings shall conform to the requirements of sections 9.1 and 9.2 of BS 5400.However materials of bearing elements may conform to Indian Standards nearest to the specifications stated in the above sections of BS: 5400.

Clause 2006 POT Bearings:
Pot Bearings shall conform to the requirements of sections 9.1 and 9.2 of BS 5400. However materials of bearing elements may conform to Indian Standards nearest to the specifications stated in the above sections of BS: 5400.

CLAUSE 2100 OPEN FOUNDATIONS

Clause 2106 TOLERANCES
Reference to Tolerance shall be made to Clause 1715.

CLAUSE 2200 SUB- STRUCTURE

Clause 2204 PIERS AND ABUTMENTS
Slipforming will not be allowed.
Add the following paragraph at the end of clause:
"Where necessary suitable cofferdams or other means shall be provided to exclude water from the construction area. The Contractor shall provide necessary pumping equipment for dewatering in working areas".

Clause 2210 RATE

"The contract rate for masonry, concrete and reinforcement in substructure shall include all works as given in respective sections and cover the cost of incidental items like providing cofferdams, dewatering, providing special formwork, where necessary, and all other items for furnishing and providing substructure as mentioned in this section."

CLAUSE 2300 SUPERSTRUCTURE

Clause 2305. Prestressed Concrete Constructionrefer clause 2305.1 and 2305.2

Clause 2305.5 Construction of Superstructure

The construction sequence of superstructures is indicated in the tender drawings.

The bridge deck is to be constructed by the cast in situ method. Formwork for the in situ cast parts shall be made by steel. The Contractor shall introduce special measures to ensure and to check that slab thickness does not deviate more than 5mm from the theoretical thickness.

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Post tensioning of the in situ cast section must not be carried out before the situ concrete has achieved a cube strength of at least 35 Mpa.

Just after signing the contract the Contractor shall plan the execution in all details. The Engineer will call for a meeting to inform about the intentions of the design and assumptions for the execution of the work.

The Contractor shall assume that approval may take one months from submissions of a document.

During construction the Contractor shall measure levels of the bridge deck before and after construction of each section. Tables with theoretical and measured values shall be submitted to the Engineer just after each measurement.

Construction may not proceed before the results of the measurements and possible proposals for correction of levels for the next section are approved by the Engineer. Contractor shall carry out any correction/adjustment in superstructure and cables as decided by the Engineer.

Clause 2306 Tolerances

Clause 2306: Reference for tolerance shall be made to Clause 1715.

CLAUSE 2500 RIVER TRAINING WORKS AND PROTECTION WORKS

Clause 2504 PITCHING/REVETMENT ON SLOPES

The heading of this Clause shall be read as above

Clause 2504.2.2 Filer Media

Second sentence of the Notes 4 shall read as follows;
The thickness of filter shall be as per drawing.
Para 1 of this Clause shall be read as under:

The material for the filter media shall consist of sand, gravel, stone or coarse sand to prevent escape of the embankment material through the voids of stone pitching/weep holes in abutments as well as to allow free movement of water without creating any uplift head on pitching, One or more layers of graded materials, commonly known as filter medium, shall be provided underneath the pitching. The material for filter media behind abutment shall conform to general guidelines given in Appendix 6 of IRC-78 (Standard Specifications and Code of Practice for road bridges – Section VII).

Clause 2509 Measurement for Payments

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The filter and stone pitching shall be measured separately in cubic meters unless otherwise specified.
The filter below stone pitching shall not be measured separately
Stone pitching shall be measured in cubic meters

Clause 2510 Rate:

The contract unit rate for one cubic metre of filter or stone/cement concrete block pitching on slopes shall include the cost of preparing the bases, putting to the profiles, laying and compacting the filter and stone pitching of dry rubble/cement concrete block revetment for embankment slopes to the specified thickness, lines, curves, slopes and levels and all labour and materials as well as tools and plant required for the work.
The contract unite rate for one cubic metre of stone pitching shall include the cost of preparing the bases, filling to profiles laying and compacting the filter and stone pitching of dry rubble for embankment slopes to the specified thickness, lines curves slopes and all labour, material, tools and plant required for the work.

CLAUSE 2600 EXPANSION JOINTS

Clause 2601 Description

This work shall consist of fabrication and placing of expansion joints as indicated on the drawing and conforming to these specifications or as directed by the Engineer.

Clause 2606 Sealed Elastomeric Joints

Clause 2606.1 Expansion Joints shall be Sealed Elastomeric Joints with positive anchorage system of movement capacity indicated in the drawings. Only proprietary products proven by international usage shall be permitted to be used. Contractor shall submit all relevant information regarding Expansion Joints proposed by him in schedule: Proprietary Product and Process Information of Bid Documents.

Expansion Joints shall extend from one end of the deck slab to the other end along the width of the deck slab including the length through footways and parapets. I.e. it shall follow the profile including footway and shall meet the requirements of clause 2603 of these specifications. Water tightness of seals shall be ensured. Installation of Expansion joints shall be carried out under the supervision of the manufacturer.

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The Contractor shall provide a warranty for 30 years and the expansion joints shall be repaired or replaced free of cost by the Contractor, if any defects are observed during this period. The Employers decision regarding replacement/repairs shall be final and binding.

After award of the Contract, the Contractor shall submit information on manufacturer of the Expansion Joints for the approval of Engineer. He shall also submit detailed specifications, design calculations and drawings including installation drawings and maintenance manual for Engineer's approval. Specifications shall cover all aspects of work like fabrication, testing including acceptance tests of Expansion Joint elements, handling, storage and installation. Design of anchorages and blackouts shall be included in the detailed designs. Work shall be carried out in accordance with designs and drawings approved by the Engineer.

Clause 2609 Measurement for Payment

The expansion joint shall be measured in running metres.

The expansion joint shall be measured along the width of the deck slab from one end to the other including length through footpaths and parapets. For filled joints, the rate per running metre shall include the cost of sealant for the depth provided in this drawing.

CLAUSE 2700 WEARING COAT AND APPURTENANCES

Clause 2702.1 Bituminous Wearing Coat

Clause 2702.1.1 “Bituminous wearing coat for major bridges (i.e. above 60 m) shall be constructed in Bituminous Concrete comprising of 50 mm thick bituminous concrete in two layers of 25 mm each over a layer of mastic asphalt 15 mm thick with a primer coat complete as per drawings. For minor bridges, the wearing coat shall be in bituminous concrete in accordance with Clause 509"

CLAUSE 2704 APPROACH SLAB

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Provision of approach slab shall be in accordance with “Guide lines regarding approach slab for bridges” given in MOST circular no. RW/NH-34015/2/86-S&R dated 22 June 1994.

Clause 2706 WEEP HOLE

"Weep holes shall be provided in solid plain concrete/reinforced concrete brick or stone abutments, wing walls, return walls as shown in the drawing or as directed by the Engineer to drive moisture from the back filling. Weep holes shall be provided with 100 mm dia AC pipe and shall extend through the full width of concrete with slope of about 1 vertical:20 horizontal towards the draining face.

The spacing of weep holes shall generally be 1m in either direction or as shown in the drawing with the lowest at about 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer".

Clause 2708 The measurement for payment for wearing coat, railings and approach slab shall be made as given below

i) Cement concrete wearing coat shall be measured in cubic metres. Asphaltic concrete wearing coat shall be measured in square metres.

ii) “Railing shall be measured in running meter as per unit provided in the BOQ.”

iii) Approach slab and its base shall be measured separately in cubic metres.

iv) Drainage spouts shall be measured in numbers.

v) Weep holes in concrete/brick masonry structure shall be measured in numbers. For structures in stone masonry, weep holes shall be deemed to be included in the item of stone masonry work and shall not be measured separately.

CLAUSE 2709 RATE

The contract unit rate of railings shall include the cost of all labour material, tool and plant required for completing the work as per these Specifications.

“The contract unit rate of railings shall include the cost of all labors, materials tools and plant required for completing the unit in accordance with specifications”.

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The contract unit rate for weep hole shall include the cost of all labors, material, tools and plant required for completing the works per these specifications.

The contract unit rate for approach slab shall include cost of providing and laying in position bitumen joint filler with joint sealing compound in the 20 thick gap between dirt wall and approach slab.

1. PRESTRESSING

Structural concrete containing prestressed steel reinforcement to introduce pre-compression is termed as prestressed concrete.

The work shall be carried out in accordance with the drawing and these specifications or as approved by the Engineer.

Concrete and untensioned steel for the construction of prestressed concrete members shall confirm to the requirements of section 1700 and 1600 for Structural Concrete and Steel Reinforcement respectively in so far as the requirements of these sections apply and are not specifically modified by requirements.

2. MATERIALS

2.1. Sheathing

2.1.1 The sheathing ducts shall be of the spiral corrugated type. Unless otherwise specified, the material shall be Cold Rolled Cold Annealed (CRCA) Mild Steel confirming to IS: 513 intended for mechanical treatment and surface refining but not for quench hardening or tempering.

The material shall normally be bright finished. However, where specified, as in case of use in aggressive environment, galvanized or lead-coated mild steel strips shall be used.

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The thickness of sheathing shall be as shown on the drawing, but shall not be less than 0.3 mm, 0.4 mm and 0.5 mm for sheathing ducts having internal diameter of 50 mm, 75 mm and 90 mm respectively. For bigger diameter of ducts, thickness of sheathing shall be based on recommendations of prestressing system supplier or as directed by the Engineer.

The sheathing shall conform to the requirement as per tests specified in Appendix 1800/I.

For major projects, the sheathing ducts should preferably be manufactured at the project site utilizing appropriate machines. With such an arrangement, long lengths of sheathing ducts may be used with consequent reduction in the number of joints and couplers. Where sheathing duct joints are unavoidable, such joints shall be made slurry tight by the use of corrugated threaded sleeve couplers which may be tightly screwed onto the outer side of the sheathing ducts.

The length of the coupler should not be less than 150 mm but should be increased upto 200 mm wherever practicable. The joints between the ends of the coupler and the duct shall be sealed with adhesive sealing tape to prevent penetration of cement slurry during concreting. The couplers of adjacent ducts should be staggered wherever practicable. As far as possible, couplers should not be located in curved zones. The corrugated sleeve couplers are being conveniently manufactured using the sheath making machine with the next higher size of die set.

2.1.2 The internal area of the sheathing duct shall be in accordance with the recommendations of the system manufacturer and shall be about three times the area of the tendons. In case of 6T13, 12T13 and 19T13 sizes of tendons comprising 12/13 mm dia strands, the inner diameter of the sheathing shall not be less than 50 mm, 75 mm and 90 mm respectively or those shown in the drawing, whichever is greater.

Where prestressing tendons are required to be threaded after concreting the diameter of sheathing shall be about 5 mm larger than that required as above.

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2.1.3 In severe environment, cables shall be threaded after concreting. In such cases, a temporary tendon shall be inserted in the sheathing or the sheathing shall be stiffened by other suitable method during concreting.

3. Anchorages

3.1 Anchorages shall be procured from authorized manufacturers only. Anchorages shall conform to BS: 4447. Test certificates form a laboratory fully equipped to carry out the tests shall be furnished to the Engineer. Such test certificates shall not be more than 12 months old at the time of making the proposal for adoption of a particular system for the project.

No damaged anchorages shall be used. Steel parts shall be protected from corrosion at all times. Threaded parts shall be protected by greased wrappings and tapped holes shall be protected by suitable plugs until used. The anchorage components shall be kept free from mortar and loose rust and any other deleterious coating.

3.2 Swages of pre-stressing strand and button-heads of pre-stressing wire, where provided shall develop strength of at least 95 percent of the specified breaking load of the strand or wire as the case may be. Where swaging / button-heading is envisaged, the Contractor shall furnish details of his methodology and obtain approval of the Engineer, prior to his taking up the work.

3.3 Un-tensioned steel reinforcements, around anchorages shall conform to the details of pre-stressing system and as shown on the drawing.

4. TESTING OF PRESTRESSING STEEL AND ANCHORAGES

All materials specified for testing shall be furnished free of cost and shall be delivered in time for tests to be made well in advance of anticipated time of use.

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All wire, strand or bars to be shipped to the site shall be assigned a lot number and tagged for identification purposes. Anchorage assemblies to be shipped shall be like-wise identified.

All samples submitted shall be representative of the lot to be furnished and in the case of wire or strand, shall be taken from the same master roll. The contractor shall furnish samples of at least 5.0 m length selected from each lot for testing. Also, two anchorage assemblies, complete with distribution plates of each size or types to be used, shall be furnished along with short lengths of strands as required.

5. WORKMANSHIP

5.1 Cleaning

Tendons shall be free from loose rust, oil, grease, tar, paint, mud or any other deleterious substance.

Cleaning of the steel may be carried out by immersion in suitable solvent solutions, wire brushing or passing through a pressure box containing carborundum powder. However, the tendons shall not be brought to a polished condition.

5.2 Straightening

High tensile steel wire and strand shall be supplied in coils of sufficiently large diameter such that tendons shall retain their physical properties and shall be straight as it unwinds from the coil. Tendons of any type that are damaged, kinked or bent shall not be used.

The packing of prestressing wire/strand shall be removed only just prior to making of cable for placement. Suitable stands shall be provided to facilitate uncoiling of wires / strands without damage to steel. Care shall be taken to avoid the possibility of steel coming into contact with the ground.

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5.3 Positioning

5.3.1 Post Tensioning

Prestressing tendons shall be accurately located and maintained in position, both vertically and horizontally, as per drawings.

Tendons shall be so arranged that they have a smooth profile without sudden bends or kinks.

The locationing of prestressed cables shall be such as to facilitate every placement and vibration of concrete in between the tendons. High capacity tendon shall be used to reduce the number of cables thereby eliminating the necessary of grouping. The selected profiles of the tendons shall be such that their anchorages are not located in the top deck surface. Where two or more rows of cables have to be used, the cables shall be vertically in line to enable easy flow of concrete. The clear vertical and horizontal distances between any two cables shall in no case be less than 100 mm anywhere along the length of the superstructure. Where precast segments are used, the clear distance shall be at least 150 mm.

Sheathing shall be placed in correct position and profile by providing suitable ladders and spacers. Such ladders may be provided at intervals of approximately 1.0 m. Sheathing shall be tied rigidly with such ladders / spacer bars so that they do not get disturbed during concreting.

The method of supporting and fixing shall be such that profile of cables is not disturbed during vibrations, by pressure of wet concrete, by workmen or by construction traffic.

Sheathing in which the permanent tendon will not be in place during concreting shall have a temporary tendon inserted or shall be stiffened by some other method to the approval of the Engineer. The temporary tendon shall be pulled out before threading the permanent tendon into place by a special threading machine or other contrivance.

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Where possible tendons shall not be placed until immediately prior to stressing. Tendons shall be handled with care to avoid damage or contamination, to either the tendon or the sheathing. Any tendons damaged or contaminated shall be cleaned or replaced.

5.3.2 Pre-Tensioning.

Prestressing steel shall be accurately located and maintained in position, both vertically and horizontally, as per drawings.

5.3.3 Each anchorage device shall be set square to the line of action of the corresponding prestressing tendon and shall be positioned securely to prevent movement during concreting.

The anchorage devices shall be cleaned to the satisfaction of the Engineer prior to the placing of concrete. After concreting, any mortar or concrete which adhere to bearing or wedging surfaces, shall be removed immediately.

5.4 Cutting

Cutting and trimming of wires or strands shall be done by suitable mechanical or flame cutters. When a flame cutter is used, care shall be taken to ensure that the flame does not come in contact with other stressed steel. The location of flame cutting of wire or strand shall be kept beyond 75 mm of where the tendon will be gripped by the anchorage or jacks.

In post-tensioning the ends of prestressing steel projecting beyond the anchorages, shall be cut after the grout has set.

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5.5 Protection of Prestressing Steel

Prestressing steel shall be continuously protected against corrosion, until grouted. The corrosion protector shall have no delirious effect on the steel or concrete. Grouting shall conform to these specifications or as directed by the Engineer.

In the case of external Prestressing, steel shall be encased in suitable polyethylene pipes before grouting.

5.6 Sheathing

The joints of all sheathings shall be water – tight. Special attention shall be paid to the junction at the end, where the sheathing must tightly fit on the protruding trumpet end of anchorage and thereafter sealed preferably with heat shrink tape, to make water proof.

The heat-shrink tape is supplied in the form of bandage rolls which can be used for all diameters of sheathing ducts. The bandage is coated on the underside with a heat sensitive adhesive so that after heating the bandage material shrinks on the sheathing duct and ensures formation of a leak-proof joint. The heating is effected by means of a soft gas flame.

A sheath making machine should be positioned at the site of work for large projects so that sheathing can be prepared as and when it is required for construction.

The sheathing and all joints shall be water tight. Any temporary opening in the sheathing shall be satisfactory plugged and all joints between sheathing and any other part of the prestressing system shall be effectively sealed to prevent entry of mortar, dust, water or other deleterious matter. Sheathing shall be neatly fitted at joints without internal projection or reduction of diameter.

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Enlarged portions of the sheathings at couplings or anchorages shall be of sufficient length to provide for the extension of the tendons.

5.7 Grout Vents

Grout vents of at least 20 mm diameter shall be provided at both ends of the sheathing and at all valleys and crests along its length. Additional vents with plugs shall also be provided along the length of sheathing such that the spacing of consecutive do not exceed 20 m. Each of the grout vents shall be provided with a plug or similar device capable of withstanding a pressure of 1.0 Mpa without the loss of water, air pressure or grout.

5.8 Anchorages

All bearing surfaces of the anchorages shall be cleaned prior to concreting and tensioning.

Anchor cones, blocks and plates shall be securely positioned and maintained during concreting such that the centre line of the duct passes axially through the anchorage assembly.

The anchorages shall be recessed are completed and prestressing wires/strands are cut, the surface shall be painted with two coats of epoxy of suitable formulation having a dry film thickness of 80 microns per coat and entire recess shall be filled with concrete or non-shrink/pre-packaged mortar or concrete.

6. Supervision

All prestressing and grouting operations shall be undertaken by trained personnel only. A representative of supplier of the prestressing system shall be present during all tensioning and grouting operations and shall ensure, monitor and certify their correctness.

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7. Tensioning Equipment

All tensioning equipment shall be procured from authorized manufactures only and be approved by the Engineer prior to use. Where hydraulic jacks are used, they shall be power-driven unless otherwise approved by the Engineer. The tensioning equipment shall satisfy the following requirements:

i) The means of attachments of the prestressing steel to the jack or any other tensioning apparatus shall be safe and secure.
ii) Where two or more wires/strands constitute a tendon, a single multipull stressing jack shall be used which is capable of tensioning simultaneously all the wires/ strands of the tendon. Suitable facilities for handling and attaching the multipull jack to the tendons shall be provided.
iii) The tensioning equipment shall be such that it can apply controlled total force gradually on the concrete without inducting dangerous secondary stresses in steel anchorage or concrete, and
iv) Means shall be provided for direct measurement of the force by use dynamo meters or pressure gauges fitted in the hydraulic system itself to determine the pressure in the jacks. Facilities shall also be provided for the linear measurement of the extension of prestressing steel to the nearest mm and of any slip of the gripping device at transfer.

All dynamo meters and pressure gauges including a master gauge shall be calibrated by an approved laboratory immediately prior to use and then at intervals not exceeding 3 months and the true force determined from the calibration curve.

Pressure gauges shall be concentric scale type gauges accurate to within two per cent of their full capacity. The minimum nominal size of gauge shall be 100 mm. The gauge shall be so selected that when the tendon is stressed to 75 per cent of its breaking load, the gauge is reading between 50 per cent of its breaking load, the gauge is reading between 50 per cent and 80 per cent of its full capacity. Suitable safety devices shall be fitted to protect pressure gauges against sudden release of pressure.

Provision shall be made for the attachment of the master gauge to be used as a check whenever requested for by the Engineer.

8. POST TENSIONING

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Tensioning force shall be applied in gradual and steady steps and carried out in such a manner that the applied tensions and elongations can be measured at all times. The sequence of stressing, applied tensions and elongations shall be in accordance with the approved drawing or as directed by the Engineer.

It shall be ensured that in no case, the load is applied to the concrete before it attains the strength specified on the drawing or as stipulated by the prestressing system supplier, whichever is more.

After prestressing steel has been anchored, the force exerted by the tensioning equipment shall be decreased gradually and steadily so as to avoid shock to the prestressing steel or anchorage.

The tensioning force applied to any tendon shall be determined by direct reading of the pressure gauges or dynamo-meters and by comparison of the measured elongation with the calculated elongation. The calculated elongation shall be invariably adjusted with respect to the modulus of elasticity of steel for the particular lot as given by the manufacturer.

The difference between calculated and observed tension and elongation during prestressing operations shall be regulated as follows :

a) If the calculated elongation is reached before the specified gauge pressure is obtained, continue tensioning till attaining the specified gauge pressure, provided the elongation does not exceed 1.05 times the calculated elongation. If 1.05 times the calculated elongation is reached before the specified gauge pressure is attained, stop stressing and inform the Engineer.
b) If the calculated elongation has not been reached at the specified gauge pressure, continue tensioning by intervals of 5 kg/sq.cm. until the calculated elongation is reached provided the gauge pressure does not exceed 1.05 times the specified gauge pressure.
c) If the elongation at 1.05 times the specified gauge pressure is less than 0.95 times the calculated elongation, the following measures must be taken, in succession, to determine the cause of this lack of discrepancy :
    i) Check the correct functioning of the jack, pump and leads.
    ii) Detension the cable. Slide it in its duct to check that it is not blocked by mortar which has entered through holes in the sheath. Retension the cable if free.

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iii) Re-establish the modulus of elasticity of steel for the particular lot from an approved laboratory.

If the required elongation is still not obtained, further finishing operations such as cutting or sealing, should not be undertaken without the approval of the Engineer.

d) When stressing from one end only, the slip at the end remote from the jack shall be accurately measured and an appropriate allowance made in the measured extension at the jacking end.

A complete record of prestressing operations along with elongation and jack pressure data shall be maintained in the format given in Appendix 1800/II. The number of stages of prestressing and grouting shall be reduced to a minimum, preferably 2 in the case of simply supported girders.

9. GROUTING OF PRESTRESSED TENDONS

Grouting shall conform to Appendix 1800/III. A record of grouting operations shall be maintained in the format given in Appendix 1800/IV.

10. PRE-TENSIONING

10.1 General

The planning and construction aspects of the tensioning bed, tensioning bench, abutments at location of anchorage, steam curing system, form work of the concrete elements and arrangements for remolding, lifting, stacking and transportation of the pre-tensioned concrete elements are all specialized items and shall be entrusted to engineers specifically experienced in this type of work.

10.2 Stressing Bed for Pre-tensioning

The abutments and bed for pre-tensioning of tendons shall be designed to withstand the total tensioning force.

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A notice shall be displayed adjacent to the stressing bed showing the maximum tensioning force permitted.

Where concrete elements are cast and prestressed individually, the stressing bench or moulds shall be rigid enough to sustain the reactions of the prestressing force without distortion.

In the long line method of prestressing, sufficient locator plates should be distributed throughout the length of the bed to ensure that the wires are maintained in their proper position during concreting. The moulds shall be free to slide in the direction of their length and thus permit the transfer of the prestressing force to all the concrete elements along the whole line.

Sufficient space shall be left in between the ends of concrete elements to permit access for cutting the strands / wires after transfer. Hold downs or deflectors shall be used for holding or deflecting the tendons in required position firmly. Deflectors which are in contact with the tendon shall have a diameter not less than the tendon or 15 mm, which are I contact with the tendon shall have a diameter not less than the tendon or 15 mm whichever is greater.

The tensioning force required to be applied as stated on the drawings shall be the force remaining in the strands / wires after all strands / wires have been anchored to the abutments of the stressing bed and after the anchorage slip has already taken place. The tensioning force shall be determined by direct reading of the pressure gauges or dynamo-meters and by the measured elongation after slip.

The Contractor shall submit method of tensioning the tendons including the arrangement and layout of prestressing beds and all tendons deflection points to the Engineer for approval before manufacture commences.

The Contractor shall carry out trial stressing operations to establish the frictional resistance offered by the hold-downs and the slip during anchoring.

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Where sheathing of pre-tensioned tendons is required to prevent bond over a specified length, it shall consist of plastic tubing or other material approved by the Engineer and shall be of a quality, diameter and thickness such that bond shall be effectively prevented. The tubing shall be fastened to the tendon in such a manner that cement mortar cannot enter. The Engineer may order that the pull-in of the tendon be measured during the transfer of prestress.

The Contractor shall also submit calculations showing that the hold-downs have been designed and constructed to withstand concentrated loads resulting from the application of the tensioning force.

10.3 Tensioning Procedure

The tensioning of the wires and strands shall be done not too much in advance of concreting.

The tensioning force shall be applied gradually and uniformly.

In order to remove slack and to lift tendons off the bed floor, an initial force approved by the Engineer shall be applied to the tendons. Allowance shall be made for this force in calculating the required elongation.

Tendons shall be marked for measurement of elongation after the initial force has been applied. When required by the Engineer, tendons shall be marked at both the jacking end and dead end of the stressing bed and at couplers if used so that slip and draw-in may be measured.

Where deflected strands have been specified, the Engineer may direct the elongation or strain gauge measurements be taken at various positions along the tendon to determine the force in the tendon at those positions.

10.4 Transfer of Prestress

While the process of tensioning can be accomplished by means of hydraulic jacks, some positive mechanical means shall be provided to maintain the

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tension during the entire period between the tensioning of the wires / strands and transfer of the prestressing force to the concrete element.

Transfer of prestress shall not proceed until the Engineer has approved the proposed method. Tendons and deflection devices shall be released in such a pre-determined order that unacceptable tensile stresses are not induced in the concrete.

Prior to transfer of the force to the units, all tendons shall be tested for tightness and any loose tendon shall be reported to the Engineer who will decide whether the units affected shall be reflected.

The Engineer may require that tendons be marked at each end of any unit to allow measurement of the pull-in of the concrete.

Tendons shall be released gradually and preferably simultaneously.

Under no circumstances shall tendons be cut while under tension.

On completion of the transfer of prestress, the projecting lengths of tendon shall be cut off flush with the end surface of the unit, unless otherwise shown, by a method approved by the Engineer.

In no case shall the transfer of prestressing force to the concrete elements take place before concrete attains the strength specified in the drawings. To determine the specified strength, additional cube testing shall be undertaken at the Contractor's cost. In case stream curing is employed, the cubes shall be placed in the same environment as the concrete elements to obtain an accurate assessment of concrete strength at the time of transfer.

The sequence of transfer of prestressing force shall be done strictly as indicated in the drawings and ensuring that eccentricities of the prestressing force in the vertical and horizontal directions of the concrete element is a minimum during the entire sequence.

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The maximum slip of any tendon during transfer shall not exceed 3 mm at any end of the concrete element. In case this slip is exceeded, the concrete element in question shall be rejected.

10.5 Protection of Ends

The exposed ends of the tendons and the concrete surfaces of the ends of the units shall be wire brushed clean of all rust, loose mortar, grease and dirt.

The exposed ends of the tendons and concrete surface within 50 mm of tendons shall be then abraded to provide a clean sound surface. An epoxy tar paint suitably formulated to give a dry film thickness of 80 microns per cost shall then be immediately applied over the ends of the tendons unless otherwise directed.

A second coat of paint shall be applied prior to the drying out of the firs coat.

11. Safety Precautions during Tensioning

Care shall be taken during tensioning to ensure the safety of all persons in the vicinity.

Jacks shall be secured in such a manner that they will be held in position, should they lose their grip on the tendons.

No person shall be allowed to stand behind the jacks or close to the line of the tendons while tensioning is in progress.

The operations of the jacks and the measurement of the elongation and associated operations shall be carried out in such a manner and from such a position that the safety of all concerned is ensured.

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A safety barrier shall be provided at both ends to prevent any tendon, which might become loose from recoiling unchecked.

During actual tensioning operation, warning sign shall be displayed at both ends of the tendon.

After prestressing, concrete shall neither be drilled nor any portion cut nor chipped away nor disturbed, without express approval of the Engineer.

No welding shall be permitted on or near tendons nor shall any heat be applied to tendons. Any tendon which has been affected by welding, weld spatter or heat shall be rejected.

12. Transportation and Storage of Units

Precast girders shall be transported in an upright position. Points of support and the direction of reactions with respect to the girder shall approximately be the same during the transportation, and storage as when the girder is placed in final position.

When members are to be stacked, they shall be firmly supported at such bearing positions as will ensure that the stresses induced in them are always less than the permissible design stresses. Further, inclined side supports shall be provided at the ends and along the length of a recast girder to prevent lateral movements or instability.

Care shall be taken during storage, hoisting and handling of the precast units to prevent their cracking or being damaged. Units damaged by improper storing or handling shall be replaced by the Contractor at his expense.

13. Tolerances

Permissible tolerances for positional deviation of Prestressing tendons shall be limited to the following :

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a) Variation from the specified horizontal profile : 5 mm

b) Variation from the specified vertical profile : 5 mm

c) Variation from the specified position in member : 5 mm

14. Tests And Standards Of Acceptance

The materials shall be tested in accordance with these specifications and shall meet the prescribed criteria.

The work shall conform to these specifications and shall meet the prescribed standards of acceptance.

15. Measurements for Payment

Prestressed Concrete shall be measured in cubic metres. The volume occupied by mild steel reinforcement / HYSD bars; high tensile steel, sheathing and anchorages shall not be deducted.

High tensile (prestressing) steel shall be paid for separately and its length shall be measured as actually incorporated in the finished work. From the length so measured its weight shall be calculated in tones on theoretical basis and paid for.

Anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grout, non-prestressed reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing samples for testing shall all be deemed to be included in the item of high tensile steel and shall not be measured separately.

16. RATE

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The contract unit rate for cast-in-place prestressed concrete shall cover the cost of all materials, labour, tools and plant required for mixing, placing in position, vibrating and compacting, finishing as per directions of the Engineer, curing and other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown on the drawings and according to specifications. The contract unit rate shall also include the cost of making, fixing and removing of all centering and forms required for the work unless otherwise specified in the Contract.

For precast stressed concrete members, the rate in addition to above shall also include the cost of all materials, labour, tools and plant required to transport and places these members in their final position as shown on the drawings and as directed by the Engineer.

The contract unit rate for high tensile steel shall cover the cost of material, labour, tools and plant required for manufacturing, placing, tensioning, anchoring and grouting the high tensile steel in the prestressed concrete as shown on the drawings and as per specifications herein above or as directed by the Engineer.

The cost of anchorage devices, additional length of cables for attaching jack, ducts or sheathing, grout, non-prestressed steel reinforcement fixed to the anchorage devices, making of recesses and filling the same, protection by painting with epoxy and furnishing samples for testing shall all be included in the unit rate. Rate shall also include payments if any to be made to the supplier of the prestressing system who has to monitor, ensure and certify the correctness of all operations.

Definitions

- Act means the Tamil Nadu transparency in Tenders Act, 1998 (Tamil Nadu Act 43 of 1998).
- The Adjudicator is the person appointed jointly by the Employer and the Contractor to resolve disputes in the first instance, as provided for in Clauses 24 and 25 hereunder.
- Arbitrator: If a party is dissatisfied with the decision of the Adjudicator or no decision is given within the time set out in the Rules, the party may give notice of dissatisfaction and a dispute which has been the subject of a notice of dissatisfaction shall be finally settled by a single Arbitrator. The Arbitrator can

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revise the decision of the Adjudicator. The Arbitral Tribunal consists of 3 Arbitrators , one each to be appointed by the Employer and the Contractor. The third Arbitrator shall be chosen by the two Arbitrators appointed by the Employer & Contractor.

- Bid Security (Earnest Money Deposit) means the amount required to be remitted by a bidder along with his bid indicating his willingness to implement the contract.
- Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.
- BIS means Bureau of Indian Standards.
- Compensation Events are those defined in Clause 42 hereunder.
- The Completion Date is the date of completion of the Works as certified by the Superintending Engineer, in accordance with Sub-Clause 53.1.
- The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 2.3 below.
- The Contractor is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.
- The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.
- Bid Price : The prices and discounts quoted by the bidder in the letter of bid and in the bill of quantities.
- The Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.
- Days are calendar days; months are calendar months.
- A Defect is any part of the Works not completed in accordance with the Contract.
- The Defects Liability Certificate is the certificate issued by Superintending Engineer upon correction of defects by the Contractor.
- The Defects Liability Period is the period named in the Contract Data and calculated from the Completion Date.
- Drawings include calculations and other information provided or approved by the Superintending Engineer for the execution of the Contract.

The Employer (The Commissioner) is the party who employs the Contractor to carry out the Works.

The Superintending Engineer is the person named in the Contract Data (or any other competent person appointed by the Commissioner and notified to the

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Contractor, to act in replacement of the Superintending Engineer) who is responsible for supervising the execution of the Works and administering the Contract.

- The Zonal Executive Engineer is an Executive Engineer of Corporation of Chennai, who will be in charge of a Zone of Corporation Chennai.
- Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.
- The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance.
- The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Superintending Engineer by issuing an extension of time.
- Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.
- Plant is any integral part of the Works that shall have a mechanical, electrical, chemical, or biological function.
- The Site is the area defined as such in the Contract Data.
- Site Investigation Reports are those that were included in the bidding documents and are factual and interpretative reports about the surface and subsurface conditions at the Site.
- Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Superintending Engineer.
- The Start Date is given in the Contract Data. It is the latest date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.
- A Subcontractor is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.
- Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.
- Two-cover system means a procedure under which the bidders are required to simultaneously submit two separate sealed covers, one containing the Earnest Money (Bid security) and the details of their capability to undertake the tender which will be opened first and the second cover containing the price quotation which will be opened only if the bidder is found qualified to execute the Bid.

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CORPORATION OF CHENNAI

…….. DEPARTMENT/ZONE

Technical Specification Buildings

for the work .....

ZONE ..... / .....DEPT

Zonal Officer

S.E.....

DEPT

signature of the Bidder

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TECHNICAL SPECIFICATIONS FOR BUILDING WORKS

A. SPECIAL CONDITION FOR PILE FOUNDATIONS

1. The tenderer shall fill in quantities, rates and amounts for all items except 9,10,11 and for alternative items where only rates are to be quoted.

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 rate 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 Executive 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 tenderer 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 if 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 IS 2911(Part II Part III and Part IV) 1979 and National Building Code and other National Standards prevailing from time to time.

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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 tenderer from competent authority.

9. The rates 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 what only in the department schedule furnished in the tender documents.

14. If the Tenderer is a registered tenderer of COC , he should renew it in time and the renewal is compulsory on the part of the tenderer.

15. Tenders which do not comply with the above conditions will be summarily rejected without assigning any reasons.

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B. GENERAL CONDITIONS FOR PILE FOUNDATIONS

DEFINITION 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 hole so 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. 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.

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 upto1.5 times the safe load..

4. Trial Piles:

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 of piles indicated by tenderer while submitting the tender.

6. Final working Load:

This shall mean the safe loads 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 tenderer.

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7. Routine Test Load :

This is the load applied to a selected pile or group of piles to test its behaviors, 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 difference 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 within 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:

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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) corresponding to the allowable (working) load.

SPACING OF PILES :

16. [The centre to centre spacing of pile is considered from two aspects (viz).

17. Practical aspect involving installing the piles and.

18. The nature of the load transfer, ie 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 and 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 cases 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-situ-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 75 mm 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 50 mm. For piles to be cut off at a substantial depth, the design should provide for the worst combination of the above tolerance in

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position and inclination. In case of piles deviating beyond these limits and to such an extent that the resulting eccentricity cannot be taken care or by a redesign of the pile cap or pile-ties, 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 form 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 tenderer's expense. 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 or pile as a whole or in part, the same shall be reported by the tenderers 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 tenderer shall not be entitled to any payment on account of the rejected pile or of the extra piles required to preserve the center 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 for one pile or if it were good pile.

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.

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27. During the process of withdrawal the concrete shall be completed by raising and dropping the 3 tonnes hammer on top of the tube. The amount of drops and the rate of striking 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 pile, as soon as pile driving is completed. Piles shall not be left un-concreted 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 metres and driving continued next day.

29. Records :

Observations made during the driving of each pile shall be recorded in the proforma 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 tenderer of the total penetration of every pile and the behavior of such pile during driving. Any deviation from the designed location, alignment or load carrying capacity of any pile shall be promptly reported to the Exe. Engineer / Superintending Engineer and adequate corrective measure reported to him. Such measures shall be taken after approval of the 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 tenderer 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.

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32. Mixing :

The concrete ingredients shall be mixed thoroughly in mixers designed so as to positively ensure uniform distribution of all the compound materials throughout the 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 20 mm square meshes and retained on a screen with 6 mm square mesh.

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

36. Effective means shall be adopted to ensure the specified cover to the reinforcement rods, as per IS 2911 (Pt 1/ Sec. 1) 1979.

37. Where rods are lapped, the laps shall be of approved length in accordance with the IS 456 – 2000.

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 :

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To obtain a uniformity good quality of concrete test specimen shall be taken by the tenderer at his own cost on the days of concreting as and when required by the Exe. Engineer. These test specimens shall be standard cylinder 15cm diameter and 30 cm high. These tests cylinder 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 tenderer by rejecting the work done

Minimum cylindrical strength requirements of RCC works

Mix	7 days	28 days
1:2:4	10 N/Sq.mm	15 N/Sq.mm
1:1½:3	13.5 N/Sq.mm	20 N/Sq.mm

40. Stresses :

In no case shall the stress in the concrete under proposed working load exceed 50 kg/cm and 70 kg/cm, in the case of 1:2:4 and 1:1½:3 mix respectively, steel stresses shall not exceed 2300 kg/cm^2 in tension and 1900 kg/cm^2 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" (30 cm), 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 slurry of adequate specific gravity shall be used for the full depth of the bore, as boring proceeds, to prevent the 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 cast-in-situ piles using drilling mud. In any case, a minimum length of one metre of 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

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bored hole must be maintained, which shall be 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. This 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 pile group. As a guide, for vertical piles, a deviation of 1.50 percent and for raker piles, a deviation of 4 percent should not be exceeded, piles should not deviate more than 75 mm or D/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 50 mm (100 mm, in case of piles having dia more than 600mm). In case of piles deviating beyond these limits and to such, an extent that the resulting eccentricity cannot be taken care of by a redesign of the pile caps or pile ties, the pile 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 pile 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 :

(a) Bentonite powder used for the work shall be tested for its liquid limit which shall be more than 300 percent and less than 450 percent. Sand content in bentonite shall be applied 7 percent (ie. passing through 15’’5 Micron-Sieve in dry condition) Method of testing liquid limit shall be as per IS 2720 (pt. V) Clauses 3.4 and 3.5.1.

(b) Bentonite solution shall be made by mixing it with 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.

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(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 at least 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 370 kg/m^3 and of slump not, less than 150mm.

(b) When concreting is carried out under water, a temporary casing shall be installed to the full depth of the borehole or 2 metres into non-collapsible stratum, so that fragrants 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 200 mm; 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 plus should not be left within the concrete.

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(f) The tremie pipe should always penetrate well into the concrete with an adequate margin with safety against accidental withdrawal of pipe is surged 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 reintroduced in the following manner to prevent in pregnation of laitance of scum lying on the top of concrete already deposited in the box. The tremie shall be gently lowered on to the old concrete with little penetration initially. A warmiculite plug should be introduced in the tremie. Fresh concrete of slump between 150mm and 175m 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 on its way. When tremie is burried by about 60 cm to 100 cm concreting may be resumed.

48. Records

Observations 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 recorded “set” observation.

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

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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 conditions furnished in the tender document.

(a) The type of pile foundation proposed by them,

(b) A layout of piles showing the single piles, pile groups, 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 his test may be an initial load test or a routine 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 tenderer.

53. The mode of measurements for the piles shall be from the tip of the pile shoe to the bottom of the respective pile caps. The tenderers are requested to state the method of piling and concreting proposed by them i.e. by volume basis or by weigh batcher.

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

55. As the area available for depositing excavated earth at the site is limited, the tenderer should make his 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 tenderer 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 tenderer, earth has got to be brought from outside at a later date.

The rate for excavation shall include all necessary shoring, bailing and pumping water found necessary fro 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, ie., lead of 10 metres and a lift of 2 metres as may be directed by the Superintending Engineer.

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 tenderer shall water, ram and thoroughly consolidate the bottom of all excavations at his cost before the construction of the foundation or other work is commenced.

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

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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 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 IS 2911 (Part 1 / Section 1 / Section 2) – 1979 and part IV of 1985 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.

Tenderer shall also work out the structural capacity of the pile offered to substantiate the safe load proposed on pile. The stresses adopted for concrete and steel bars shall be in accordance with the IS 456 – 2000 and IS 2911 (Part 1 / Section 1) 1979 and part IV of 1985.

64. Tenderer shall adopt provisions in IS 2911 (Part 1 Section 1/ Section 2), 1979 in the design calculation for pile caps. The depth of as pervious line pile cap adopted should be proportionate to the size of pile offered.

65. The design details for grade beams shall be in accordance with the provisions in IS 2911 (PL III) 1980.

66. When a pile is a 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 overloading of pile will, however, not be acceptable in the initial stages at the time of submitting his tender.

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67. The reinforcement and cover and all other details relating to this will be governed by provision in IS 2911 (Part 1 Section 2, 1979) and as per the directions of the Superintending Engineer / Executive Engineer during execution.

68. The tenderer 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 form the time of casting the pile.

70. The tenderer 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 form a recognized institution and the calibration chart produced to the Superintending Engineer before commencement of test.

73. The arrangement of loading platform etc. shall conform to the specifications and drawing enclosed to tender documents.

74. The floor of test pit shall be 15 cm. 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.

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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 15 mm at least.

77. The datum bars shall be of suitable structural section, (preferable channel section) and should be built in position into masonry of concrete at a distance 5d (five times the stem diameter of the pile) from face to 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 at least 1.50 m 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 as per design.

80. Settlements shall be recorded with preferably four dial gauges (placed equidistance 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 0.10 mm per hour in sandy soils and 0.02 mm per hour in case of clayey 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

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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 constant 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 routine load test/routine cyclic 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;

(a) Two thirds of the final load at which the total settlement attains a value of

12 mm ; unless it is specified that a total settlement different from 12 m 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.

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(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 proforma appended.

90. The rates quoted shall include charges for such items of work as the following and shall be for the finished work in situ and shall include all contingent expenses including of taxes or import duties etc.

a) Marking and setting at the work : The tenderers shall carryout the same with theodolite 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 concrete lines, level and labour required in setting out the work.

c) Provision of all necessary scaffoldings, 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.

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.

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k) Allow for hire tools and plant and test loads required fro tests of piles and materials thereof of inclusive 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 charges that may be levied by the Superintending Engineer's to whom samples of materials used on the work will be sent up @ 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 tenderer.

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.

q) Allow in rate for providing necessary arrangements to enable observations of pilo driving, land tests, etc.,

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 tenderer should arrange for their own mixer and mixer driver.

C. CONCRETE FOR STRUCTURES

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.

2. Materials :

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

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Ordinary Portland Cement	Clause 4
Water	Clause 4
Fine aggregate	Clause 1
Coarse Aggregate	Clause 4
Bitumen for water proofing	I.S. 73
Expansion joint filler	I.S. 1838
Covers for curing and protecting concrete	Clause 4

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

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 (7 cft.) 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.

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

4. Staging and centering :

The tenderer 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 tenderer 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 tenderer of responsibility of obtaining satisfactory results.

For calculating the strength of staging or centering a weight of 2400kg/m3 (150 lbs/c.ft) shall be assumed for green concrete. The tenderer shall make allowance for the deflection of forms and for

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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 tenderer 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 locations, 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.

5. Forms :

The tenderer shall submit detailed plans of form work for examination by the Superintending Engineer. In designing forms concrete shall be treated as fluid weighing 2400 kg/m3 (150 lbs/c.ft.) and in addition a live load of 245 kg/m2 (50 ibs/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 nay 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 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 colourless 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.

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The foregoing specifications for forms shall also apply to steel forms. The sheets used shall be of such thickness that tile forms will remain true to shape. All bolts and revet 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 allow for forms, price for concrete shall include the price for forms.

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.

No super-imposed load either dead or live shall be allowed upon the bridge within the period fro 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 unitl 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 tenderer may be required to leave them in place for a longer period of time and no compensation shall be paid to the tenderer.

7. Classes of Concrete :

Unless otherwise stipulated concrete shall be of ordinary grade.

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 or 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.

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(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 set forth. 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.

(b) **Minimum Cement Content :** The minimum cement content shall not be less than 16 bags of 50.8kg per 2.83m3 (1 cwtper 100 c.ft) or ordinary grade concrete of 1:2:4 mix. Substitute mixes designed by the tenderer 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 tenderer 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. Testing will be done departmentally. The tenderer 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 :

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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 28		Days 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 For 75mm (3") Slump	3960	2640	1760	15
Maximum size of aggregate	12.5mm (1/2")	20mm (3/4")	25mm (1")	37.5mm (11/2")
Water in 0.4536 kg/2.83m3 (lbs / 100 c.ft)	1,333	1,241	1,204	1,122
Water in 454 litres / 0.028 m3 (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 ration. 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 ration 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

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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 tenderer 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 after such proportions as he may deem necessary. If such alternations changes 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 tenderer in whatever amount the total cost of the cement has been increased or decreased. The amount of such increased 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 of 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 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 wing. The aggregate and the cement shall be thoroughly mixed in the mixer for a period of not less than one minute

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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 tenderer 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 manufacture'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 authorized 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 through the mass. Mixing shall be continued until all the stone particles are thoroughly covered and a homogenous 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.

D. 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 tenderer shall notify the Superintending Engineer of all proposed deposit 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

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compensation. Concrete shall be placed in continuous layers of thickness as directed by the S.E. 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 puddled and the mortarflush 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 steely and the surface of the forms shall be removed. Dried mortar chips and dust shall not be puddle 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 place 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.

(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.

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E. 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 o 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 footing 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 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.

F. 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.

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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 the 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 into 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 in 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.

G. Surface Finish :

Immediately following the removal of forms all cavities produced by the removal of form ties and all other hooks and depressions honeycomb 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

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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 honeycomb spots. All such work shall considered incidental to the placing of concrete.

H. 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.

I. 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.

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J. 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 worked out to the nearest $0.0028m^3$ (1/10c.ft) and the total of each set of measurement shall be rounded correct to the nearest m^3 (cft). No measurements 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 tenderer, greater dimensions than those shown on the plans. No deduction shall be made for the volume of the concrete displayed by the embedded steel reinforcement, drain pipes and downfall pipes, expansion joints (bituminous or metallic) and similar items.

K. 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 materials and for furnishing all labour, equipment, tools, an 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 an 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 therefore. 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

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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, 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.

L. REINFORCED CONCRETE STRUCTURE

1. General :

Provisions of this section shall apply to all types of RCC 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 4-16.

2. Materials :

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

Concrete for structures : Clause **C** shall apply

Reinforcement Bars : Clause shall apply.

3. Construction Methods :

(a) **General Requirements :** The construction method used shall be in accordance with the requirements set forth in the specifications for the several parts of the completed structures.

(b) **False work and Forms :** Shall conform to Clause 4-16

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(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 placed in successive stages, first upto the lower fide of the haunch, 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 the 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 , 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 placed the day after the concrete in the floor has been laid. Kerbs and concrete railing other than the solid paneled 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.

M. Construction Method :

(a) **Spreading and Compacting :-** The earth filling in the embankment shall be moistened and theatrical (Gravel) shall be spread upon it uniformly to the

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specified depth and in special layers by an approved method, but no material shall be dumped in piles on the embankment and spread there from. The material shall be dragged with a long base drag or other leveling device so as to secure uniform distribution and eliminate all unevenness. 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 4-191-5(c).

The material shall 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 such course shall 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 confirm to the line grade and cross-section 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 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 centre line of the road, and there shall be no depression visible below the straight edge, 12.5mm (half-an inch) or more in depth.

N. Joining the Old and New surfaces:

During construction the tenderer shall take all precautions to ensure a smooth and shock free junction between the old and new surfaces.

O. Method of Measurement:

Supplying, spreading and consolidation of materials will be measured by are in sq.m. (sq.feet) in length being taken along the centre line of the soling and the

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width along the line at right angles to the centre line. The thickness will be measured by taking difference of levels.

P. 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, paint and equipment for the proper execution of the work.

Q. PLASTERING WITH CEMENT MORTAR

1 Method: All joints in the masonry shall be raked out at least 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 leveled 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:-

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.

Portland cement shall be measured by weight, 40.8 kg (90 pounds) being taken as 0 (:1e and 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.

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 work spot.

The plastering shall be kept constantly watered for three weeks to avoid possibility of the cracking of plaster, the tenderer 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 tenderer, the work shall be removed and redone at the tenderer's expense, or should the tenderer fail to water the work to the satisfaction of

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the Superintending Engineer the letter may supply the requisite men to water the work properly and charge the cost to the tenderer.

2 Measurement and Payment

The plastering snail 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 ands shall include full compensation for all operations described in the specification, mixing, mortar, plastering, curing and for furnishing all labour, tools necessary for the proper execution of the work.

R. WELDING

1. Scope:-

The specification applies to the design and construction of welds made by the metal arc process.

2. Materials:-

Reinforcing bars shall conform to Clause 4-9, electrodes used to strength welds shall conform to the requirements of Class 'A' electrode in 1.5.814-1957.

3. Forms of Butt-Joints:

Butt-Joints shall unless otherwise agreed to by the Engineer, be made in one of the following forms:

a. Double 'V Butt-joint

b. 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 but-weld shall be first build up and then dressed flush.

4. Size of Electrode:-

The maximum gauge of the electrode is 10mm (3/8") diameter for 20mm (3/4") and above diameter bars.

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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, greese, paint, heavy rush 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 arc crater.

After every interruption of the arc except at completion of the run, the arc shall be restarted ahead of the previous deposit and moved back to fill the carter; or such alternative technic shall be used as will equally well ensure complete filling of the crater, complete fusion between the new old deposit 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 conform 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 re-welded.

(i) Finished welds and the adjacent parts shall be protected with clean boiled linseed oil after all slag has been removed.

S. 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 shield, or goggles equipped with suitable filter lenses.

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(b) Suitable protection against the rays of the arc shall be maintained by the tenderer when arc welding operations might be viewed with harmful range by persons other than the welding operators and supervisors.

(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 tenderer shall furnish the superintending Engineer with copies of any welding operations.

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, through out the whole of the work. An ammeter shall be provided to each arc so situated that the Superintending Engineer can check easily the current being used by the operator.

T. 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 welds is to be rejected and the welder is not to be employed.

U. CEMENT WASH

1. Materials:

(1) Cement

(2) Slaked lime

(3) Powdered Glue

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(4) Plaster of Paris

(5) Alum

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 powered 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 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 that 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 ti 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.

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.

4. Measurement and payment:

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The cement wash shall be measured in m^2 (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.

V. 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.

(3) The minimum strength of the concrete as specified shall be obtained.

(4) Preliminary tests shall be made prior to commencement of the work.

(5) Daily and whenever the materials or the mix, is changed, atleast two cylinders shall be tested, and in addition at least one consistence 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 4-16.

W. 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 tenderer.

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.

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3. Design and Drawings:

Before actual fabrication is started, detailed working drawings should be furnished by the Tenderer 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 Tenderer 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:

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 and 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, knoteches 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 tenderer in accordance with the approved drawings without extra payment 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:

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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.

Shop welding should be adopted wherever possible in fabricating components and sub-members.

Suitable jibs and fixture should be used both in the field as well as in the shop to avoid distortions during fabrications and erection.

Components which are mass fabricated in the shops should be proved in the master templates.

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 tenderer shall be responsible for the transportation from the tenderers 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 transmit 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 very based on final approved drawings

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X. EARTH WORK EXCAVATON

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 tenderer and necessary supports such as strutting, planking, shoring etc., are to be given for which no extra payment will be made.

Y-1 SAND FILLING

Sand from PWD notified quaries and shall be filled , watered rammed suitably as may be directed during the execution.

Y -2 LEAN CEMENT CONCRETE 1 :5:10

(a) **Coarse Aggregate:-** The coarse aggregate shall consist of blue granite metal of 25 m.m. and 12 mm 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.

(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

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mixing is permitted the tenderer shall use 10% extra cement for which no extra payment will be made.

Z. LAYING AND JOINTING S.W. PIPES

For conducts the stone ware pipes of 150mm and 250 internal diameter required for the work shall be according to MDSS No. 107 and S.W. pipes shall be laid to proper alignment and level and joining the same by inserting spun yarn in the socket and pointing with cement as per MDSS No.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 MDSS shall be applicable.

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Corporation of Chennai
Bridges Department
Bill of Quantities

Br.D.C.No.B3/0813/2010

Name of the Work :Propored Construction of Steel Foot over Bridge and 2 Nos of Lift Room at Gandhi Irwin Road, Near Egmore Station in Dn-105, Zone-VII.

Sl. No	Brief Description of Items	Quantity	Per	Rate in words and figures	Amount Rs. P.
1	**Earth work excavation** for foundation in all kinds soils invarying depths including dismantling any masonry and roots met within foundation and shoring planks, baling water if necessary and filling the sides with excavated earth including clearing and levelling site etc., complete with an initial lead of 10m.and lift of 2m	150.00m3	m^3		
2	**Plain cement concrete** work 1:2:4 (1cement,2 river sand and 4stone jelly, 12 to 20mm gauge) including consolidation,curing, etc.,complete upto basement (upto 1m above ground level)	6.00m3	m^3		
3	Providing **Vibrated concrete reinforced controlled ready mix cement concrete M25 mix (to be designed with the material to be used)** using 20mm ISS Size including cement handling charges for the same. mixing including placing the pump in position erecting the horizontal and vertical pipe line to the required distance and height, laying compacting providing cover blocks finishing smooth the surface including vibration charges curing concrete all other tools and plants employed and all other incidental charges etc., complete (excluding cost and fabrication charges of steel and form work) confirming to MoRTH specifications as directed by engineers (MoRTH standard data book for analysis of rates first revision page - 474 & 475 case -II)	46.00m3	m^3		

signature of the Bidder

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4. a	Providing **Vibrated concrete reinforced controlled ready mix cement concrete M25 mix (to be designed with the material to be used)** using 20mm ISS Size including cement handling charges for the same. mixing including placing the pump in position erecting the horizontal and vertical pipe line to the required distance and height, laying compacting providing cover blocks finishing smooth the surface including vibration charges curing concrete all other tools and plants employed and all other incidental charges etc., complete (excluding cost and fabrication charges of steel and form work) confirming to MoRTH specifications as directed by engineers (MoRTH standard data book for analysis of rates first revision page - 474 & 475 case -II). For **Precast RCC slab and Kerb** of 60mm thickness and 2.125m x 0.24m x 150mm respectively .	11.00m3	m^3		
4. b	extra labour for RCC precast works including moulding with necessary centering materials plastering the exposed surface with C.M. 1:3 (1 cement and 3 river sand) 10mm thick and rendering smooth with cement at 1.5kg per 1 sq.m curing for 7 days fixing in position etc., complete as directed during execution. For **Precast RCC slab and Kerb** of 60mm thickness and 2.125m x 0.24m x 150mm respectively .	11.00m3	m^3		
5	Supplying and erecting **shuttering** including necessary supports for palne surface in foundation and basement for RCC column footings, pintol blocks, plinth beam, staircase steps, critical steps, critical piers, etc., using mild steel sheets of size 90 x 60cm and 10 gauge stiffened with welded mild steel angle of size 25 x 25 x 3 mm for boarding laid over siler oak (Country wood) joists of size 10 x 6.5 cm spaced at abuot 90 cm centre to centre and supported by casuarina props of 10 to 13 cm dia spaced at 75 cm centre to centre etc., complete.	107.00m2	m^2		

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6	Supplying, Fabrication and erection by crane of structural steel for Foot over bridge as per detailed structural drawing including erection of scaffolding up to required height, proper working platform, etc., The structural steel materials, like ISMB300, ISMB150, ISMB100, ISMC300, ISMC200, ISMC150 and ISMC100 etc as per the drawings should confirm to the relevant Indian standard specification. The rate quoted shall include the cost of base-plate with holding down bolts and nuts to RCC or Masonry works, the members fixing accessories etc., painting one coat of re-oxide pant and erecting in position etc., complete as directed during execution, **for Truss, Column and Staircase**,	35000.00Kg	kg		
7a.	Supplying **ribbed tor steel** up to 16 mm dia including cutting, cranking, fabricating, assembling, laying in exact position, tying with soft steel wire 16 or 18 BWG etc., complete for all RCC Works	3000.00Kg	kg		
b.	Supplying **ribbed tor steel** above 16 mm dia including cutting, cranking, fabricating, assembling, laying in exact position, tying with soft steel wire 16 or 18 BWG etc., complete for all RCC Works	2000.00Kg	kg		
8	Supplying fitting and fixing in position true to line and level elastomectric bearing confirming to IRC 83 (Part-II) section IX and clause 2005 of MoRt&H specifications complete including all accessories as per drawing and technical specifications	2160.00Cm3	cm^3		
9	Providing and fixing of cast iron **drainage spouts** 100mm dia as per MOST drawing SD/ 205 with grating arrangements at top as shown in the drawing using 12mm x 25mm flats for grating arrangements, and 100mm dia drainage spout projecting 600mm beyond the bottom of deck slab as shown in the drawing including cost and conveyance of materials and fixing them in position etc., complete as per standard technical specification 2700. 111 and 112 of MoRTH and as per the directions of Engineer -in -charge.	16.00Nos	Nos.		

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10	Supplying and fixing **P.V.C. pipe** 110mm dia rain water down fallpipe as per ISI standard (I.S.4985)including P.V.C.Bends withoutdoor arrangements, shoes, gratings with F.I.Clamps 40mmx20mm of suitable size fixed to wooden plugs embeded in walls in cementmortar 1:3 (1 cement and 3 river sand including cutting holes inwalls and making good the same after fixing the plugs, etc. complete as directed during execution.	82.00RM	RM		
11	Painting new iron works two coats with ready mixed paint with relevant ISI STD of superrior quality and approved colour	1050.00 m²	m²		
Construction of 2 Nos of Lift Rooms for Foot Over Bridge					
12	Earth work excavation for foundation in all kinds of soils invarying depths including dismantling any masonry and roots met within foundation and shoring planks,baling water if necessary including clearing and levelling the site etc.,cand excluding refilling, complete with an initial lead of 10m and lift of 2m	106.00m3	m3		
13	Supplying clean Karanodai sand and filling in regular layers of15cm thick each including watering, consolidating etc. completefor foundation, basement,etc	15.00m3	m3		
14	Cement concrete work 1:4:8 (1 cement, 4 river sand and 8 blue granite broken stone jelly 40mm gauge) including consolidation curing, etc. complete for foundation, etc. upto basement	13.00m3	m3		
15	Providing and laying in position,machine mixed andmachine vibrated concrete mix of grade M25 for reinforced cement concrete structural elements using a minimum of 410 kg of cement and byusing machine crushed 10mm and 20mm gauge hard broken granite stone jelly excluding cost of centering,shuttering,reinforcement,f abrication and placing in position etc.,but including curing,vibrating and finishing etc.,complete complying with standard specification and water / cement ration not exceeding 0.50 and asdirected by the departmental officers.(Plasticizers if requiredwill	40.00m3	m3		

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	be supplied departmentally free of cost)				
16	Extra lift charges forconcrete work in ground floor(i.e 1m high above ground level.)	8.00m3	m3		
17	Extra lift charges forconcrete work in I st floor	8.00m3	m3		
18	Brick work with bricks (9"x4 3/8" x 2 3/4") second class chamber burnt G.M. in C.M.1:6 (1 cement and 6 river sand) including curing,thick walls upto basement (upto 1m high aboveG.L.) etc.,Complete,for 23cm	40.00m3	m3		
19	Extra lift charges for brick works those in ground floor(i.e. 1m above ground level)	10.00m3	m3		
20	Extra lift charges for brick works those in first floor.	15.00m3	m3		
21	Supplying and erecting centering for sides and soffits including supports and shuttering upto 3m high for plane surface such asside slabs of RCC boxing and similar vertical RCC slab,etc.,withall cross bracings using mild steel sheets of size 90x60cm and 10gauge stiffened with welded mild steel angles of size 25x25x3mmfor boarding laid over Oak (country wood) joists of size 10x6.5cmspaced at about 90cm centre to centre and supported by casuarina props of 10 to 13cm dia spaced at 75cm centre to centre etc., complete	133.00m2	m2		
22	Supplying and erecting centering for sides and soffits including supports and structting upto 3m high for plane surfaces such as RCC coloumns,top and bottom slabs of boxing. sill labs,sunshades,etc.,with necessary facia using mild steel sheets ofsize 90x60cm and 10 gauge stiffened with welded mild steelangles of size 25x25x3mm for boarding laid over silverOak(country wood) joists of size 10x6.5cm spaced at about 90cm centre to centre and supported by casuarina props of 10 to 13cm dia spaced at 75cm centre to centre etc.,complete	98.00m2	m2		

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23	Supplying ribbed tor steel rods upto 16mm dia including cutting, cranking, fabricating, assembling, laying in exact position,tying with soft steel wire 16 or 18 BWG etc.,complete for all RCC Works.	5000.00Kg	Kg		
24	Plastering with cement mortar 1:3 (1cement and 3 river sand) 10mmthick including hacking,curing, etc.,complete for ceiling and other exposed RCC surfaces.	12.00m2	m2		
25	Plastering with cement mortar 1:4 (1 cement and 4 river sand)12mm thick including curing, etc., complete.	220.00m2	m2		
26	White washing three coats over new plastered surface	12.00m2	m2		
27	White washing one coat over a new plastered surface.	220.00m2	m2		
28	Colour washing two coats with supercem or snowcem or any other approved cement based (with relevent ISI STD) colour washing over new plastered walls by brush with silvery grey or any other approved colour as may be directed during execution. The surface must be free from dust,oil,etc., Loose meterials and dust must be removed by brushing and washing before applying the cement based colour wash the surface shall be saturated with clean water. The mixed cement based colour wash shall pass through a fine wiremesh sieve before applying by brush, curing, etc.,complete as directed during execution	220.00m2	m2		
29	Supplying and erecting rolling shutters of 76mm,18gauge ofgalvanized steel sheet with push pull or self coiling typeoperated by pulling hook with top cover including lockingarrangements and fixed position inside or outside etc.,completeand painting a priming coat of red oxide for the shutters for theopening below lintel of rolling shutters. The head should befixed with necessary bolts of 30cm long and nuts (payment will bemade only for the actual opening of the shutter area rolled upwherever the shutters are to be fixed.(ISI STD)	12.00m2	m2		

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30	Painting new iron work two coats with ready mixed paint with relevant ISI STD of superior quality and approved colour, Roiling shutter	58.00m2	m2		
31	Cement concrete work in C.C. 1:1.5:3 (1 cement, 1.5 river sand and 3 stone jelly 12 to 20mm gauge) for RCC sunshade 60cm clear width from the face of the wall and 65mm average thickness i.e.,80mm depth at the face of the wall tapering to 50mm depth at the free-end cast-in -site along with the lintels or beams, including centering, rendering smooth the exposed surfaces, 10mm thick.neat with cement mortar 1:3 (1cement and 3 river sand) curing etc., complete (excluding cost of reinforcement.)	10.00m	m		
32	Terrace flooring with one course of pressed tiles (with relevent ISI STD) 23cm x 23cm x 20mm using C.M. 1:3 etc.,	10.00m2	m2		
33	Paving the flooring with special type of flooring (tiles colored cement based hydraulic pressed Antiskid tiles) 20mm thick in 1:3 including painting with colour cement etc. ,complete (ISI)	24.00m2	m2		
34	Supplying and fixing P.V.C. pipe 110mm dia rain water down fallpipe as per ISI standard (I.S.4985)including P.V.C.Bends withoutdoor arrangements, shoes, gratings with F.I.Clamps 40mmx20mm of suitable size fixed to wooden plugs embeded in walls in cementmortar 1:3 (1 cement and 3 river sand including cutting holes inwalls and making good the same after fixing the plugs, etc. complete as directed during execution.	32.00m	m		
35	Plastering with cement mortar 1:4 (1 cement and 4riversand),20mm thick including curing, etc., complete	260.00m2	m2		
36	Granolithic flooring 50mm thick with cement concrete 1:2:4 (1cement,2 river sand and 4 blue granite broken stone jelly 3 to10mm gauge) and top rendered smooth with cement at 10kg per10sq.m. including thread lining, curing, providing 25mm diaG.I.pipe of necessary length for water outlet, etc., complete as directed during execution.	18.00m2	m2		

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37	Supplying and fixing M.S.Grill gate of required size in twoshutters with necessary iron members, gun metal cups and wheels75mm dia. with fittings locking arrangements, etc., complete,including painting a priming coat of approvedprimer,etc.,complete (The design of gate furnished is subject toalteration during execution.)	490.00Kg	Kg		
38	Supplying and erecting shuttering including necessary supports for plane surface in foundation and basement for RCC column footings,pintol blocks,plinth beam,staircase steps, critical steps, critical piers, etc., using mild steel sheets of size 90x60cm and 10 gauge stiffened with welded mild steel angles of size25x25x3mm for boarding laid over silver Oak (country wood) joistsof size 10x6.5cm spaced at about 90cm centre to centre and supported by casuarina props of 10 to 13cm dia spaced at 75cmcentre to centre etc., complete.	104.00m2	m2		
39	Cladding the vertical wall with Pre polished S.K Blue Granite Slab (16-18mmthick) and best quality free from all defects and set in cm1:2 for 10mm thick etc complete as directed by Engineer -in-charge.	280.00m2	m2		
40	Supplying & fixing of 12mm thick clean toughened glass panels of approved brand using glass wall bracket and sealed with approved quality silica on glasses joints and all other edges and necessary labour charges for cutting and making holes and fixing the glass in position i/c necessary scaffolding charges for fixing of toughened glass and wastage etc., complete and providing suncontrol of 50mm width on all around the toughened glass on inner side (excluding the cost of glass wall bracket)	26.00m2	m2		
41	Cost of brass - chromium finish glass wall bracket size 50 x 50mm with necessary screws.	40.00Nos	Nos		

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42	Supplying & fixing of aluminium composite panel of 4mm thick consist of 0.5mm tk aluminium sheet on both sides of approved brand using aluminium angle of size 38 x 38 x 3mm over the standard M.S.frame work 38 x 38 x 6mm which is fastened to the wall using anchor fastener bolts. The composite panels are fabricated as atray type with aluminium angle frame section and necessary labour charges for cutting,grooving, scaffolding, fabrication and etc an sealed with approved quality of silica for joints etc., complete.	32.00m2	m2		
43	Full round edge polishing for granite slabs of 20mm thick (Special Data-5).	46.00m	m		
	Total				
Total in words and figures					

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