

Tamil Nadu Road Development Company Ltd.
(TNRDC)

**Improvement to Roads, Bridges and Culverts of North
Chennai Thermal Power Station Road and Ennore Port Road for
the Movement of 575 MT Special Transport Vehicle in
Thiruvallur District, Tamil Nadu**

BID DOCUMENT

Section I :	Instruction to Bidders
Section II :	Forms of Bids & Forms of Securities
Section III :	Conditions of Contract
Section IV :	Contract Data
Section V :	Bill of Quantities
Section VI :	Drawings
Section VII :	Technical Specifications

January 2013

TNRDC

**Tamil Nadu Road Development Company Limited,
Sindur Panthion Plaza, 2nd Floor, 346, Pantheon Road,
Egmore, Chennai- 600 008
Phone: 044-2819 4800, 044-2819 4900
Fax : 91- 44 -2819 5800**

Tamil Nadu Road Development Company Ltd.
(TNRDC)

**Improvement to Roads, Bridges and Culverts of North
Chennai Thermal Power Station Road and Ennore Port Road for
the Movement of 575 MT Special Transport Vehicle in
Thiruvallur District, Tamil Nadu**

Period of Issue of Tender Document	30th January, 2013 to 01st March, 2013
Bid Document Price	Rs 15,000/- DD in Favour of M/s. Tamil Nadu Road Development Company Limited, (TNRDC) for each package , payable at Chennai
Last Date and Time for Receipt of Bids	04th March, 2013 at 15.00 Hrs
Pre-Bid Meeting	18th February, 2013 at 15.00 Hrs
Bid – Opening Date and Time: Technical Bid Opening Financial Bid Opening	04th March, 2013 at 15.30 Hrs Date will be intimated to the Technically Qualified bidders later

Tamil Nadu Road Development Company Ltd.

(TNRDC)

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Tamil Nadu Road Development Company Ltd.

INVITATION FOR BIDS

“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”

Bids are invited by **M/s Tamil Nadu Road Development Company Ltd. (TNRDC)** for implementation of the following works in **Thiruvallur District, Tamil Nadu**.

Description of Works	Nature of Work and Location	Indicative value of work		EMD / Bid Security Value (Rs)	Period of Completion
		Package	Amount (Rs) Lakhs		
Carrying out Improvement to Roads, bridges and culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu.	1) Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)	I	2586	26,00,000/-	15 Months
	2) Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)	II	1193	12,00,000/-	12 Months

Bid document can be obtained between **10.00 hrs and 17.00 hrs** on all working days from **30th January, 2013 to 01st March, 2013** at the address for communication mentioned below on payment of Non-refundable fee of **Rs. 15,000/- (Rupees Fifteen Thousand only)** for each package by way of a demand draft drawn in favour of **M/s. Tamil Nadu Road Development Company Ltd.** payable on any scheduled bank in **Chennai**. Alternatively, the Bid document can also be downloaded from the website www.tnrdc.com and in such cases, the bidders will be required to pay the non-refundable fee as mentioned above, at the time of submission of Bids. The proposals shall be submitted through **Two-Cover System (Technical and Financial Proposals in separate envelopes)**

Sealed proposals should reach at the following address not later than **15.00 hrs on 04th March, 2013**.

Address for communication

General Manager - Projects

Tamil Nadu Road Development Company Ltd.

Regd. Office : Sindur Panthion Plaza, 2nd Floor,

No. 346, Pantheon Road, Egmore,

Chennai – 600 008, Tamil Nadu, India

Phone No.: 091 – 44 - 2819 4800 / 4900

Fax No. : 091 – 44 - 2819 5800

E-Mail: tenders@tnrdc.com

Web : www.tnrdc.com

Section I

Instructions to Bidders

SECTION 1: INSTRUCTIONS TO BIDDERS**A: GENERAL****1. Scope of Bid****1.1 Background**

- (a) Tamil Nadu Road Development Company Ltd. (TNRDC) is promoted by Tamil Nadu Industrial Development Corporation Ltd (TIDCO) and TIDEL Park Ltd.

Bids are invited by Tamil Nadu Road Development Company Ltd, (TNRDC), for "Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu" from independent firms. In case of bidding is done for both the packages, bids are invited from Joint Ventures consortiums also interested in the project to submit their bids.

The estimated cost of the work for Package – I is Rs.25.86 Crores and for Package – II is Rs. 11.93 Crores.

Each prospective bidder can place their bid for either of the packages or for both i.e, the bidder can bid for either Package –I or Package –II or for both Package I & II with separate Bid Document Cost for each package and EMD/ Bid Security as appropriate for each package.

The successful bidder will be expected to complete the works within the following period from the date of issue of Notice to Proceed the Work.

Package – I is **15 Months**

Package – II is **12 Months**

- 1.1.2 The execution of the above works is on "Item Rate Contract basis". The approximate quantities for all items of works to be executed are furnished in the Bill of Quantities (BoQ) - Section- V of the bidding document.

1.2 Scope of works

- 1.2.1 The broad scope of Works to be carried out by the selected bidder includes the following components, but not limited to:

- Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts, excluding RoB at Athipattu (Km 0/00 to Km 4/800) – **Pacakge - I**
- Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400) **Pacakge - II**
- Other works and services as may be indicated in the contract.

The scope of work (in packages) are as follows:

S.No	Description	Nature of work and location	Indicative value of work		Period of Completion
			Package	Amount (Rs)	
1.	Carrying out Improvement to Roads, bridges and culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu.	Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)	I	25.86 Crores	15 Months
		Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)	II	11.93 Crores	12 Months

The Cost of the Bid document for each Package of work is **Rs.15,000/- (Rupees Fifteen Thousand Only)** which is Non-Refundable as indicated in clause 5. EMD should be attached as prescribed in Clause 15.

Any bid not accompanied by the Bid Document and its acceptable Cost and EMD, shall be summarily rejected by the Employer as **Non- Responsive**.

2. Throughout this Bidding document, the term 'bid' and 'tender' and their derivatives (bidder/ tenderer, bid/ tender, bidding/ tendering, etc.) are synonymous.

3. Eligible Bidders

3.1 Qualification of the Bidder

To be qualified for award of the contract, bidders shall provide evidence satisfactory to the Employer of their capability and adequacy of resources to carry out the contract effectively.

- 3.2 Bids shall include the following relevant information & particulars in the prescribed forms attached in Section –II: Forms of bid & Forms of securities.

- Copies of original documents defining the constitution or legal status, place of registration and principal places of business; written Power of Attorney of the signatory of the Bid to commit the bidder;
- Total Annual Turnover in the civil works construction business expressed as total of payment certificates for work performed in each for the last three years;
- Performance as Contractor, on works of a similar nature and complexity over the last three years and details of other work on hand and contractual commitments;
- Major items of Contractor's equipments proposed for carrying out the contract;

- (e) The qualifications and experience of key personnel proposed for administration and execution of the contract.
 - (f) Reports on the financial standing of the bidder including profit and loss statements, balance sheets and auditor's reports for the past three years.
 - (g) Authority to seek references from the bidder's bankers;
 - (h) Information regarding any litigation or arbitration resulting from contracts executed by the bidder in the last three years or currently under execution. The information shall include the names of the parties concerned, the disputed amount, cause of litigation, and matter in dispute;
 - (i) Proposal of work methods, in sufficient detail to demonstrate the adequacy of the bidder's proposals to meet the technical specifications and the completion time referred in sub-clause 1.1.2 above.
- 3.3 Bidders shall not be under a declaration of ineligibility or blacklisted for corrupt and fraudulent practices or poor quality/ delayed implementation of any work by the Government of India (GoI), Government of Tamil Nadu (GoTN), other State Governments or any other agencies and/ or Statutory Authorities.

4. Qualification Criteria and Information

The Qualification will be based on the bidder / joint venture /Lead Partners of consortiums who meets the following criteria with respect to general and particular experience, financial position, personnel, and equipment capabilities and other relevant information as given by the applicant in the required format.

The following criteria must be fulfilled by the Bidder / joint venture / Lead Partners of consortiums and the same shall be duly certified by auditors/ clients, as applicable. The Bidder / joint venture /Lead Partners of consortiums shall note that the criteria set out hereunder shall be satisfied by the Bidder.

4.1 Experience and Turn Over

The bidder shall provide documentary evidence of having been actively engaged in the civil works of similar nature during the last three years in the role of contractor.

4.2 Particular Construction Experience

The bidder / joint venture / Lead Partners of consortiums shall provide evidence that the firm has successfully completed or substantially completed during last three years (year 2009-2010, 2010-2011 & 2011-2012) a single civil work contract of similar nature for the value of

**Rs 10.40 Crores for Package – I and
Rs.04.80 Crores for Package – II**

In the case of Joint venture, the members of the Consortium shall nominate one member as the lead member (the "Lead Member"), who shall have an equity share holding of at least 26% (twenty six per cent) of the paid up and subscribed equity of the SPV; shall have Technical Capacity of atleast 26% (twenty six per cent) of the Threshold Technical Capacity The nomination(s) shall be supported by a Power of Attorney, as per the format at Appendix-III, signed by all the other members of the Consortium.

4.3 Turn Over

The bidder / joint venture / Lead Partners of consortiums shall have generated a minimum **Annual Average Project Related Civil work Turnover of Rs 26 Crores for Package – I and Rs.12 Crores for Package – II** during the last 3 years commencing from the year 2009-2010, 2010-2011 & 2011-2012.

4.4 Personnel Capabilities

The bidder shall supply general information on the management structure of the firm and shall make provision for suitably qualified personnel required for the work

The Minimum requirement of the Personnel for the project is as follows:

Sl. No	Designation	Educational Qualification	Professional Experience in similar capacity
1	Project Manager	P.G. Degree in Civil Engineering	10 Years
2	Senior Engineer	P.G. Degree in Civil Engineering	05 Years
3	Site Engineer (2 Nos.)	Diploma in Civil Engineering	03 Years
4	Quantity Surveyor	Diploma in Civil Engineering	05 Years
5	Pavement Specialist	B.E Degree Holder in civil Engineering	05 Years
6	Land Surveyor	Diploma in Civil Engineering	05 Years
7	Material Engineer	B.E Degree Holder in civil Engineering	05 Years

All other necessary inputs of man power such as support staffs, field technical staffs, office staffs other than the above mentioned, as deemed necessary, shall be provided by the bidder within the quoted amount to ensure that the entire work is completed in accordance with the conditions stipulated in the Bid document.

In case of non deployment of the above personnel on the part of the contractor, a penalty of **Rs. 20,000/-** per month for the Diploma holder and **Rs. 30,000/-** per month for the PG Degree holder shall be levied based on the norms for the value of this contract.

The Bidder should have **ESI / Workmen Compensation Policy and EPF code**. The Bids submitted by the firms without **ESI / Workmen Compensation Policy and EPF code**, shall be declared **Non-Responsive**. However, the Successful bidder has to furnish **ESI / Workmen Compensation Policy and EPF code subsequent to which payment for the work done will be released**.

4.5 Equipment Capabilities

The bidder is required to own or have assured access through hire or lease key equipments required for implementation of the project and **shall give an undertaking** in the prescribed format to provide all the plants and machineries required for the project in good condition during the project period.

4.6 Financial Capabilities

The bidder shall demonstrate that he has access to or has available liquid assets (aggregate of working capital, cash in hand and uncommitted bank guarantee), line of credit and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirement. The bidder must demonstrate the current soundness of the bidder's financial position, and indicate its prospective long-term profitability, if deemed necessary; the Employer shall have the authority to make enquiries with the bidder's bankers.

4.7 Litigation History

The bidder as on date should not have been debarred from taking up any civil construction works and shall not be under a declaration of ineligibility for corrupt and fraudulent practices by the Government of India, Government of Tamil Nadu or any other agency. The bidder should provide accurate information about any litigation or arbitration resulting from contracts completed or ongoing under its execution over the last three years. A consistent history of awards against the bidder will result in rejection of the bid. Suppression of any information or material in this regard would be construed as a fundamental breach and TNRDC reserves its right to take appropriate action including cancellation of the bid, forfeiting of bid security etc., as may be deemed fit by TNRDC at any time without requiring to give any notice to the applicant in this regard.

4.8 Deleted

4.9 Construction Programme

The Bidder shall submit details of proposed construction programme regarding work methodology including preliminary Environment Management Plan, Traffic Management Plan and Resource Management Plan.

The Bidder shall, pay special attention and concentrate on the following issues wherever mentioned throughout bid document and propose the construction programme accordingly:

- i) Test inspection and rejection of defective materials on work.
- ii) Carriage
- iii) Construction Plant
- iv) Water and Lighting
- v) Cleaning up during progress and for delivery
- vi) Accidents
- vii) Delays
- viii) Particulars of Payment

5. Cost of Bid document

The cost of bid document for each package is **Rs.15,000/- (Rupees Fifteen Thousand Only)** which is Non-Refundable as indicated in the Invitation for Bids. Any bid not accompanied by the acceptable bid document and its cost will be rejected by the employer as **Non-Responsive**.

The bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will in no case be responsible and liable for such costs, regardless of the conduct or outcome of the tendering process.

6. Site Visit

The Bidder shall, prior to submission of the Bid for the work, at his own expense, responsibility and risk, is encouraged to visit and examine the Site of Works and its surroundings and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the works.

B. BIDDING DOCUMENT

7. Contents of the Bid Document

The contents of the Bid documents are given in the succeeding paragraphs

7.1 The Bidding Document comprises the documents listed below and should be read in conjunction with any addenda issued in accordance with Clause 9

- (a) Section I Instructions to Bidders
- (b) Section II Forms of Bid and Forms of Securities
- (c) Section III Conditions of Contract
- (d) Section IV Contract Data
- (e) Section V Bill of Quantities (BoQ)
- (f) Section VI Drawings
- (g) Section VII Technical Specifications

7.2 The Bidder is expected to examine carefully all instructions, qualification information, forms, Conditions of Contract, Contract Data, Technical specifications, forms, BoQ, and Drawings in the Bid Document. Failure to comply with the requirements of Bid Document shall be at Bidder's own risk. Pursuant to Clause 25.2, bids, which are not substantially responsive to the requirements of the Bid Document, will be rejected.

8. Clarification of Bidding Document

A prospective bidder requiring any clarification of the bidding documents may notify the Employer in writing or by cable (hereinafter the term "cable" is deemed to include telex and facsimile) at the Employer's address indicated in the Invitation for Bid. The Employer will respond to any request for clarification which he receives **on or before 01st March, 2013.**

8.1 Pre Bid Meeting

8.1.1 The bidder or his official representative is invited to attend a Pre Bid Meeting which will take place at the office of TNRDC, Egmore on **18th February, 2013 at 15.00 Hrs** and the minutes of the meeting will be conveyed to the bidders who have purchased the document by post or fax or e-mail and will be uploaded in the website. It is the bidder's responsibility (for those who download from the website) to keep track of the website specified in the NIT for minutes of pre bid meeting and/or any addendum. The minutes of Pre-bid meeting shall form part of this Bid document.

- 8.1.2 The purpose of the meeting will be to clarify issues and to answer questions on any matter regarding the work that may be raised on or before the date of Pre-Bid Meeting.

9. Amendment of Bidding Document

- 9.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.
- 9.2 Any addendum thus issued shall form part of the bidding documents and shall be communicated in writing or by post or fax or e-mail to all the purchasers of the bidding documents and it will also be uploaded in the website. It is the bidder's responsibility (for those who download from the website) to keep track of the website specified in the NIT for any addendum. The addendum of the bidding document will not be notified in the newspaper. Prospective bidders shall acknowledge receipt of each addendum by post or fax or e-mail to the Employer.
- 9.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer may, at his discretion, extend the deadline for submission of bids, in accordance with Sub-Clause 19.2.

C. PREPARATION OF BIDS

10. Language of the Bid

- 10.1 The bid, and all correspondence and document related to the bid exchanged between the Bidder and the Employer shall be written in **English** language.

The Bidders shall submit separate, sealed envelopes for each package comprising of Technical Bid and Financial Bid as detailed in clause 11 below.

11. Documents Comprising the Bid

- 11.1 The bid shall be prepared and complete in accordance with the provisions of the Bid Document and shall be submitted by the bidder in a duly sealed and signed manner as appropriate. It shall comprise the following:

(a) TECHNICAL BID (Envelope No.1) :

- (i) Bidder's qualification and other information and supporting documents of Clause 4 as per the formats given in Section-II of Bid Document
- (ii) Earnest Money Deposit (EMD) as per Clause 15.1
- (iii) Bid Document and its cost as per Clause 5

The Technical Bid must not include any details of Financial Bid and the Financial Bid must not include any details of Technical Bid.

(b) FINANCIAL BID (Envelope No.2) :

- (i) Letter of Financial Bid as per the format given in Section-II of Bid Document, and
- (ii) Bill of Quantities as given in Section-V of Bid Document.

- 11.2 The '**BID**' must be in a bound form with pages numbered serially and by giving an index of submissions. The forms and schedules given in Section-II, and Section-V shall be filled in without exception and without any variation, both in respect of form and contents. **Any bid not bound and if submitted in loose papers shall be summarily rejected.**

11.3 All the addenda issued should be properly incorporated. Failure to do so may result in the bid being rejected.

12. Bid Prices

12.1 Unless stated otherwise in the bidding documents, the contract shall be for the whole work or parts thereof as described in Sub-Clause 1, based on the quoted rates in Bill of Quantities submitted by the Bidder.

12.2 The bidder shall fill in rates and prices on unit basis (both in figures and words) for all items of the works described in the Bill of Quantities along with total bid price (both in figures and words). Items for which no rate or price is entered by the bidder will not be paid for by the Employer when executed and shall be deemed covered by the other rates and prices in the Bill of Quantities. Corrections, if any, shall be made by crossing out, initialling, dating and rewriting.

12.3 All duties, taxes (including service tax), fees, tolls, royalties, cess and octroi, insurance, contribution to labour welfare fund, EPF and other levies payable by the contractor under the contract, or for any other cause shall be included in the rates, prices and total Bid Price submitted by the Bidder.

12.4 The rates and prices quoted by the Bidder shall be fixed for the duration of the Contract and shall not be subject to adjustment on any account.

13 Currencies of Bid and Payment

The unit rates and the prices shall be quoted by the bidder entirely in **Indian Rupees only**.

All payments shall be paid in Indian Rupees only.

14 Bid Validity

14.1 Bids shall remain valid for a period of 180 days (One Hundred and Eighty days) after the deadline date for Bids as specified in Clause 19. A bid valid for a shorter period shall be rejected by the Employer as **Non-Responsive**.

14.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request the bidders to extend the period of validity for a specified additional period. The request and the bidder's responses shall be made in writing or by cable. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for the period of the extension, and in compliance 19.2 in all respects.

15 Earnest Money Deposit (EMD)

15.1 The proposals duly filled in the required format must reach the Office of TNRDC, Egmore, Chennai – 600 008 on or before **15.00 hrs, on 04th March, 2013** along with **EMD/ Bid Security for an amount of Rs.26,00,000/- for Package – I and Rs. 12,00,000/- for Package – II** in one of the following forms:

- i) Form of **Demand Draft drawn in favour of M/s. Tamil Nadu Road Development Company Ltd**, as indicated in the bid document.
- ii) **Bank Guarantee** from any Nationalised Indian Bank / Scheduled Bank approved by the RBI.

- iii) The Bank Guarantees issued, as surety for the bid shall be valid for 28 days beyond the validity of the bid.

15.2 **Any bid not accompanied by the acceptable EMD shall be rejected by the Employer as Non- Responsive.**

16 Alternative Proposals by Bidders

Bidders shall only submit offers that comply with the requirements of the bidding documents, including the basic technical design as indicated in the drawing and specifications.

Alternate proposals will not be considered.

17 Format and Signing of Bid

- 17.1 Only relevant supporting documents shall be submitted along with the Bid, Documents furnishing additional information other than that is required as per Bid Document, if any, shall be submitted separately under separate heading, which may not be considered for evaluation.
- 17.2 The entire Bid including covering letter and supporting documents shall be duly page numbered and shall contain a detailed table of contents with page references.
- 17.3 The person or persons signing the Bids shall initial all pages of the Bids.
- 17.4 The Bidder shall prepare and submit one original of the Bid Document comprising the Bid as described in Clause 11, bound and clearly marked "**ORIGINAL**".
- 17.5 The Bid shall be typed or written in indelible ink and shall be signed by a person or persons duly authorized to sign on behalf of the Bidder. All pages of the bid where entries or amendments have been made shall be initialled by the person or persons signing the bid.
- 17.6 The Bid shall contain no alterations or additions, except those to comply with instructions issued by the Employer, or as necessary to correct errors made by the bidder, in which case such corrections shall be initialled by the person or persons signing the bid.
- 17.7 The Bidder shall furnish information as described in the Form of Bid and Qualification on commissions or gratuities, if any, paid or to be paid to agents, and to contract execution if the Bidder is awarded the contract.
- 17.8 All witnesses and sureties shall be persons of status and probity and their full names, occupation and addresses shall be printed below their dated signatures.

D. SUBMISSION OF BIDS

18 Sealing and Marking of Bids

- 18.1 **For Each Package** :-The Bidder shall submit Technical Bid and Financial Bid in two separate envelopes, securely sealed. These envelopes shall be clearly marked on top as "**TECHNICAL BID**" and "**FINANCIAL BID**" as appropriate. The Technical Bid and Financial Bid in two separate envelopes so sealed and marked shall then be put into an **Outer Envelope stating the Package Details** and duly sealed.

18.2 The Inner and Outer envelopes shall

(a) be addressed to the Employer at the following address:

General Manager - Projects

Tamil Nadu Road Development Company Ltd.

346, Sindur Panthion Plaza,

2nd- Floor, Pantheon Road,

Egmore, Chennai- 600 008

And

(b) bear the following identification:

For Package – I as

Bid for “Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)”

For Package – II as

Bid for “Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts (Km 0/00 to Km 2/400)”

18.3 In addition to the identification mentioned above, the inner and outer envelopes shall indicate the name and address of the bidder to enable the bid to be returned unopened in case it is declared late, pursuant to Clause 20.

18.4 If the envelopes are not sealed and marked as above, the Employer will assume no responsibility for misplacement or premature opening of the bid and the bid will be rejected on the grounds of **Not Substantially Responsive.**

19 Deadline for Submission of the Bids

19.1 Bids must be received by the Employer at the address specified above not later than **15.00 Hours on 04th March, 2013.** In the event of the specified date for the submission of bids declared a holiday for the Employer, the Bids will be received up to the appointed time on the next working day.

19.2 The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 9, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

20 Late Submission of Bids

Any Bid received by the Employer after the deadline prescribed in Clause 19 will be returned unopened to the bidder.

21 Modification and Withdrawal of Bids

21.1 Bidders may modify or withdraw their bids by giving notice in writing before the deadline prescribed in Clause 19.

21.2 Each Bidder's modification or withdrawal notice shall be prepared, sealed, marked, and delivered in accordance with Clause 18 & 19, with the outer and inner envelopes

additionally marked "**MODIFICATION**" or "**WITHDRAWAL**", as appropriate along with the package details.

- 21.3 No bid may be modified after the deadline for submission of Bids.
- 21.4 Withdrawal or modification of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 14.1 above or as extended pursuant to Clause 14.2 may result in the forfeiture of the Bid security pursuant to Clause 15.
- 21.5 Bidders may only offer discounts to, or modify the prices of their Bids only by submitting Bid modifications in accordance with this clause, or included in the original Bid submission.

E. BID OPENING AND EVALUATION

22 Bid Opening

- 22.1 The Employer will open all the Bids received (except those received late), including modifications made pursuant to Clause 19, in the presence of the Bidders or their representatives who choose to be present **at 15:30 Hrs on 04th March, 2013** at the office of the TNRDC, Egmore, Chennai.
- 22.2 In the event of the specified date of Bid opening being declared a holiday, the Bids will be opened at the appointed time and location on the next working day by the employer.
- 22.3 Envelopes marked "**WITHDRAWAL**" shall be opened and read out first. Subsequently, all envelopes marked "Modification" shall be opened and the submissions therein read out in appropriate detail at the time of opening of Financial Bid.
- 22.4 After opening of the outer envelope containing the Bid, its contents shall be examined for compliance in pursuant to Clause 18.1. Bids found not complying are liable to be rejected without further examination. The contents of envelope titled "**TECHNICAL BID**" will be opened first and its contents shall be scrutinised as per requirements of Bid document for initial responsiveness. Only for the Bidders, whose Technical Bid contains the requisite Bid Document Cost, acceptable EMD / Bid security and the Technical Bid along with the Bid document and if found in order and evaluated as substantially responsive, the envelope titled "**FINANCIAL BID**" shall be opened. TNRDC may notify those bidders whose bids were not considered as per conditions of the bid document and will return their Financial Bid "unopened" along with the EMD. TNRDC shall simultaneously notify the technically qualified bidders indicating the date and time set for opening of the Financial Bid. The financial bid will be opened **at the same address as specified in Clause 18.2** in the presence of Bidders or their authorized representatives who choose to be present.

The Tender scrutiny Committee will determine whether the submitted Financial bid is complete i.e. whether they have included cost of all items; if not, then the cost towards such missing items will be considered as NIL, but, the bidder shall, however, be required to carry out such obligations without any additional compensation. In case under such circumstances, if TNRDC feels that the work cannot be carried out

within the overall cost as per the submitted financial bid, such bid shall be considered **Non - Responsive**.

- 22.5 The Bidder's names, the Bid Prices, the total amount of each bid, any discounts, Bid modifications and withdrawals and such other details as the Employer may consider appropriate, will be announced and recorded by the Employer at the time of opening. No bid shall be rejected at the time of Bid opening except for late bids pursuant to Clause 20 and conditional bids. Bids [and modifications pursuant to Clause 21] that are not opened and read out at Bid opening will not be considered for further evaluation regardless of the circumstances. Late and withdrawn bids will be returned unopened to Bidders along with the EMD submitted by them.

23 Process to be Confidential

Information relating to the examination, clarification, evaluation, and comparison of Bids and recommendations for the award of a contract shall not be disclosed to Bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any effort by a Bidder to influence the Employer's processing of Bids or award decisions may result in the rejection of his Bid.

24 Clarification of Bids

- 24.1 To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his Bid, including breakdowns of the unit rates. The request for clarification and the response shall be in writing or by cable, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 27. Provided however, the employer shall seek the rectification of price with the bidder who quoted lowest in total;
- 24.2 Subject to sub-clause 24.1, no Bidder shall contact the Employer/ its representatives on any matter relating to its bid from the time of the bid opening to the time the contract is awarded.
- 24.3 Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidder's bid.

25 Preliminary Examination of Bids and Determination of Responsiveness

- 25.1 Prior to the detailed evaluation of Bids, the Employer will determine whether each Bid (a) has been properly signed; (b) is accompanied by the required securities and; (c) is substantially responsive to the requirements of the Bidding documents pursuant to Clause 22.4; and (d) provides any clarification and/ or substantiation that the Employer may require pursuant to Clause 24.
- 25.2 A substantially responsive Bid is one, which conforms to all the terms, conditions, and specifications of the Bidding documents, without material deviation or reservation. A material deviation or reservation is one (a) which affects in any substantial way the scope, quality, or performance of the Works; (b) which limits in any substantial way, inconsistent with the Bidding documents, the Employer's rights or the Bidder's obligations under the Contract; (c) not confirming to the requirement

at Clause 18 or (d) whose rectification would affect unfairly the competitive position of other Bidders presenting substantially responsive Bids.

- 25.3 If a Bid is not substantially responsive, it will be rejected by the Employer, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

26 Correction of Errors

- 26.1 Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors. Errors will be corrected by the Employer, where there is a discrepancy between the unit rates in figures and in words, the lesser of the two will prevail.
- 26.2 The amount stated in the Bid will be adjusted by the Employer in accordance with the above procedure for the correction of errors and, with the concurrence of the Bidder, shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount the Bid, will be rejected, and the Bid security may be forfeited in accordance with Sub-Clause 17.6.

27 Evaluation and Comparison of Bids

- 27.1 The Employer will evaluate and compare only the Bids determined to be substantially responsive in accordance with Clause 25.
- 27.2 In evaluating the Bids, the Employer will determine for each Bid, the evaluated Bid Price by adjusting the Bid Price as follows:
- (a) Making any correction for errors pursuant to Clause 26;
 - (b) Excluding Provisional Sums and the provision, if any, for contingencies in the Summary Bill of Quantities;
- 27.3 Towards evaluation, the employer will take into account the adjusted Bid Price for construction/ improvement works arrive at the lowest evaluated rate of bid.
- 27.4 The Employer reserves the right to accept or reject any variation, deviation, or alternative offer and other factors which are in excess of the requirements of the Bidding document or otherwise result in the accrual of unsolicited benefits to the Employer shall not be taken into account in Bid evaluation.
- 27.5 If the Bid of the successful Bidder is seriously unbalanced in relation to or substantially below the Employer's estimate of the cost of work to be performed under the contract, the Employer may require the Bidder to produce detailed price analysis for any or all items of the Bill of Quantities, to demonstrate the internal consistency of those prices with the construction methods and schedule proposed. After evaluation of the price analysis, the Employer may require that the amount of the performance security set forth in Clause 31 be increased at the expense of the successful Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.

F. AWARD OF CONTRACT

28 Award Criteria

Subject to Clause 27, the Employer will award the Contract to the Bidder whose Bid has been determined to be substantially responsive to the Bidding documents and

whose bids are evaluated to be the lowest, provided that such Bidder has been determined to be eligible and qualifying in accordance with the provisions of Clause 1, 3 and 4.

The successful bidder of each package will be awarded work based on their lowest quote for the respective packages for which they have quoted. In case if a single bidder emerges as the lowest successful L1 bidder in Package I & Package- II, they becomes eligible for award of work for both the packages after negotiation.

If the lowest bidder is not responding for further negotiations, the Employer reserves the right to negotiate with any of the eligible bidders who is willing to offer a negotiated and reasonable rate.

Awarding the work to bidders or summarily rejecting all the bids or to annul the bid process at any stage shall be the sole discretion of TNRDC, based on the capability of the Bidders.

Employer reserves the right to appoint other contractor/contractors for :-

Package –I:- Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

Package –II:- Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts (Km 0/00 to Km 2/400)

or part of this work/contract and any other works that the Employer may decide.

29 Employer's Right to accept any Bid and to reject any or all Bids

29.1 Notwithstanding Clause 28, the Employer reserves the right to accept or reject any Bid, and to annul the Bidding process and reject all Bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or Bidders or any obligation to inform the affected Bidder or Bidders of the grounds for the Employer's action.

30. Notification of Award

30.1 The Bidder whose Bid has been accepted will be notified of the award by the Employer prior to expiration of the Bid 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 Employer 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").

31 Performance Security

31.1 Within 7 days of receipt of the Letter of Award, the successful Bidder shall deliver to the

- a. Employer a Performance Security in the form of a bank guarantee from Nationalised Bank/ Scheduled Bank acceptable to the Employer in the form as given in Section 2 for an amount equivalent to **2% of the initial contract price** in accordance with Clause 27.5 and Clause 48 of Conditions of Contract. The Performance Security for works shall be valid for a period of

12 Months beyond the completion date of each package. The bidder should maintain the facility in acceptable condition as stipulated in the Bid document.

31.2 Failure of the successful bidder to comply with the requirements of Clause 31.1 shall constitute a breach of contract, cause for annulment of the award, forfeiture of the bid security, and any such other remedy the Employer may take under the contract.

31.3 Retention Money

In each, Interim Payment Certificate (IPC) @ 5 % of value of work executed during each bill period will be withheld and the withheld amount will be refunded to the Contractor along with the Final Bill /Taking over certificate. The maximum amount of Retention money to be with held is restricted up to 5% of the contract value.

32 Signing of Agreement

32.1 At the same time, the employer notifies to the successful Bidder that his Bid has been accepted, and the Employer will direct him to attend the Employer's office on a date determined by the Employer for signing the Contract Agreement as per the format provided in the Bidding Document incorporating all the agreements between the parties. The signing of the Contract Agreement shall take place only after the furnishing of the requisite performance security by the selected Bidder as per Clause 31.1

32.2 The Agreement will incorporate all agreements / correspondences between the Employer and the successful Bidder. It will be kept ready for signature of the successful bidder in the office of employer within 21 days following the acceptance of the Letter of Award by the successful bidder; the successful Bidder will sign the Agreement upon furnishing of the requisite performance security and deliver it to the Employer.

32.3 Upon furnishing of the Performance Security by the successful Bidder, the Employer will promptly notify the other Bidders that their Bids have been unsuccessful and refund the Bid Security.

33 Corrupt or Fraudulent Practices

33.1 The Employer requires that all the Bidders should observe the highest standard of ethics during the procurement and execution of this Contract. In pursuance of this policy, the Employer:

(a) Defines, for the purposes of this provision, the terms set forth as follows :

“Corrupt practice” means the offering, giving, receiving or soliciting of anything of value to influence the action of Employer/ its representatives in the procurement process or in contract execution; and

“Fraudulent practice” means a misrepresentation of facts in order to influence a procurement process or the execution of a contract to the detriment of the Employer, and includes collusive practice among Bidders (prior to or after Bid Submission) designed to establish Bid prices at artificial non-competitive levels and deprive the Employer of the benefits of free and open competition;

(b) will reject a proposal for award if he determines that the Bidder recommended for award has, engaged in corrupt or fraudulent, practices in competing for the Contract in question;

- (c) will declare a firm ineligible, either indefinitely by TNRDC or for a stated period of time, to be awarded any contract in **TNRDC**, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for, or in executing, this Contract.

34 **Termination:-**

In case the Contractor fails to carryout the works, as per the construction programme and as per the conditions stipulated in the Bid document, then the Employer, at its sole discretion is entitled to terminate this contract at the '**Risk and Cost**' of the Contractor and to employ such other Contractor/s to carryout the balance works. The additional cost incurred by the employer in completing the works, which remain unfinished at the time of termination of the contract will be recovered from the Contractor. Any unrecovered 'Risk and Cost'

amount will be a debt payable to the Employer and the Employer will take suitable actions for such unrecovered 'Risk and Cost' amount at the cost of the Contractor. Any bill/s for the works executed remains unsettled and/or the value of materials, machineries etc., taken over or possessed by the Employer at the time of termination or on termination will be adjusted towards the 'Risk and Cost' recoverable from the contractor.

Section II
Forms of Bid &
Forms of Securities

SECTION II

FORMS OF BID & FORMS OF SECURITIES

1. LETTER OF APPLICATION

(Letterhead paper of the Bidder)

[Including full postal address, telephone, fax, cable and telex addresses]

[date]

To:

General Manager (Projects)

Tamil Nadu Road development Company Limited.(TNRDC)
Sindur Panthion Plaza, 2nd Floor, 346, Pantheon Road,
Egmore, Chennai- 600 008

Sir,

1. Being duly authorised to represent and act on behalf of ----- (hereinafter "the bidder"), and having reviewed and fully understood all the bid information provided, the undersigned hereby apply to be qualified by your agency as a bidder for the contract of the "**Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu**".

Package No. _____

2. TNRDC and its associates / representatives are hereby authorized to conduct any inquiries or investigations to verify the statements, documents, and information submitted in connection with this application, and to seek clarification from our bankers and clients regarding any financial and technical aspects. This Letter of Application will also serve as authorization to any individual or authorised representative of any institution, to provide such information deemed necessary to verify statements and information provided in this application or with regard to the resources, experience, and competence of the Bidder.
3. This application is made in the full understanding that:
 - (a) TNRDC reserves the right, to reject or accept any application, cancel the bidding process and reject all applications; and
 - (b) TNRDC shall not be liable for any such actions and shall be under no obligation to inform the Bidder of the grounds for them.
4. The undersigned declared that the statements made and the information provided in the duly completed application are complete, true, and correct in every detail.

Authorised Signature

Name and Title of Signatory

2. BIDDER, QUALIFICATION AND OTHER INFORMATION

Bidders are requested to complete the information in this form through indicated formats or suitable attachments:

A. Bidder Particulars

No.	Particulars
(a)	Name of the Bidding Firm :
(b)	Status (Sole/ firm in partnership/ Pvt. or Public Ltd Company)
(c)	Place of incorporation/ registration : Year of incorporation/ registration :
(d)	Registered Head Office address/ Telephone/ Fax/ E-mail :
(e)	Contact Office address/ Telephone/ Fax / E-mail :
(f)	Contact Person and Title :
(g)	Names of Promoters :
(h)	Names of Principal Shareholders :
(i)	Shareholding Pattern :

B. Details on Structure and Operation, Key Management Personnel of the Bidder's organization

(To be enclosed as an attachment)

C. Proof of Constitution of Legal Status

(To be enclosed as an attachment)

D. Power of Attorney authorizing the signatory of the Bid document to commit the Bidder

(Original or Notary Attested Photocopy to be enclosed as an attachment)

E. Auditor Certified Financial Statement by the Bidder (Annual Reports, Turnover, Liquid Assets, Banker's Details)**(i) Auditor Certified Audited Annual Reports for three years starting from Financial Year 2009-10 to Financial Year 2011-12**

[To be enclosed as an attachment)

Ref. Page Nos. _____

(ii) Annual Turnover Data (duly supported by audited Annual Reports/ Provisional Certificate for respective periods and certification by Statutory Auditors)

Turnover from Improvement / Construction related works of similar nature in last three years ending March 31, 2012

Description		2009-2010	2010-2011	2011-2012
(a) Turnover from civil work of similar nature	Vide Page No.			
	Amount in INR			
(b) Factor for updating to 31, Mar 2012 level @6% pa		1.1236	1.06000	1.00
(c) Turnover updated to Mar 31, 2012 level (a) x (b)				

(d) Sum of Project related Civil works turnover updated to to 31 Mar 2012, for three years INR _____

(e) Average Project related Civil works turnover for three years upto 31 Mar 2012 (updated to 31 Mar 2012 price level):

(f) **Is Average Annual Particular Experience Turnover**

(e) > INR 26 Crores for Package -I INR _____

(e) > INR 12 Crores for Package -II INR _____

(Average Annual Turnover)

(g) Supporting documents:

Description	Ref. Page No.

(iii) **Current Liquid Assets (as on 31 March 2012 duly supported by Certificate for Financial Year 2011-2012 by Statutory Auditors)**

Current Liquid Assets as on Mar 31, 2012	
Particulars	Amount in INR
Working Capital	
Cash in Hand	
Uncommitted line of credit	
Other Financial Means	

Supporting Documents:

Description	Ref. Page No.

(iv) Details of Bidder's Bankers

Name of the Banker	Contact Person, Contact Address, Phone number and fax number
(Banker 1)	
(Banker 2)	
.....	

F. Qualifying Works

For all works indicated below, the Bidder shall necessarily submit the relevant client's/ Engineer's Certificate.

I (a) Details of qualifying single civil work contract of similar nature [as per Clause 4.2]			
Description	2009-2010	2010-2011	2011-2012
(a) Name of Qualifying work			
(b) Cost of Qualifying work (in INR crore)			
(c) Period of implementation	From :	To :	
(d) Updation factor @ 6%	1.1236	1.0600	1.0000
(e) Updated value of work done during period under consideration			
At least One civil work contract of similar nature for the value of			
i) Rs.10.40 Crores for Package-I			
ii) Rs.4.80 Crores for Package - II			

Supporting Documents:

Description	Ref. Page No.

G. Litigation / Arbitration History [as per Clause 4.7]

The Bidder shall provide the following information on history of litigation or arbitration resulting from contracts executed in the last three years or currently under execution.

Name of the Bidder: _____

1	(a)	Has the Applicant or its constituent partners consistent history of litigation/ arbitration awarded against / favour of him.Yes/ No
	(b)	If yes, give details for each such case in the format of Table 1 below	
2	(a)	Has the applicant or any of its constituent partners been debarred/ expelled by any agency in India, during the last 3 years as on date of application, except on account of reasons other than non-performance, such as rescinding of joint venture, partner of joint venture pulling out, court directions leading to breaking up of a joint venture before start of work etc.Yes/ No
	(b)	If yes, give details	

3	(a)	Has the Applicant or any of its constituent partners abandoned any contract work in India during the last 3 years.Yes/ No
	(b)	If yes, give detailsYes/ No
4	(a)	Has the Applicant or any of its constituent partners been declared bankrupt during the last 3 years.Yes/ No
	(b)	If yes, give details, including present status	
5		Has the Applicant or any of its constituent partners been debarred by GOTN/TNRDC or any other agency in India for as on date of application.Yes/ No

Format for Case Summary (to be submitted by the Bidder each case pending/ settled):

<i>Item Head</i>	<i>Particulars to be Furnished</i>
Name of Client	
Year	
Cause of Litigation/ Arbitration/ Matter in Dispute	
Disputed Amount (Current Value in Indian Rupees)	
Resolved or pending resolution	
Award for or against	
Actual amount awarded (Current value in Indian Rupees)	
Other Claims Made, Settled/ Rejected	

H. Details of Construction Program and Work Methodology (including Preliminary Environment Management Plan, Traffic Management Plan and Resource Management Plan) [as per Clause 4.9]

(To be enclosed as an attachment)

Ref Page Nos. _____

Declaration Statement

(Letterhead paper of the Bidder)

[date]

To

General Manager (Projects)
Tamil Nadu Road Development Company Limited
Sindur Panthion Plaza,
2nd Floor, 346, Pantheon Road,
Egmore, Chennai- 600 008

Dear Sir,

1. I, the undersigned, do hereby certify that all the statements made in the application and attachments thereto are true and correct.
2. The undersigned also hereby certifies that neither our firms M/s..... nor any of its constituent partners have abandoned any work awarded to us by any Agency in India nor any contract awarded to us for such works has been rescinded, during last three years prior to the date of this application.
3. The undersigned also furnish undertaking that we are not declared by any court of law as proclaimed offenders also that we are not convicted under any law for the offences punishable under Indian Penal Code, Negotiable Instrument Act of any Labour/ employee beneficial legislations.
4. The undersigned hereby authorize(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested to verify this statement or regarding my (our) competence and general reputation.
5. The undersigned understands and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of TNRDC.

Signed by an Authorised Officer of the Firm

Title of Officer

Name of Firm

Date

**4. SPECIMEN FORMAT FROM BIDDER TO BANKERS AUTHORISING THEM
TO PROVIDE INFORMATION TO TNRDC/ ITS REPRESENTATIVES**

To
Name of Bank/ Address/ city

Dear Sir:

We have recently submitted a Bid Proposal to M/s. Tamil Nadu Road Development Company Limited. for implementing of its project for _____ . We hereby authorise you to provide all information/ data readily about us and our credit status, as may be desired by TNRDC and you need not seek any clearance/ opinion from us for providing the information/ data to TNRDC.

Sincerely,

Authorised Signatory

LETTER OF FINANCIAL BID

(Letterhead of the Bidder)

[date]

General Manager (Projects)

Tamil Nadu Road Development Company Limited

Sindur Panthion Plaza,
2nd Floor, 346, Pantheon Road,
Egmore, Chennai- 600 008

Dear Sir:

Sub: **“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”**

Package No. _____

Having examined the Bid Document including Notice Inviting Bids, Instructions to Bidders, General Conditions of Contract, Special Conditions of Contract, Contract data, Technical Specifications, Bill of Quantities, Drawings, Schedules, Annexures and Addenda for the execution of the above named works, we, the undersigned, offer to execute and complete such works and remedy any defects therein in conformity with the said Bid Document at the prices indicated in the enclosed BoQ.

The Payment for:

“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu” Package No. _____ **for the sum of INR** _____ **(Indian Rupees in words)** _____ **) inclusive of all taxes** in accordance with the said Bid Document.

We undertake, if our Bid is accepted, to commence the works within fourteen (14) days of receipt of the Engineer's order to commence, and to complete and deliver the sections and whole of the works comprised in the Contract within the period stated in the Appendix to Bid/ Contract data hereto.

We also undertake to furnish Performance Security (ie) in the form of a Bank Guarantee in accordance with the Conditions of Contract.

We agree to abide by this Bid for the period of One Hundred and Eighty (180 days) from the date of Bid opening, as prescribed in Clause 14.1 of the Instructions to Bidders (Section-I), and it shall remain binding upon us and may be accepted at any time before the expiry of that period.

We confirm our Agreement to treat the Bid Document, Drawings and other records connected with the works as secret and confidential document and shall not communicate information contained therein to any other person other than the person authorized by Employer or use such information in any manner prejudicial to the safety and integrity of the works.

We undertake that, in completing for (and, if the award is made to us, in executing) the above Contract, we will observe the laws against fraud and corruption in force in India namely “Prevention of Corruption Act 1988”.

We confirm that our firm has VAT/PAN registrations along with **ESI/ Workmen Compensation Policy and EPF code** as stipulated under Appendix 2 and 3 of GCC.

We hereby confirm that this Bid complies with the Eligibility, Bid validity and Bid security required as stated in the Bidding documents.

Yours faithfully,

Authorised Signature:

Name and Title of Signatory:

Name of Bidder with official seal:

Address:

FORMAT FOR AGREEMENT**1. Agreement Form****Contract Agreement**

This agreement, made the ___ day of _____, 2013 between **M/s. Tamil Nadu Road Development Company Ltd (TNRDC)**, having its registered office at **Sindur Panthion Plaza, 2nd Floor, 346, Pantheon Road, Egmore, Chennai, Tamil Nadu, India**, (hereinafter called "the Employer") which expression shall unless the context otherwise requires, include its successors and assigns of the one part and

M/s.-----.(Herein after called "the Contractor") a company incorporated under the Companies Act ,1956 and having its registered office at _____ which expression shall unless the context otherwise requires, include its successors and assigns of the other part.

WHEREAS

The Employer is desirous that certain works should be executed by the Contractor, viz. **"Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu"** Package No. _____ (hereinafter called "the Works") and the Employer has accepted the Bid by the Contractor for the execution and completion of such Works and the remedying of any defects therein, at a contract price of Rs. -----/- (**Rupees** _____ **only**) inclusive of all taxes.

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this Agreement, words and expressions shall have the same meanings as are respectively assigned to them in the Conditions of Contract hereinafter referred to.
2. The following documents shall be deemed to form and be read and construed as part of this Agreement, viz.:
 - i) Letter of Award and Confirmation Letter;
 - ii) Notice to proceed with the works;
 - iii) The Priced Bill of Quantities.
 - iv) Conditions of Contract (including Special Conditions of Contract);
 - v) Instructions to Bidders
 - vi) Technical Specifications;
 - vii) Drawings; Construction Programme and
 - viii) Any other document listed in the Contract Data as forming part of the contract (Minutes of Pre Bid Meeting, addendum and clarifications).
3. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to execute and complete the Works and remedy and defects therein in all respects with the provisions of the Contract.

4. The Employer hereby covenants to pay the Contractor in consideration of the execution and completion of the Works and the remedying of defects therein 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.

Signed, sealed, and delivered by the said Employer and the Contractor in the presence of:

WITNESSES:

On behalf of M/s. Tamil Nadu Road Development Company Ltd. Egmore, Chennai	On behalf of the Contractor
1.	1.
2.	2.

Binding Signature of the Employer:-

Binding Signature of the Contractor:-

2. Letter of Award

(Letterhead paper of the Employer)

[date]

To: [name and address of the contractor]

Dear Sirs,

Sub: **"Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu"**

Package No. _____

This is to notify that your Bid dated _____ for INR _____ [as corrected and modified in accordance with the Instructions to Bidders] is hereby accepted by our Agency.

We note that as per bid, you do not intend to sub-contract any component of work.

You are hereby requested to send a Confirmation Letter acknowledging receipt of the Letter of Award and accepting the offer. You are also requested to furnish Performance Security, *plus additional security for unbalance bids in terms of ITB Clause 27.5, in the form detailed in Clause 31 of ITB for an amount of INR _____ within 7 days of the receipt of this Letter of Award, valid up to **12 Months** beyond the completion Period, of each package and sign the Contract Agreement, failing which action as stated in Para 31.2 of ITB will be taken.

You are requested to submit the detailed Construction Program including Environmental Management Plan and Traffic Management Plan as per Clause 25 of Conditions of Contract within 7 days of receipt of this letter.

Yours faithfully,

Authorised Signature:
Name and Title of Signatory:
Name of Agency:

3. Confirmation Letter

(Letterhead paper of the Contractor)

To:
[name and address of the Employer)

Dear Sir,

Subject **“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”**

Package No._____

We acknowledge receipt of your Letter of Award, Ref No._____ dated _____and unconditionally accept the offer to take up above captioned works at the price indicated in the Letter of Award.

We also confirm our acceptance to all the corrections and modifications made by the Employer in respect of our bid.

We undertake to provide you unconditional bank guarantee towards performance security and additional security for unbalanced bid as per the agreed format within the prescribed data as per the Instructions to Bidder and Conditions of Contract.

Yours faithfully,

Authorized Signature:
Name and Title of Signatory:
Name of Agency:

4. Issue of Notice to Proceed with the Work

(Letterhead paper of the Employer)

To: [name and address of the contractor)

Dear Sir,

Subject: **“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”**

Package No._____

Pursuant to your furnishing of the requisite security as stipulated in ITB clause 31.1 and signing of the Contract Agreement for the **“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”** for construction, improvement and maintenance in that order, you are hereby instructed to proceed with the execution of the said works in accordance with the contract documents with effect from ----- (date).

Yours faithfully,

Authorised Signature:

Name and Title of Signatory:

Name of Agency:

FORM OF BANK GUARANTEE FOR EMD / BID SECURITY

WHEREAS _____
 (Name of the Bidder) (hereinafter called the Contractor) wishes to submit his tender for
**“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power
 Station Road and Ennore Port Road for the Movement of 575 MT Special Transport
 Vehicle in Thiruvallur District, Tamil Nadu”** for Package No. _____ of herein
 after called “the Tender” KNOW ALL MEN by these present that we
 _____ (Name of Bank) of
 _____ having our Registered Office at
 (_____) (hereinafter called the ‘Bank’) are bound unto
 Tamil Nadu Road Development Company Limited (TNRDC) (hereinafter called “the
 Employer”) the sum of Rs. _____ (Rupees
 _____) for which payment can truly be made to
 the said Employer. The Bank bind themselves, their successors and assigns by these
 presents with the common seal of the Bank this day _____ of 2013 and
 undertake to pay the amount of _____ (Rupees
 _____) to the employer upon receipt of a written demand and
 without demur and without the employer having to substantiate his demand.

The conditions of this obligation are:

If the Tenderer withdraws his tender during the period of Tender validity specified in the
 Form of Tender Or

If the Tenderer having been notified of the acceptance of his Tender by the Employer
 during the period of tender validity Or

If the Tenderer fails or refuses to execute the Form of Agreement in accordance with the
 Instructions to Bidders, if required Or

Fails or refuses to furnish the Performance Security, in accordance with the Instruction to
 Bidders.

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

This guarantee will remain in force up to -----(Date) and including the date
 28 days beyond the validity of the bid as such deadline is stated in the Instructions to
 Bidders or as it may be extended by the Employer, at any time prior to the closing date for
 submission of the Tender Notice of which extension to the Bank is hereby waived. Any
 demand in respect of this guarantee should reach the Bank not later than the above date
 of expiry of this guarantee.

Notwithstanding anything contained herein.

- i) Our liability under this Guarantee shall not exceed the guaranteed amount **Rs. -----/- (Rupees -----only)**

This Guarantee shall be valid upto -----20__ (**Expiry date**) and

- ii) We shall be liable to pay the guaranteed amount under this guarantee only and if we receive a written claim or demand duly signed by a duly Authorised official of the Employer before the -----20__ (**Expiry date**) as mentioned above.

SIGNATURE OF AUTHORISED REPRESENTATIVE OF THE BANK _____

NAME AND DESIGNATION _____

SEAL OF THE BANK _____

SIGNATURE OF THE WITNESS _____

NAME OF THE WITNESS _____

ADDRESS OF THE WITNESS _____

BANK GUARANTEE FOR PERFORMANCE SECURITY

BG No dated2013

To

Tamil Nadu Road Development Company Ltd.,
Sindur Panthion Plaza,
2nd Floor,346, Pantheon Road
Egmore, Chennai – 600 008

Bank Guarantee No.datedfor Rs./- (Rupees
.....only)

WHEREAS vide the Work order no..... dated 2013 for “**Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu**” (hereinafter referred to as “**The Contract**”) **M/s**....., a company incorporated under the Companies Act, 1956, having its registered office at.....(address) (hereinafter referred to as “**The Contractor**” which expression shall unless repugnant to or inconsistent with the context mean and include its successors and assigns) has been awarded by **M/s Tamil Nadu Road Development Company Ltd**, a company incorporated under the Companies Act, 1956, having its registered office at Sindur Panthion Plaza, 2nd Floor, 346, Pantheon Road, Egmore, Chennai- 600 008 (hereinafter referred to as “**The Employer**” which expression shall unless repugnant to or inconsistent with the context mean include its successors and assigns), the contract for “**Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu**” **Package No.** _____

AND WHEREAS it has been stipulated by you in the said contract that the Contractor shall furnish you a Performance Guarantee, within 7 days of signing the work order by a specified Scheduled / Nationalised Bank, for the sum specified therein as security for compliance with the contractor’s obligations in accordance with the Contract and against any breach or non-performance of the terms and conditions contained in the contract.

AND WHEREAS we**BANK**, having its Head Office atand amongst others, a branch office situated at....., have agreed to furnish a Performance Guarantee for a sum **Rs. -----/- (Rupees ----- only)** (hereinafter referred as the Guaranteed amount) as security for compliance of the contractor’s obligations under the contract.

NOW THEREFORE we hereby affirm that we as the Guarantor are responsible to you on behalf of the Contractor, for the guaranteed amount and we irrevocably undertake to pay you upon your first written demand and without demur or argument, any sum or sums within the limits of the guaranteed amount as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified herein. The guaranteed amount shall be payable merely on demand by the Employer. Any letter stating that the amount claimed in the demand notice/letter is due and payable, signed by a duly authorized official of the Employer to this effect, shall be final, binding or conclusive upon us.

We, hereby agree to pay on demand the guaranteed amount without demur by crediting to the Bank Account of the Employer, the details of which are to be informed to us by you during the validity of the guarantee.

Our liability under this Guarantee shall not be affected by any change in the constitution of the Contractor or of the Guarantor.

We hereby undertake that this Guarantee is absolute, irrevocable and unconditional and shall be enforceable against us notwithstanding any security or securities comprised in any instrument executed or to be executed by the contractor in favour of the Employer.

We hereby also agree that this guarantee shall not be wholly or partially satisfied or exhausted by any payments made to or settled with the Employer by the Contractor and shall be valid and binding on us and operative until the expiry of this Guarantee.

We, further agree that no change or addition to or other modification of the terms of the contract or of the works to be performed there under or of any of the contract documents which may be made between you and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modification.

The jurisdiction in relation to this Guarantee shall be Courts at Chennai and Laws of India shall be applicable. This guarantee shall be valid up to -----20__ (hereinafter referred to us as the "Expiry Date") 12 Months beyond the completion period of each package.

Notwithstanding anything contained herein.

iii) Our liability under this Guarantee shall not exceed the guaranteed amount
Rs _____ (Rupees _____ only)

This Bank Guarantee shall be valid up to -----20__ (Expiry date) and

iv) We shall be liable to pay the guaranteed amount under this guarantee only and if we receive a written claim or demand duly signed by a duly Authorised official of the Employer before the -----20__ (Expiry date) as mentioned above.

IN WITNESS WHEREOF we have executed this guarantee on this2013.

Signature of Authorised Representative of the Bank

Name and Designation

Seal of the Bank

Signature of Witness

Name of Witness

Section III

Conditions of Contract

Section III: CONDITIONS OF CONTRACT**A. GENERAL****1. Definitions**

- 1.1 Terms which are defined in the Contract Data are not also defined in the Conditions of Contract but kept their defined meanings. Capital initials are used to identify defined terms.

Activity Schedules means the priced and completed Activity Schedules forming part of the Bid.

Bill of Quantities (BOQ) means the completed Bill of Quantities attached in Appendix and forming part of this Contract.

Compensation Events are those defined in Clause 41 hereunder.

Confirmation Letter is the letter of the Contractor accepting the Letter of Award issued by the Employer.

The **Contract Completion Date** is the date of completion of Contractor's Obligations under this Contract as certified by the Engineer in accordance with Clause 50.2.

The **Contract** is the contract between the Employer and the Contractor to execute and complete the Works. It consists of the documents listed in Clause 2.3 below.

The **Contract Data** defines the documents and other information which comprise the Contract.

The **Contractor** is a person or firm or corporate body who's 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.

The **Contract Price** is the price stated in the letter of Award 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 Period** is the period named in the Contract Data and calculated from the date of issue of completion certificate for the construction of improvement works (or) improvement works completion date, whichever is later.

The **Employer** is the party who will employ the Contractor to carry out the Works and in this case the employer is TNRDC, Egmore, Chennai – 600008.

The **Engineer** is the person named in the Contract Data (or any other competent Person appointed and notified to the Contractor by the Employer to act in replacement of the Engineer) who is responsible for supervising the execution of the works and administering the Contract and in this case it is TNRDC, Egmore, Chennai – 600008.

"Engineer Representative" means a person appointed from time to time by the Engineer under Sub-clause 5.1.

Equipment is the Contractor's plant / machineries and vehicles brought temporarily to the site to construct the works.

Improvement Works means " **Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu**" (Package – I & Package –II)

The **Initial Contract price** is the Works Contract price in the Employer's Letter of Award.

The **Intended Completion Date** is the date on which it is intended that the Contractor shall complete the Construction Works or Improvement Works or both, as the case may be. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time, in writing.

Letter of Award is the letter dated _____ issued by the Employer to the Contractor containing the Initial Contract Price and other details as enclosed in Appendix of this Contract.

Materials are all supplies, including consumables, used by the contractor for incorporation in the Works.

Plant is any Integral part of the Works which is to have a mechanical, electrical, electronic or chemical or biological function.

Project Facility means the stretch of the Road as mentioned in Contract Data, all appurtenances thereto, including road furniture, Sign boards and other road components and all access roads up to 50m from the Project Road.

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

Site Investigation Reports are those which were included in the Bidding documents and are factual interpretative reports about surface and Sub - surface conditions at the site.

Specification means the Specification of the Works included in the Contract and any Modification or addition made approved by the Engineer in writing.

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

A **Variation** is an instruction given by the Engineer/ Employer in writing which varies the Works.

The **Works** are what the Contract requires the Contractor to carry out as part of this Contract and shall refer to Construction Works or Improvement Works or Maintenance Works or any combination thereof.

The **Works Completion Date** is the actual date of completion of the Works as certified by the Engineer in accordance with Clause 50

2. Interpretation

- 2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Heading have no significance. Words have their normal meaning under the language of the Contract unless

specifically defined. The Engineer will provide instructions clarifying queries about the Conditions of Contract.

- 2.2 If sectional completion is specified in the Contract data, reference in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the works (other than references to the Completion Date and Intended Completion date for the whole of the Works).
- 2.3 The documents forming the Contract shall be interpreted in the following order of priority:
 - a. Agreement
 - b. Letter of Award, Confirmation Letter and Notice- to Proceed with the Works
 - c. Bill of Quantities
 - d. Contract Data
 - e. Conditions of Contract including Special Conditions of Contract
 - f. Specifications and Drawings
 - g. Instructions to Bidders and
 - h. Any other document listed in the Contract Data / bid document as forming part of the Contract (Minutes of Pre-Bid meeting, addendum and clarifications).

3. Language and Law

- 3.1 The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer's Decisions

- 4.1 Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractors in his role representing the Employer.

5. Delegation

- 5.1 The Engineer may delegate any of his duties and responsibilities to other person/organization after notifying the Contractor.

6. Communications

- 6.1 Communication between parties which are referred to in the conditions are effective only when in writing. A notice shall be effective when it is delivered (in terms of Indian Contract Act).

7. Sub- contracting

- 7.1 The contractor shall not, with out the prior consent of the Employer assign the contract or any part thereof or any benefit or interest therein or there under.

The contractor shall not sub contract the works. Except where otherwise provided by the contract, the contractor shall not sub contract any part of the works, without the prior consent of the Employer. Any such consent shall not relieve the contractor from any liability or obligation under the contract and he shall be responsible for the acts, defaults and neglects of any Subcontractor, his agents, servants or workmen as fully as if they were the acts, defaults or neglects of the contractor, his agents, servants or workmen.

Provided that the contractor shall not be required to obtain such consent from the Employer for:

- a. The provision of labour and
- b. The purchase of materials which are in accordance with the Specifications and quality standards specified in the Contract.

8. Other Contractors

- 8.1 The Contractor shall cooperate and share with the other contractors, public authorities, utilities, and the Employer and his representative between the dates given in the Schedule of the other contractors. The Contractor shall also provide facilities and services to them as may be necessary for smooth coordination. The Employer may modify the schedule of other contractors and shall notify the Contractor of any such modification.
- 8.2 Pursuant to 8.1, the Contractor hereby agrees and acknowledges that the Employer is well within their right to appoint other contractor for ” **Improvement To Roads, Bridges And Culverts Of North Chennai Thermal Power Station Road And Ennore Port Road For The Movement Of 575 Mt Special Transport Vehicle In Thiruvallur District, Tamil Nadu” (Package – I , Package –II)** and any other works that the Employer may decide. The Contractor acknowledges that the Employer has no liability what so ever towards the Contractor in this regard and that the Contractor will, Unconditionally and without any financial charge, extend all necessary assistance and cooperation to the Employer and other Contractor(s), so as to ensure that the Works are completed as stipulated in the Contract Data.
- 8.3 Any default in the above regard shall be treated as a fundamental breach of the contract in terms of Clause 54.2

9. Personnel

- 9.1 The Contractor shall employ required personnel to carry out the functions stated in the approved program in terms of Clause 25.
- 9.2 If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff or his work force stating reasons, the Contractor shall ensure that the person leaves the site within seven days and has no further connection with the work in the Contract.

9.3 Labour Statutory requirement

The Contractor shall confirm to and comply with the regulations and by-laws of the State or Central Government and other statutory Body the provisions contained in the various Acts specified in Appendix 2 of this section.

The Minimum requirement of the Personnel for the project is as follows:

Sl. No.	Designation	Educational Qualification	Professional Experience in similar capacity
1	Project Manager	P.G. Degree in Civil Engineering	10 Years
2	Senior Engineer	P.G. Degree in Civil Engineering	05 Years
3	Site Engineer(2 Nos.)	Diploma in Civil Engineering	03 Years
4	Quantity Surveyor	Diploma in Civil Engineering	05 Years

5	Pavement Specialist	B.E Degree Holder in civil Engineering	05 Years
6	Land Surveyor	Diploma in Civil Engineering	05 Years
7	Material Engineer	B.E Degree Holder in civil Engineering	05 Years

All other necessary inputs of man power such as support staffs, field technical staffs, office staffs other than the above as deemed necessary shall be provided by the bidder within the quoted amount to ensure that the entire work is completed in accordance with the conditions stipulated herein.

10. Employer's and Contractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

11.1 The Employer is responsible for the expected risks which are in so far as they directly affect the execution of the Works in the Employer's country, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, Insurrection or military or usurped power, civil war, (unless restricted to the Contractor's employees), and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive.

12. Contractor's Risks

12.1 All risks of loss or damage to physical property or personal injury and death which arise during and in consequence of the performance of the Contract other than the expected Employer's risks are the responsibility of the Contractor.

13. Insurance

13.1 The Contractor shall provide, in the joint names of the Employer and the Contractor, insurance cover from the start Date to the end of the Defects liability period, in the Amounts and deductibles stated in the Contract Data for the following events:

- a. loss of or damage to Works, Plant and Materials;
- b. loss of or damage to Equipment;
- c. loss of or damage of property (except the Works, Plant, Materials and Equipment) in connection with the Contract;
- d. personal injury or death of employer/employee personal and third party persons;

However, it is for the contractor to decide whether the minimum amount specified in the Contract data is sufficient, and if he considers it necessary, to insure for a greater amount. The policy should cover an unlimited number of claims in any one year.

13.2 Policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the start Date. All such insurance shall provide for compensation to be payable in the type and proportions of currencies required to rectify the loss or damage incurred. The contractor shall be responsible for effecting change to the policies and certificates as may be directed by the Engineer, within time period indicated by the Engineer.

- 13.3 If the Contractor does not provide the policies and certificates as required, the Employer may effect the insurance which the Contractor should have provided and recover the premiums the Employer has paid, from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be a debt due and if warranted, recovered by invoking Performance Security.
- 13.4 Alterations to the terms of insurance shall not be made without the approval of the Engineer.
- 13.5 Both parties shall comply with any conditions of the insurance policies.
- 13.6 The Contractor shall be entitled to place all insurance relating to the Contract with insurers from India, which have been determined to be acceptable to the Employer.

14. Queries about the Contract Data

- 14.1 The Engineer will clarify queries on the Contract Data.

15. Contractor to undertake the Works

- 15.1 The Contractor shall undertake the Works in accordance with the Specifications, Conditions of Contract, Contract data, Drawings, and as per the instructions of the Engineer.

16 The Improvement Works to be Completed by the Intended Completion Date

- 16.1 The contractor shall commence execution of the construction/ improvement works on the start date and shall carry out the construction/ improvement works in accordance with the construction program submitted by the contractor, as updated with the approval of the Engineer and complete them in all respects by the Intended Completion date.
- 16.2 All the time during the construction period, Contractor shall notify the Engineer details of drawings and instructions required and of why and by when it is required. This notice shall be given by the contractor at least one month advance correlating the approved construction program.

17.0 Approval by the Engineer

- 17.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer, who is to approve them if they comply with the Specifications and Drawings.
- 17.2 The Contractor shall be responsible for design of Temporary Works.
- 17.3 The Engineer's approval shall not alter the Contractor's responsibility for the quality, safety and design of the Temporary Works, who shall bear all consequences of failures thereof.
- 17.4 The Contractor shall obtain approval of other parties/ agencies to the design of the Temporary Works where required.
- 17.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent works are subject to prior approval by the Engineer before their use.

18.0 Safety

- 18.1 The contractor shall be responsible for the safety of all activities on the Site. The proposed work site falls in High speed road Corridor. In addition to the safety of workmen in the project, the Contractor is responsible for the safety of the road users. The Contractor shall at his own cost formulate and implement an efficient traffic movement/regulation plan so as to achieve safe and efficient movement of vehicular traffic and pedestrians.
- 18.2 The contractor shall make necessary safety arrangements and equipments specified in Appendix 1 of this section.
- 18.3 Any damage caused to the existing structure, the road surface and other appurtenances shall be remedied /restored /replaced to the original condition at the cost of the Contractor and to the satisfaction of the Employer.
- 18.4 In case of default by the contractor, the Employer has the option to carry out the required remedial/restoration/replacement works and deduct the expenditure incurred from the payments due to the Contractor.
The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.
- 18.5 During continuance of the contract, the Contractor shall abide at all times by all existing enactments on environments on environmental protection and rules, labour laws made there under, regulations, notifications and bye-laws of the State or Central Government, or local bodies/authorities and any other law, bye-law, regulations that may be passes or notification that may be issued in this respect in future by the State or Central Government or the local authority.
- 18.6 Salient features of some of the major statutory laws (Acts) that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974, provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of Water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981, provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986, provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991, provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

19.0 Discoveries

19.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site is the property of the Employer. The Contractor is to notify the Engineer/ Employer of such discoveries and carry out the Engineer's instructions for dealing with them.

20.0 Possession of the Site

20.1 The Employer shall give possession of the site to the Contractor in accordance with the Contract Data. If possession of a part is not given by the agreed date stated in the Contract Data, then the Intended Completion Date shall be postponed by the Employer as may be required for that particular part/ stretch. However, this will not be applicable if sufficient work site is made available to the Contractor as and when required, for him to proceed ahead with the progress of work and if available work fronts remain unattended.

20.2 The Contractor will co-ordinate with service provider/ concerned authorities for shifting of utilities and removal of encroachments etc. and making the site unencumbered from the project construction area required for completion of work. This includes getting estimates, initial and frequent follow-up with concern authorities. However, the cost of shifting shall be borne by the employer. The contractor will not be entitled for any additional compensation for delay in shifting of utilities and removal of encroachments by the service provider/ local bodies/concern authorities.

21.0 Access to the Site

21.1 The Contractor shall allow the Engineer and any person authorized by the Engineer access to the Site, to any place where work in connection with the Contract is being carried out or is intended to be carried out and to any place where materials or plant are being manufactured / fabricated / tested/ stored for the works.

22.0 Instructions

22.1 The Contractor shall carry out all instructions of the Engineer which comply with the applicable laws where the Site is located.

23.0 Disputes

23.1 If either party believes that a decision taken by the Employer was either outside the authority given to the Employer by the contract or that the decision was wrongly taken, the objecting party may file written notice of dispute to the other party with a copy to the Engineer stating that it is giving the notice pursuant to this Clause while stating clearly the basis for the dispute.

23.2 The party receiving the dispute notice will consider it and reply in writing within 30 days of the receipt of the notice. If no reply is received or the reply is not acceptable to the other party, the affected party may refer only to the High Court of Madras (Chennai) for adjudication.

23.3 Further, in case of any dispute or difference between the parties to the contract after the completion of the works or after the determination / abandonment of the contract or any other matter/s arising thereof shall be referred to or filed with the High Court of Madras (Chennai) within a period of **18 Months** beyond such date. No other courts or persons or bodies will have any jurisdiction over the dispute/s beyond such date.

24.0 Deleted

B. Time Control

25.0 Program

25.1 The Contractor should adhere to the construction programme submitted by the contractor and approved by the Engineer and complete the works within the agreement time without any lapse.

26.0 Extension of the Intended Completion Date for Improvement Works

26.1 The Engineer shall extend in consultation with Employer the Intended Completion Date if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining work and which would cause the Contractor to incur additional cost.

26.2 The Engineer shall decide whether and by how much to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to give early warning of a delay or has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new Intended Completion Date.

27 Delays Ordered by the Engineer

27.1 The Engineer in consultation with the Employer may instruct the Contractor to delay the start or progress of any activity within the Works.

28 Management Meetings/ Site Visits

28.1 Either the Engineer or the Contractor may require the other to attend a Management Meeting. The business of a Management Meeting shall be to review the programme for the remaining work and to deal with the matters regarding progress of works etc.

28.2 The Engineer shall record the minutes of Management Meetings and is to provide copies of his record to those attending the meeting and to the Employer. The responsibility of the parties for actions to be taken is to be decided by the Engineer either at the Management Meeting or after the Management Meeting and stated in writing to all who attended the meeting. Failure to attend the Management Meetings/ site visits shall attract penalties at the rate indicated in the Contract Data and in case of non-attendance of more than three such meetings/ visits then the same shall be construed as fundamental breach of Contract in terms of Clause 54.

29 Early Warning

29.1 The Contractor is to warn the Engineer at the earliest opportunity of specific likely future events or circumstances that may adversely affect the quality of the work, increase the Contract Price or delay the execution of works. The Engineer may require the Contractor to provide an estimate of the expected effect of the future event or circumstance on the Contract Price and Completion Date. The estimate is to be provided by the Contractor as soon as reasonably possible.

- 29.2 The Contractor shall cooperate with the Engineer in making and considering proposals for how the effect of such an event or circumstance can be avoided or reduced by any one involved in the work and in carrying out any resulting instructions of the Engineer.

C. Quality Control

30 Identifying Defects

- 30.1 The Engineer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.
- 30.2 The contractor shall permit the Employer's Technical auditor to check the contractor's work and notify the Engineer and Contractor of any defects that are found. Such a check shall not affect the Contractor's or the Engineer's responsibility as defined in the Contract Agreement.

31 Tests

- 31.1 The Contractor shall establish suitable Testing Facility with adequate and suitable equipment, to the satisfaction of the Engineer, in the vicinity of the Project Road or site office premises or Works Site premises. The cost of setting up the Testing Facility and testing there to, shall be to the account of the Contractor. If the Engineer instructs the Contractor to carry out a test not specified in the Specification to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples.

32 Correction of Defects

- 32.1 The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.
- 32.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defects within the length of time specified by the Engineer's notice.

33 Uncorrected Defects

- 33.1 If the Contractor has not corrected a Defect within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect corrected and rectify the defects if needed, by employing other persons and the Contractor will pay this amount or can be recovered from the bills of the contractor.

D. Cost Control

34 Bill of Quantities (BOQ)

- 34.1 The Bill of Quantities for works contains items for the Works being implemented by the Contractor as in Section – V.
- 34.2 The Bill of Quantities is used to calculate the payment for works. The Contractor will be paid for the quantity of the work done at the rate in the Bill of Quantities for each item of work.

35 Changes in the Quantities

- 35.1 Any additional quantity required for completing the work will have to be carried out by the Contractor at the same quoted rate. There will be no percentage ceiling either on addition or reduction in the quantities for completion of the project.

35.2 Provided further that no change in the rate or price for any item contained in the Contract shall be considered unless such item accounts for an amount more than 2 % of the Contract Price, and the actual quantity of work executed under the item exceeds or falls short of the quantity set out in the Bill of Quantities by more than 25 % of the Contract Price.

36. Variations during Implementation of Construction/ Improvement Works

36.1 Approval and methodology for all variations either Rate or Quantity should be followed as per the directions of the Engineer / Engineers representative.

37. Payments for Variations in Construction/ Improvement Works

37.1 The Contractor shall provide the Engineer with an estimate and quotation (with break up of unit rates) along with detailed justification, vouchers, for carrying out the Variation items, **if not available in the BOQ** and when requested to do so by the Engineer. The Engineer shall assess the quotation, with in a period of 7 (seven) days of the request (or) with in a reasonable time by the Engineer, and before the variation is ordered.

37.2 If the work in the Variation corresponds with an item description in the Bill of Quantities and if, in the opinion of the Engineer, the timing of its execution do not cause the cost per unit of quantity to change, the rate in the Bill of Quantities shall be used to calculate the value of the Variation. If the cost per unit of quantity changes, or if the nature or timing of the work in the Variation does not correspond with items in the Bill of Quantities, the quotation by the Contractor shall be in form of new rates for the relevant items of work as per the Tamil Nadu Building Practice / National Building Code and standard procedures.

(a) The Contractor shall submit a detailed rate analysis with all supporting documents. Such analysis shall be prepared based on similar items available in Bill of Quantities, subject to mutual Agreement between the Engineer and the Contractor and according to the MoRTH , IRC and IS specification and standard procedures adopting the schedule of rates for the current year applicable to the Chennai region of Tamil Nadu.

(b) In case the data for the item is not available in the standard data, observed data with current schedule of rates applicable to Chennai region of Tamil Nadu shall be adopted.

With the concurrence of the employer, the Engineer shall determine the quantities and rates for the variation works. Prior approval should be obtained for all the variation items from the employer.

37.3 If the Contractor's quotation is unreasonable (or if the contractor fails to provide the Engineer with a quotation within a reasonable time specified by the Engineer in accordance with Clause 37.1), the Engineer shall fix the variation rate and make a change to the Contract Price which shall be based on Engineer's own forecast of the effects of the Variation on the Contractor's costs.

37.4 If the Engineer decides that the urgency of varying the work would prevent a quotation being given and considered without delaying the work, the Engineer shall instruct in writing, to commence the additional works before the approval of the rate.

37.5 The Contractor shall not be entitled to additional payment for costs that could have been avoided by giving early warning.

38. Cash flow forecasts

The Contractor is to provide the Engineer with a cash flow forecast and an updated cash flow forecast as appropriate.

39. Payment

39.1 “The Contractor shall submit a statement in 3 (three) copies to the Engineer by the 7th (seventh) day of each month, signed by the authorized representative of the Contractor, for the work executed up to the end of the previous month in a tabulated form approved by the Engineer, showing the amounts to which the Contractor considers himself to be entitled. The statement shall include the following items, as applicable, which shall be taken into account in the sequence listed:

- (a) the estimated value of work executed (Works executed & payable) up to the end of the month in question determined in accordance with conditions of contract, at base unit rates and prices;
- (b) the Actual value certified for payment for the Temporary and Permanent Works executed up to the end of the previous month, at base unit rates and prices;
- (c) the estimated value at base unit rates and prices of the Temporary and Permanent Works for the month in question, obtained by deducting (b) from (a);
- (d) the value of any variations executed up to the end of the month in question, less the amount certified in the previous Interim Payment Certificate.
- (e) amount to be deducted for all taxes in accordance with contract conditions.
- (f) net amount of application, which will be expressed in Indian Rupees.
- (g) The details of RFI, joint measurement sheets, level sheets, test results to be enclosed along with the bill.

Notwithstanding the terms of this Sub-Clause or any other Clause of the Contract, no amount will be certified by the Engineer for payment until the Performance Security has been provided by the Contractor and approved by the Employer.”

39.2 Monthly Payments

“Within 7 (seven) days of receipt of the monthly statement from the Contractor in pursuant to above, the Engineer shall broadly determine the amount due to the Contractor and shall, accordingly, recommend to the Employer for release to the Contractor up to a maximum of 70% of net payment as part payment against the monthly statement, pending certificate of IPC by the Engineer. Within 10 (ten) days of the receipt of recommendation of the Engineer, the Employer shall make payment to the Contractor.

The said statement shall be approved or amended by the Engineer in such a way that in his opinion, it reflects the amount due to the Contractor in accordance with the Contract, after deduction, of any sums which may have become due and payable by the Contractor to the Employer. In cases where there is a difference of opinion as to the value of any item, the Engineer’s view shall prevail.

Within 21 (twenty one) days of the receipt of the monthly statement referred as above, the Engineer shall carry out check measurement as required by the employer and recommend payment of balance 30% of bill, if satisfied; Engineer to account for liquidated damages and other deductions, and add/deduct amounts to account for variation in price of bitumen as the case may be, while arriving at amount payable to contractor; if not satisfied with works, Engineer to inform Employer and instruct Contractor to complete the works within a stipulated time and carry forward this balance amount;

Engineer shall determine the amount due to the Contractor and shall deliver to the Employer and the Contractor, an Interim Payment Certificate, certifying the amounts due to the Contractor after adjusting the payment already released to the Contractor against the said statement.

Employer will make payment within 10 (ten) days of receipt of payment recommendation from Engineer; and

Notwithstanding anything contained herein above, the final payment due shall be made only upon completion of Improvement works, and suitable certification by the Engineer.

39.3 Retention money

In each Interim Payment Certificate (IPC) @ **5%** of value of work executed during each bill will be withheld and the withheld amount will be refunded to the contractor along with the Final bill / Taking over certificate. The maximum amount of Retention money to be with held is restricted up to **5%** of the contract value.

40 Delayed and Disputed Payments

40.1 The Employer shall pay the Contractor, the amounts certified by the Engineer within the periods stipulated in this Contract. If the Employer makes a late payment, the contractor shall be paid interest on the late payment along with the next payment. Interest shall be calculated from the date by which the payment should have been made up to the date when the payment is made at the rate of 8% p.a.

40.2 If an amount certified is increased either in a later certificate or as a result of any judgement, the contractor shall be paid interest upon the delayed payment as set out in this clause. Interest as referred above, shall be calculated from the date upon which the increased amount would have been accepted by the Employer in the absence of dispute.

41 Compensation Events

41.1 The following are compensation events unless they are caused by the Contractor;

- (a) The Engineer orders a delay in execution of works for a period of more than 60 days;
- (b) The effect on the Contractor of any of the Employer's Risks; and
- (c) Other Compensation Events listed in the contract data, if any.

41.2 If a Compensation Event would prevent the Works from being carried out in terms of the Contract, then the Employer shall extend the Intended Completion Date as may be warranted. The Engineer shall decide by how much the Intended Completion Date shall be extended.

41.3 As soon as information demonstrating the effect of each Compensation Event has been provided by the Contractor, it is to be assessed by the Engineer and the Intended Completion period shall be adjusted accordingly. If the Contractor's forecast is deemed unreasonable, the Engineer shall adjust the Intended Completion Period on Engineer's own forecast. The Engineer will assume that the Contractor will react competently and promptly to the event.

41.4 The Contractor shall be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Engineer/Employer.

42. Tax

- 42.1 The rates quoted by the Contractor shall be deemed to be inclusive of the service tax, sales tax, contract tax, royalty, Toll tax, cess and other taxes/duties/levies as may be levied by Central / State Governments and local bodies that the Contractor will have to pay for the performance of this Contract. The Employer will perform such duties in regard to the deduction of such taxes at source as per applicable law.
- 42.2 The contractor shall have valid Registration for VAT and PAN as prescribed in Appendix 3

43. Currency

- 43.1 All payments shall be made in Indian Rupees only.

44. Price Adjustment for Works

The amounts payable to the Contractor and valued at base rates and prices in the Interim Payment Certificates issued by the Engineer, shall be adjusted in respect of the rise or fall in the index cost for labour, Contractor's Equipment, Plant, materials, and other inputs to the Works, by the addition or subtraction of the amounts determined by the formulae prescribed in this Clause.

44.1 Other Changes in Cost

To the extent that full compensation for any rise or fall in costs to the Contractor is not covered by the provisions of this or other Clauses in the Contract, the unit rates and prices included in the Contract shall be deemed to include amounts to cover the contingency of such other rise or fall of costs.

44.2 Price Adjustment Formulae

Contract Price shall be adjusted for increase or decrease in rates and price of labour, materials, fuels and lubricants in accordance with the following principles and procedures as per formula given below. The amount certified in each payment certificate is adjusted by applying the respective price adjustment factor to the payment amounts due:

- (a) Price adjustment shall apply only for work carried out within the stipulated time or extensions granted by the Employer and shall not apply to work carried out beyond the stipulated time; price adjustment for extensions for reasons attributable to the Contractor, shall be paid in accordance with the following clauses.

Price adjustment shall be calculated as per the formula given below:

- (b) Following expressions and meanings are assigned to the value of the work done during each month:

R = Total value of work done during the month. It would include the value of materials on which secured advance has been granted, if any during the month less than the value of materials in respect of which the secured advance has been recovered, if any during the month. This will exclude cost of work on items for which rates were fixed under variations for which the escalation will be regulated as mutually agreed at the time of fixation of rate.

i) **Adjustment for Labour Component**

Price adjustment for increase or decrease in the cost due to labour shall be paid in accordance with the following formula:

$$V_L = 0.85 \times P_l/100 \times R \times (L_i - L_o)/L_o$$

V_L = increase or decrease in the cost of work during the month under consideration due to changes in rates for local labour.

L_o = the average consumer price index for industrial workers for the place as defined in the Appendix to Bid, in the previous month prior to the closing date of submission of bids as published by Labour Bureau, Ministry of Labour, Government of India.

L_i = The average consumer price index for industrial workers for the place as defined in the Appendix to Bid, in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related as published by Labour Bureau, Ministry of Labour, Government of India.

P_l = Percentage of labour component of the work.

Note: For the application of this Clause, index of Industrial Workers has been chosen to represent the labour component.

ii) **Adjustment for Cement Component**

Price adjustment for increase or decrease in the cost of cement procured by the Contractor shall be paid in accordance with the following formula.

$$V_c = 0.85 \times P_c/100 \times R \times (C_i - C_o)/C_o$$

V_c = Increase or decrease in the cost of work during the month under consideration due to changes in the rates for cement

C_o = The all India average wholesale price index for cement in the previous month prior to the closing date of submission of bids as published by the Ministry of Commerce & Industry, Government of India.

C_i = The all India average wholesale price index for cement in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related, as published by Ministry of Commerce & Industry, Government of India.

P_c = Percentage of cement component of the work

(iii) **Adjustment for steel component**

Price adjustment for increase or decrease in the cost of steel procured by the Contractor shall be paid in accordance with the following formula:

$$V_s = 0.85 \times P_s/100 \times R \times (S_i - S_o)/S_o$$

V_s = Increase or decrease in the cost of work during the month under consideration due to changes in the rates for steel.

S_o = The all India average wholesale price index for steel (Bars and Rods) in the previous month prior to the closing date of submission of bids as published by the Ministry of Commerce & Industry, Government of India.

S_i = The all India average wholesale price index for steel (Bars and Rods) in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related as published by the Ministry of Commerce & Industry, Government of India.

P_s = Percentage of steel component of the work

Note: For the application of this Clause, index of Bars and Rods has been chosen to represent steel component.

(iv) Adjustment for Plant and machinery and spares component

Price adjustment for increase or decrease in the cost of Plant and machinery spares procured by the Contractor shall be paid in accordance with the following formula:

$$V_p = 0.85 \times P_p/100 \times R_x (P_i - P_o)/P_o$$

V_p = Increase or decrease in the cost of work during the month under consideration due to changes in the rates for Plant and machinery spares

P_o = The all India average wholesale price index for heavy machinery and parts in the previous month prior to the closing date of submission of bids as published by the Ministry of Commerce & Industry, Government of India.

P_i = The all India average wholesale price index for heavy machinery and parts in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related as published by the Ministry of Commerce & Industry, Government of India.

P_p = Percentage of Plant and machinery spares component of the work

Note: For the application of this Clause, index of heavy machinery and parts has been chosen to represent the Plant and Machinery spares component.

(v) Adjustment for Bitumen Component

Price adjustment for increase or decrease in the cost of bitumen shall be paid in accordance with the following formula:

$$V_b = 0.85 \times P_b/100 \times R_x (B_i - B_o)/B_o$$

V_b = increase or decrease in the cost of work during the month under consideration due to changes in the rates for bitumen:

B_o = the average official retail price of bitumen at the nearest refinery for the place as defined in Appendix to Bid, in the previous month prior to the date of submission of Bids.

B_i = the average official retail price of bitumen at nearest refinery for the place as defined in Appendix to Bid, in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related.

P_b = Percentage of bitumen component of the work.

(vi) Adjustment for Fuel and Lubricants (POL)

Price adjustment for increase or decrease in the cost of POL (fuel and lubricant) shall be paid in accordance with the following formula:

$$V_f = 0.85 \times P_f/100 \times R_x (F_i - F_o)/F_o$$

V_f = Increase or decrease in the cost of work during the month under consideration due to changes in rates for fuel and lubricants.

F_o = The average official retail price of High Speed Diesel (HSD) oil at the existing consumer pumps of IOC for the place defined in the Appendix to Bid in the previous month prior to date of submission of bids.

F_i = The average official retail price of HSD at the existing consumer pumps of IOC for the place defined in the Appendix to Bid in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related

P_f = Percentage of fuel and lubricants component of the work.

Note: For the application of this clause, the price of High Speed Diesel oil at the IOC pumps has been chosen to represent fuel and lubricants component.

- Based price index for Industrial Workers to be published by Labour Bureau, Ministry of Labour, Govt. of India be checked.

(vii) Adjustment for Other Local Materials

Price adjustment for increase or decrease in cost of local materials other than cement, steel, bitumen, plant spares and POL procured by the Contractor shall be paid in accordance with the following formula:

$$V_m = 0.85 \times P_m / 100 \times R_x (M_i - M_o) / M_o$$

V_m = Increase or decrease in the cost of work during the month under consideration due to changes in rates for local materials other than cement, steel, bitumen, plant spares and POL.

M_o = The all India average wholesale price index (all commodities) in the previous month prior to date of submission of bids, as published by the Ministry of Commerce & Industry, Government of India.

M_i = The all India average wholesale price index (all commodities) in the previous month prior to the last day of the period to which a particular Interim Payment Certificate is related as published by the Ministry of Commerce & Industry, Government of India.

P_m = Percentage of local material component (other than cement, steel, bitumen, plant spares and POL) of the work.

(viii) The following percentages will govern the price adjustment of the contract:

1.	Labour – P_l	20 %
2.	Plant and Machinery and Spares - P_p	20 %
3.	POL - P_f	10 %
4.	Bitumen- P_b	x %
5.	Cement - P_c	y %
6.	Steel - P_s	z %
7.	Other materials - P_m	50 - (x + y + z) %
	Total	100 %

(Note: x, y, z are the actual percentage of material of bitumen, cement and steel respectively used for execution of work as per the Interim Payment Certificate for the month).

44.3 Base, Current and Provisional Indices

The base cost indices or prices shall be those prevailing in the previous month prior to the closing date for submission of bids. Current indices or prices shall be those prevailing in the previous month to which a particular Interim Payment Certificate is related. If at any time, the current indices are not available, provisional indices as determined by the Engineer will be used, subject to subsequent correction of the amounts paid to the Contractor when the applicable indices become available.

44.4 Limit of Price Adjustment

Provided that, in determining all such price adjustment in accordance with the aforesaid Sub-Clauses:

- (a) No account will be taken of any amount by which any cost incurred by the Contractor has been increased by default or negligence of the Contractor.
- (b) If the Contractor fails to complete the work within time for completion, the adjustment of prices thereafter until the completion of the works shall be made using either the indices or prices relating to prescribed time for completion, or the current indices or prices, whichever is more favourable to the Employer, provided that if an extension of time is

granted, the above position shall apply to the adjustments made after expiry of such extension of time.

44.5 Subsequent Legislation

If, after the date 28 days prior to the latest date for submission of tenders for the Contract, there occur changes to any National or State Statute, Ordinance, Decree or other Law or any regulation or bye-law of any local or other duly constituted authority, or the introduction of any such State Statute, Ordinance, Decree, Law, regulation or bye-law which causes additional or reduced cost to the Contractor, other than under the preceding Sub-Clauses of this Clause, in the execution of the Contract, such additional or reduced cost shall, after due consultation with the Employer and the Contractor, be determined by the Engineer and shall be added to or deducted from the Contract Price and the Engineer shall notify the Contractor accordingly, with a copy to the Employer.

Notwithstanding the foregoing, such additional or reduced cost, shall not be separately paid or credited if the same shall already have taken into account in the indexing of any inputs to the Price Adjustment Formulae in accordance with the provisions of Sub-Clause (1) to (5) of this Clause.

45. Penalty and Liquidated Damages

45.1 For Construction/ Improvement Works

- (a) In case of non-completion of the construction works within the Intended Completion Date, the Contractor shall pay liquidated damages to the Employer at the rate specified in contract data for each day that the actual completion date is later than the intended completion date. The liquidated damages amount shall be deducted from payments due to the Contractor and shall not be refundable. The total amount of liquidated damages shall not exceed the amount defined in the Contract Data.
- (b) Time is the essence of the Contract and payment or deduction of penalty or liquidated damages shall not relieve the Contractor from his obligation to complete the works as per agreed Construction Program or from any of the other Contractor's obligations and liabilities under the Contract or the Employer's right to invoke the Performance Security.
- (c) In case of default performance on the part of the contractor to engage required personnel for the work as stipulated in Clause 9.3, a penalty of **Rs. 20,000/-** per month for the Diploma holder and **Rs. 30,000/-** per month for the PG Degree holder shall be levied based on the norms for the value of this contract.

45.2 For Maintenance Works

In case the Contractor has not rectified or addressed deficiencies as directed by the Engineer at the time of Site inspections during defects liability period, the Employer retains the right to get works done through a third party and debit the cost and expenses incurred to the Contractor. Alternatively, the Engineer may recommend invoking of Performance Security in part or full, as the case may be. In case the Contractor still fails to rectify or address deficiencies even after invoking Performance Security, as described earlier, then the Employer shall treat the event as fundamental breach of Contract in terms of Clause 54 of Conditions of Contract.

46. Deleted

47. Advance Payment for Construction/ Improvement Works

- 47.1 No Mobilisation advance/Machinery and equipment advance payment will be made to the Contractor for the works.
- 47.2 No material advance will be made or paid to the Contractor.

48. Securities

- 48.1 The Performance Security (including additional security for unbalanced bids) shall be provided to the Employer not later than the date specified in the Letter of Award and shall be issued in an amount and form indicated in Contract Data from:
- a. State Bank of India or subsidiaries;
 - b. Any Indian Nationalised Bank; or
 - c. Any Scheduled Bank

as acceptable to the Employer, and denominated in Indian Rupees. The Performance Security shall be valid for period of **12 Months** beyond the completion date of each Package of work. In case the Intended Completion Date is extended, then the Contractor shall submit a fresh Performance Security or extension of the date of the Bank Guarantee/s if any, furnished as security, the same value valid up to a date one month beyond the issue of Defect Liability Certificate.

49. Cost of Repairs

- 49.1 Loss or damage to or defective works or Materials during the Contract Period shall be remedied by the Contractor at the Contractor's cost to the satisfaction of the Engineer/Employer. In case of default by the Contractor, the Employer shall carry out suitable remedial measures and deduct the amount incurred thereto from payments due to the Contractor.

E. Finishing the Contract**50. Completion**

- 50.1 The Contractor shall request the Engineer to issue a Certificate of Completion of Works and the Engineer will do so upon deciding that the Works are completed in all respects.
- 50.2 Upon satisfactory compliance and observance of the performance standards by the Contractor during the Defect Liability Period, the Engineer shall suitably inform the Employer who may then issue the Certificate of Contract Completion to the Contractor, Subject to Contractor satisfying all Provisions under this Contract.

51 Taking Over

- 51.1 The Employer will take over the Site and the Works with in 1 month of the Engineer issuing a certificate of Contract Completion in terms of Clause 50.2.

52 Final Account

- 52.1 In case of Construction / Improvement Works, the Contractor shall supply to the Engineer a Detailed account of the total amount that the contractor considers payable under the Contract on or before 30 days beyond the Engineer shall assess the quality and completion status of Construction /improvement Works in terms of this Contract and upon satisfaction, shall certify and final payment that is due to the contractor within 30 days of receiving the Contractor's account. If the Engineer is not satisfied, then the Engineer shall issue within 7 days thereto, a schedule that states

the scope of the corrections or additions that are necessary. If the Contractor fails to comply with the Engineer's instructions. The Engineer shall levy Liquidated Damages and shall recommend the Employer suitably. The Employer retains the right to employ a third party and carry out the remaining works and deduct the payment from pending bills of the Contractor.

53 As Built Drawings, Operating and Maintenance Manuals

53.1 "As Built" Drawings and Operation and Maintenance Manuals as required by the Employer shall be supplied by the Contractor as stated in the Contract Data.

53.2 If the Contractor does not supply the Drawings and/or manuals as stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

54. Termination

54.1 The Employer or the Contractor may terminate the contract if the other party causes a fundamental breach of the Contract.

54.2 Fundamental breach of Contract includes, but shall not be limited to the following:

- (a) Contractor stops work for 28 days when no stoppage of work is shown on the agreed program and the stoppage has not been authorized by the Employer.
- (b) Employer or the Contractor is made bankrupt or goes into liquidation, other than for a reconstruction or amalgamation
- (c) Payment certified by the Engineer is not paid by the Employer to the Contractor within 60 days of the Engineer's Certificate.
- (d) The Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;
- (e) The Contractor does not maintain a security (performance security, Security against Advance Payment etc) which is required;
- (f) In case of the Contractor has awarded more than 20% of value of works on sub-contract
- (g) The Contractor has defaulted in fulfilling his obligations under this Contract;
- (h) The Contractor has contravened clause 7,8 and 9 of the conditions of contract
- (i) The Contractor does not adhere to the agreed construction program of individual milestone and also fails to take Satisfactory remedial action as per agreements reached in the Management Meetings (clause 28) for a period of 30 days;
- (j) The Contractor fails to carry out the instructions of Engineer within a reasonable time determined by the Engineer in accordance with Clause 15.1 and 22.1 of the conditions of Contract.
- (k) The Contractor has delayed the completion of works by the number of days for which the maximum amount of liquidated damages can be paid as defined in the Contract Data; and
- (l) If the Contractor, in the judgment of the Employer has engaged in corrupt or fraudulent practices in competing for or in the executing the Contract.

For the purpose of this paragraph "corrupt practice" means the offering, giving, receiving or soliciting anything of value, to influence the action of a public official or the Employer or Engineer in the procurement process or in contract execution. "Fraudulent practice" means a misrepresentation of facts in order to influence a procurement process or the execution of a contract, and includes collusive practice

among Contractors (prior to or after bid submission) designed to establish bid prices at artificial non competitive levels and to deprive the Employer of the benefits of the free and open competition.”

- 54.3 When either party to the Contract gives notice of a breach of Contract to the Engineer for a cause than those listed under Clause 54.2 above, the Engineer shall decide whether the breach is fundamental or not.
- 54.4 **Notwithstanding** the above, the Employer may terminate the Contract for his convenience.
- 54.5 If the Contract so terminated the Contractor shall stop work immediately make the site safe and secure and leave the site as soon as reasonably possible.
- 54.6 In case the Contractor fails to carryout the works, as per the construction programme submitted by the Contractor and approved by the Engineer then the Employer, at its sole discretion is entitled to terminate this contract at the '**Risk and Cost**' of the Contractor and to employ such other Contractor/s to carryout the balance works. The additional cost incurred by the employer in completing the works, which remain unfinished at the time of termination of the contract will be recovered from the Contractor. Any unrecovered '**Risk and Cost**' amount will be a debt payable to the Employer and the Employer will take suitable actions for such unrecovered '**Risk and Cost**' amount at the cost of the Contractor. Any bill/s for the works executed remains unsettled and/or the value of materials, machineries etc., taken over or possessed by the Employer at the time of termination or on termination will be adjusted towards the '**Risk and Cost**' recoverable from the contractor.

55. Payment upon Termination

If the Contract is terminated because of fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payment received up to the date of the issue of the work certificate, less other recoveries due in the terms of the Contract, less taxes due to be deducted at source as per applicable law and the estimated/actual '**Risk and Cost**' to be recovered from the contractor due to termination. If the total amount due to the Employer exceeds any payment due to the Contractor the difference shall be a debt payable to the Employer.

If the Contract is terminated at the Employer's convenience or because of a fundamental breach of Contract by the Employer, the Engineer shall issue a certificate for the value of the Works done, the reasonable cost removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's cost of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the contract and less taxes due to be deducted at source as per applicable law.

56 Property

- 56.1 All materials on the site, plant, Equipment, Temporary Works and Works are deemed to be property of the Employer, if the Contract is terminated because of a Contractor's default.

57. Release from Performance

- 57.1 If the Contractor is frustrated by the outbreak of war or by any other event entirely outside the control of the Employer or the Contractor, the Engineer shall certify that the Contractor has been frustrated. The Contractor shall make the site safe and stop works as quickly as possible after receiving this certificate and shall be paid for all

works carried out before receiving it and any work carried out afterwards to which commitment was made.

58. Maintenance of ROW

- 58.1 Throughout the period of the Contract, the Contractor shall at all times maintain public vehicular access along the right-of-way to all public and private access and land. The contractor on written request to the Engineer, (including a drawing, program and specification), be given approval to operate.

59. Field Laboratory with Equipment and Tests

- 59.1 Without any extra cost shall provide and maintain adequately equipped field laboratory,
- 59.2 The cost of making any test to be conducted on all types of materials as per quality assurance plan, Tamil Nadu Building Practice/ National Building Code, standard procedures and specifications shall be borne by the contractor, and the contractors quoted rates shall include the same.
- 59.3 Third Party Inspection on Factory / Site shall be arranged by the contractor as per the instruction of the Employer. The Employer (or) Third Party Quality Auditor(s) appointed by the Employer shall be entitled to visit Factory / Site, Conduct sampling and Testing on the Products/works in accordance with relevant specifications. The entire expenses towards the third party inspection shall be borne by the contractor.

60. Approval of Proprietary Product / Process / System

Within 7 days of award of the work, the Contractor shall submit the following information for all proprietary products for approval by the Engineer. The Engineer may instruct and additional tests for the purpose of accepting the product which shall be followed by the Contractor

I. Name of manufacturer and name of product/process/system.

Complete details of manufacturer of the product/process/system shall be furnished. Details of where similar product/process/system has been successfully used be furnished. Authenticated copies of License/ collaboration Agreement shall be furnished.

II General features of the product/product process system.

Detailed write-up with method statements shall be furnished for each product/process system. This shall include complete working drawings and installation drawings, technical specification covering fabrication, material, system of corrosion protection, etc

III 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.

APPENDIX 1**Safety Measures****I Contractor's Liability**

The contractor shall be absolutely and solely responsible for any and all kinds of injuries or damages to person and property of any description whatever may be caused by or result from the execution of the works, whether these may have been carried out skillfully and carefully and strictly in conformity with the provisions of the specifications or not.

II Responsibility for Accidents, Damages etc.

The care of the whole of the permanent works shall remain with the contractor who shall be responsible for all accidents or damages from whatever cause arising and chargeable for anything that may be stolen, removed destroyed or damaged to whomsoever belonging and also for making good all defects and damages to the said works or to any property adjoining or any cause whatever whether such damage or defects were occasioned by the negligence of the contractor or not or may be or might have been discovered during the progress of the works or in consequences thereof, or shall appear to be known after the completion whereof or whether payment may wholly or partially have been made or the works approved as supposed to have been properly done and no certificate of approval of any works by any officers of ITEL/TNRDC shall affect or prejudice the right of TNRDC against the contractor or be considered or held as at all conclusive as to the sufficiency of any works or materials.

III Contractor to be responsible for all Trespasses and Damages

In the event of accidents to any person including employees of TNRDC on duty, damages to property, trespass on land, injury to cattle, horses, or other animals or damage injury of any description to any person or thing arising out of the execution of the works, the contractor shall be held responsible for and make good the same and shall indemnify TNRDC from all claims or expenses on account thereof and if TNRDC has to pay any money in respect thereof the sum so paid and the costs incurred by TNRDC shall be charged to the contractor as so much money paid to him on account of his contract and the contractor shall not be at liberty to dispute or question the right of TNRDC to make such payment for him or on his account notwithstanding the same may have been made without his consent of authority and decision or determination in law or otherwise to the contrary notwithstanding. TNRDC shall not be liable to, or for in respect of any damages or compensation or claim there for, under any Act for the time being in force or common law because or by reason or in consequences of any accident or injuries to workmen or others in the employment of the contractor or any subcontractor or of any person acting under him or on his behalf or the staff / persons employed by TNRDC for supervision of the work under his contract and the contractor shall save TNRDC harmless and indemnify in respect thereof and of any all costs and expenses incidental there to or consequent thereon.

IV Safety Measures

1. All the works to be carried out in and around the work site, it must be under the contractors supervision with their supervisor, at their own risk and cost
2. The contractor should possess rubber gloves, gum safety boots, helmet, face mask, torch light, emergency light etc. as safety equipments in good condition
3. Each and every employee of the contractor should have insurance cover under Workmen Compensation Act.
4. The Contractor has to carry out any activity of the construction work only after informing and getting concurrence of TNRDC / Engineer in charge

V Safety Equipments & Loose Tools:

The Contractor will be responsible to make available the safety equipment and loose tools as listed below if the Contractor fails to keep the safety equipment and loose tools and consumable items as listed the above will be procured by TNRDC and the cost will be deducted immediately from the bill payable to the contractor with a penalty of Rs. 2,000/-

VI Safety Measures to be adhered

1. Only experienced, skilled people have to be employed by the contractor
2. All personnel should be covered by insurance under Workmen Compensation Act.
3. All labour act provisions has to be met with
4. Rubber gloves, gum safety boots, helmet, face mask, torch light, emergency light etc are need to be provided by the contractor.
5. Exhibit labels of "Safety First"

VII List of Safety equipments to be provided by the contractor

SI No	Name of Equipment
1	Face Mask
2	Shock proof hand gloves
3	Disposable hand gloves
4	Gum boot / Safety shoes
5	First Aid Box
6	Emergency light
7	Helmet / hard hat
8	Safety cones
9	Traffic barriers
10	Warning lights
11	Red flags
12	Caution boards

Note: The above is only an illustrative minimum list. The contractor must note that it is their responsibility to ensure the lives and safety of the workers employed by them. Towards this end, all the equipments of appropriate specifications should be procured and made available to the workers in usable conditions throughout the period of contract. Responsibility for any health problem or death will solely rest with contractor.

APPENDIX 2**Labour Statutory Requirements****I General**

The Contractor shall confirm to and comply with the regulations and by-laws of the State or Central Government or ITEL/TNRDC and of all other local authorities such as Corporation of Chennai, The Tamil Nadu Electricity System, The Chief Electrical Inspector to Government of Tamil Nadu, The Government Customs and Police Departments Fire Service, the provisions contained in the various Labour Acts enacted by the State Legislature and Central Parliament in force and rules made there under including those under Minimum Wages Act, Factories Act, The Indian Electricity Act and rules framed under it, Workmen Compensation Act, The Employees State Insurance Act 1948, Provident Fund Regulations Act, The EPF and Miscellaneous Provisions Act 1952, Employees Provident Fund 1961 and scheme made under the said Act, Health and Sanitary Arrangements for workers etc. and the Contract Labour (Regulation and Abolition) Central Act 1970 and the Contracts (Regulation and Abolition) Central Rules 1971 etc. for Welfare and protection of works, workers or for the safety of the public and other Insurance provisions.

II Further, the Contractor has to give a declaration for the following provisions:-

- i. That in the capacity of Contractor, the Contractor has to comply with the provisions of Contract Labour (Regulation & Abolition) Act, 1970 by obtaining a valid license under the Act and the Rules thereto and similarly under Factories Act wherever applicable.
- ii. The Contractor has to pay the wages in accordance with the Minimum Wages Act to all his / their employees
- iii. That the Contractor has to abide to recover the Employees Provident Fund and the Employees' Insurance contributions (both Employees and employers contribution) from the payment of bills every month
- iv. The Contractor's Code Nos. for E.S.I / Workmen Compensation Policy and E.P.F. are----- & ----- and both the Employees, Employers contributions will be remitted by the contractor in his / their code numbers and copy of the remittance challans will be produced. In case, if the contractor is failing to remit, he / they will inform wage rates of employees to the Principal employer so that they can remit Employees' State Insurance Contribution & Employees Provident Fund contribution (both for employer and employee) and authorize them to make deductions from the payment of bills
- v. That the contractor has to authorize to recover the contributions towards Tamil Nadu Manual Worker (Regulations of Employment and Conditions of work) Act, 1982 fund at the percentage prescribed by the Government from time to time.
- vi. That the contractor has to further declare and undertake that in case of any liability pertaining to his / their employees is to be discharged by the Principal Employer for his / their lapse, the contractor undertake to reimburse the same or the Principal Employer is authorized to deduct the same from the contractor's dues as payable.
- vii. That the contractor will maintain the Registers and records about the Contract Labour employed under Section 29 of Labour (Regulation & Abolition) Act wherever applicable
- viii. That the contractor will take insurance policy under Workmen Compensation Act to meet out any untoward incident until the contract labourers are issued with ESI card

III Compliance with Labour Regulations

During continuance of the contract, the contractor and his sub contractors shall abide at all times by all existing labour enactment's and rules made there under, regulation, notifications and bye laws of the State or Central Governments or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep TNRDC indemnified in case any action is taken against TNRDC by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulation's or notifications including amendments. If TNRDC is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications / bye laws / Acts / Rules / Regulations including amendments, if any, on the part of the contractor, the Engineer / TNRDC shall have the right to deduct any money due to the contractor including his amount of performance security. TNRDC /Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by TNRDC.

The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of TNRDC at any point of time.

IV Contribution to Fund

Notwithstanding anything contained in any Law for the time being enforced or in any Agreement every person / Contractor who undertakes any Civil work shall be liable to pay a sum at such percent, not exceeding one percent of the total estimated cost of the work as may be fixed by the Government, by notification, as contribution to the fund constituted for the benefit of manual workers in the employment in Civil Works under a scheme, framed under Section 3 of Tamil Nadu Manual Workers (Regulation of Employment and Conditions of Work) Act, 1982. The percentage of total estimated cost of work, as may be fixed by the Government, notification from time to time shall be recovered from the Contractor, deductible at source and remit it to the Tamil Nadu Constructions Workers Welfare Board within such period as may be prescribed.

V Contract Labour Welfare

- i. The rights and benefits conferred on the workmen employed by the contractor under the provisions of various Labour Laws are the responsibility of the contractor. The contractor has to indemnify TNRDC in case of loss or any damages. It is the responsibility of the contractor to take insurance policy under Workmen's compensation Act, 1923 for each labour engaged by the contractor. The contractor will be responsible for any deficiency on safety measures to be adhered as stipulated in Safety measures to be adhered in Appendix 1. A photocopy of the insurance under Workmen's Compensation Policy should be furnished to TNRDC. The policies should be kept alive till the completion of the contract period.
- ii. The Contractor shall produce fitness certificate from any Authorized Medical Attendant (AMA) of Government Hospital for all the Technical Staff and Labour Staff to be employed.

VI Following Laws shall be adhered to by the contractor wherever applicable

- a. Workmen Compensation Act, 1923
- b. Payment of Wages Act, 1936
- c. Industrial Disputes Act, 1947
- d. Minimum Wages Act, 1948
- e. Factories Act, 1948

- f. Employees PF and Miscellaneous Act, 1952
- g. Payment of Bonus Act, 1965
- h. Payment of Gratuity Act, 1972
- i. Equal Remuneration Act, 1979
- j. Maternity Benefit Act, 1951
- k. Contract Labour (Regulation & Abolition) Act 1970
- l. Industrial Employment (Standing Orders) Act 1946
- m. Trade Unions Act 1951
- n. Child Labour (Prohibition & Regulation) Act 1986
- o. Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act 1979
- p. The Building and other Construction workers (Regulation of Employment and Conditions of Service) Act 1996 and the Cess Act of 1996
- q. Employee State Insurance Act, 1948
- r. The Tamil Nadu Manual Workers (Regulation of Employment and Conditions of Work) Act, 1982
- s. The Bonded Labour System (Abolition) Act, 1976
- t. The Employer's Liability Act, 1938

VII Elimination of Child Labour

1. Attention of all contractor are invited to the Child Labour (Prohibition and Regulations) Act 1986, which prohibits employment of children below 14 years of age in certain occupations and process and provides for regulations of employment of children in all other occupations and progress. Employment of child labor is prohibited in building and construction industry.
2. Hence, all the contractors are requested to adhere to the provisions in the above Act and see that engagement of child labour in the operational activities of TNRDC are completely prohibited. Any violation of the provision will lead to penal action and removing of the contractor from the list of registered contractors.

APPENDIX 3
Tax Registration Number

We confirm that our firm/company has valid VAT/PAN details as under:

- i) VAT No. _____
- ii) PAN No. _____

We confirm that our firm/company has valid ESI/ Workmen Compensation Policy and EPF codes as under:

- i) ESI No. _____
or
- ii) Workmen Compensation Policy No. _____
- iii) EPF No. _____

APPENDIX IV

Power of Attorney for Lead Member of Consortium

(Refer Clause 14 of ITB)

Whereas the Tamil Nadu Road Development Company Ltd. (“the Authority”) has invited Bids from interested parties for the “Carrying out Improvement to Roads, bridges and culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu” (the “Project”) and

Whereas,,, and (collectively the “Consortium”) being Members of the Consortium are interested in bidding for the Project in accordance with the terms and conditions of the bid document and other connected documents in respect of the Project, and

Whereas, it is necessary for the Members of the Consortium to designate one of them as the Lead Member in accordance with the terms and conditions of the bid document and other connected documents in respect of the Project with all necessary power and authority to do for and on behalf of the Consortium, all acts, deeds and things as may be necessary in connection with the Consortium’s bid for the Project and its execution and be held responsible for the same.

NOW THEREFORE KNOW ALL MEN BY THESE PRESENTS

We, having our registered office at, M/s. having our registered office at, M/s. having our registered office at, and having our registered office at, (hereinafter collectively referred to as the “Principals”) do hereby irrevocably designate, nominate, constitute, appoint and authorize M/s having its registered office at, being one of the Members of the Consortium, as the Lead Member and true and lawful attorney of the Consortium (hereinafter referred to as the “Attorney”). We hereby irrevocably authorise the Attorney (with power to sub-delegate) to conduct all business for and on behalf of the Consortium and any one of us during the bidding process and, in the event the Consortium is awarded the concession/contract, during the execution of the Project and in this regard, to do on our behalf and on behalf of the Consortium, all or any of such acts, deeds or things as are necessary or required or incidental to the pre-qualification of the Consortium and submission of its bid for the Project, including but not limited to signing and submission of all , bids and other documents and writings, participate in bidders and other conferences, respond to queries, submit information/ documents, sign and execute contracts and undertakings consequent to acceptance of the bid of the Consortium and generally to represent the Consortium in all its dealings with the Authority, and/ or any other Government Agency or any person, in all matters in connection with or relating to or arising out of the Consortium’s bid for the Project and/ or upon award thereof till the Concession Agreement is entered into with the Authority.

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

IN WITNESS WHEREOF WE THE PRINCIPALS ABOVE NAMED HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS DAY OF 2.....

For

(Signature)

.....

(Name & Title)

For

(Signature)

.....

(Name & Title)

For

(Signature)

.....

(Name & Title)

Witnesses:

1.

2.

.....

(Executants)

(To be executed by all the Members of the Consortium)

(Notarised)

Person indentified by me/ personally appeared before me / signed before me/ Attested / Authenticated*

(* Notary to specify as applicable)

(Signature, Name and Address of the Notary)

Seal of the Notary

Registration Number of the Notary

Date : _____

Notes:

- The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.
- Also, wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.

- For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Apostille certificate.

Section IV

Contract Data

SECTION IV CONTRACT DATA

Item	Clause Reference
The following documents are also part of the contract and enclosed as Appendix	2.3
Detailed program regarding Work Methodology, Quality control and Assurance Plan to complete the work as per the construction programme	--
Operation and Maintenance Manuals.	53
<p>The Employer is :</p> <p>Tamil Nadu Road Development Company Limited (TNRDC), Sindur Panthion Plaza, 2nd Floor, 346, -Pantheon Road, Egmore, Chennai- 600 008.</p> <p>Phone: 044 - 2819 4800, 044 - 2819 4900 Fax 91- 44 -2819 5800</p> <p>Name of Authorised Representative : Managing Director / TNRDC</p> <p>-----</p> <p>Engineer is :</p> <p>Tamil Nadu Road Development Company Limited (TNRDC), Sindur Panthion Plaza, 2nd Floor, 346, -Pantheon Road, Egmore, Chennai- 600 008.</p> <p>Phone: 044 - 2819 4800, 044 - 2819 4900 Fax 91- 44 -2819 5800</p> <p>Name of Authorised Representative : General Manager (Projects)</p>	1.1
<p>The name of the Contract is :</p> <p>“Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”</p> <p>Package – I “Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)”</p> <p>Package – II “Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts (Km 0/00 to Km 2/400)”</p>	1.1
The Start Date shall be the date of issue of Acceptance letter / Notice-to-Proceed by the Contractor for the Works.	1.1
Intended Completion Date: For Package – I is 15 Months & Package – II is 12 Months from the Date of Commencement as indicated in the Notice to Proceed the Works.	1.1,16,26
The Contractor Shall submit a Detailed Work Program including Construction Program, Work Methodology, Quality Control, for the works (in such form and detail as the Engineer prescribe) within 7 days of receipt of Letter of Award. The Program should have adequate details and conform to the contract provisions.	25

<p>The Site is “Improvement to Roads, Bridges and Culverts of North Chennai Thermal Power Station Road and Ennore Port Road for the Movement of 575 MT Special Transport Vehicle in Thiruvallur District, Tamil Nadu”</p> <p>Package – I “Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)”</p> <p>Package – II “Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts (Km 0/00 to Km 2/400)”</p>	1												
<p>The Defects Liability Period is 12 Months after the Completion Date of the construction / improvement works</p>	50.2												
<p>Insurance requirement :</p> <table border="0"> <thead> <tr> <th>Item</th> <th>Minimum cover for</th> </tr> </thead> <tbody> <tr> <td>Works, Plant and material</td> <td></td> </tr> <tr> <td>Fire policy/ Loss or damage to Equipment</td> <td>Equivalent to 1.15 times of the contract value</td> </tr> <tr> <td colspan="2"><u>Personal Injury or death Insurance</u></td> </tr> <tr> <td>For other people</td> <td>Equivalent to 1.15 times of the contract value</td> </tr> <tr> <td>Contractor’s employee</td> <td>In accordance with applicable existing laws</td> </tr> </tbody> </table>	Item	Minimum cover for	Works, Plant and material		Fire policy/ Loss or damage to Equipment	Equivalent to 1.15 times of the contract value	<u>Personal Injury or death Insurance</u>		For other people	Equivalent to 1.15 times of the contract value	Contractor’s employee	In accordance with applicable existing laws	13
Item	Minimum cover for												
Works, Plant and material													
Fire policy/ Loss or damage to Equipment	Equivalent to 1.15 times of the contract value												
<u>Personal Injury or death Insurance</u>													
For other people	Equivalent to 1.15 times of the contract value												
Contractor’s employee	In accordance with applicable existing laws												
<p>The language of the Contract Document is English</p>	3												
<p>The law which applies to the Contract is the Law of Union of India</p>	3												
<p>The currency of the contract is Indian Rupees Only.</p>	43												
<p>Retention money :-</p> <p>In IPC’s @ 5 % of value of each bill will be withheld and the withheld amount will be refunded to the Contractor along with the Final Bill / Taking over certificate.</p>	39.3												
<p>Penalty for not attending Management Meetings/ Site Visits : Rs 1,000/- per incidence The maximum amount of the penalty is 2% of initial contract Price for Works.</p>	28.2												
<p>The liquidated damages for non-completion of construction Works within the intended completion date shall be 5% of contract value for each week’s delay or part there of beyond the completion date. The maximum amount of liquidated damages for the whole of the works is 5% final Contract Price for Works.</p>	45.1												
<p>Performance Security shall be of 2 % of Contract Price for Construction and Improvement Works as stated in the Acceptance letter / work order, valid for 12 Months beyond the Intended Completion Date for Works, for each package.</p> <p>The standard form of Performance Security acceptable to the Employer shall be an unconditional and irrevocable Bank Guarantee of the type as presented in section – II of Bidding Documents.</p>	48												
<p>Hard copy and a soft copy of “As- Built” Drawings (in scale as per codal specifications) and Operation and Maintenance manuals are required before issuing the “Certificate of Completion of Works”.</p> <p>The amount to be withheld for failing to supply the “As- Built” Drawings and Operation and Maintenance Manuals within the date required is Rs. 2 Lakhs.</p>	53												

Section V
Bill of Quantities

Bill of Quantities for works

(BOQ)

A.Preamble

1. The Bill of Quantities shall be read in conjunction with the Instruction to Bidders, General and Special Conditions of Contract, Technical Specifications, Drawings and conforming to the MoRTH /IRC/IS Specifications.
2. The Bidder should closely peruse all the specification clauses for items of works for which he is tendering his rates.
3. The quantities given in the Bill of Quantities are approximate and provisional, which are given to provide a common basis for making payment for works. Actual quantities of work are likely to increase or decrease as per the requirement at site. Hence, there is no claim for any additional or less quantities than the specified in the BOQ.
4. The rates in the Bill of Quantities shall, except in so far as it is otherwise provided under the Contract, include all construction plant, labour, supervision, materials, erection, transportation, maintenance, insurance, administrative overheads, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract.
5. The Bidder shall indicate the unit rate and line total on the Total Estimate Bid Amount, which shall be applicable on each item of the Bill of Quantities, whether quantities are stated or not.
6. General directions and description of work and materials are not necessarily repeated nor summarized in the Bill of Quantities. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering prices against each item in the Bill of Quantities.
7. The method of measurement of completed work for payment shall be in accordance with relevant best practices as set forth in the accordance with relevant best practices MoRTH /IRC/IS/ BIS /AASHTO or as per codal provisions/specifications as may be decided by the Employer.

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

SUMMARY

S.No	Description	Amount (Rs)
A	HIGHWAYS	
Bill No.1	Site clearance	
Bill No.2	Earth work	
Bill No.3	Sub-base and base courses	
Bill No.4	Bituminous courses	
Bill No.5	Drainage & protective works	
Bill No.6	Road furniture	
Bill No.7	Arboriculture	
Bill No.8	Highway lighting	
Total A		
B	STRUCTURES	
Bill No.9	Major bridge-1no. (Ennore creek.)	
Bill No. 10	Box culverts	
Total B		
Grand Total (A+B)		

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu
(Km 0/00 to Km 4/800)

Bill No.1 SITE CLEARANCE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
1.01	Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned, up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness,as per Technical Specifications,MORTH Clause 201.	Hect.	5.10			
1.02	Cutting of trees, including cutting of trunks, branches and removal of stumps, roots, stacking of serviceable material with all lifts and up to a lead of 1000 metres and earth filling in the depression/pit.as per Technical Specifications,MORTH Clause 201.					
(a)	above 300 mm to 600 mm	No.	3			
(b)	above 600 mm to 900 mm	No.	2			
					Sub Total (Rs)	

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu
(Km 0/00 to Km 4/800)

Bill No.2 EARTH WORKS

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
2.01	Excavation for roadwork with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead upto 5 Km,as per Technical Specifications,MORTH Clause 301.					
	in soils (other than soft rock and hard rock)	Cum.	36,115			
2.02	Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2.as per Technical Specifications,MORTH Clause 305.					
(A)	with Material obtained from Borrowpits	Cum.	11,593			
(B)	with Material Deposited from Roadway Cutting	Cum.	7,223			
2.03	Construction of sub-grade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2,as per Technical Specifications,MORTH Clause 305.					
(A)	with Material obtained from Borrowpits,with minimum soaked CBR of 10%	Cum.	19,627			
2.04	Construction of Stabilized Sub-grade soil with 2% RBI Grade 81 satisfying the requirements with minimum soaked CBR of 10% with all lifts and leads all complete as per Technical Specifications,MORTH Clause 305.	Cum.	3,920			
Sub Total (Rs)						

Rupees _____ Only

Package - I

**Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu
(Km 0/00 to Km 4/800)**

Bill No.3 SUB-BASE AND BASE COURSES

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
3.01	Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, at OMC, and compacting with vibratory roller to achieve the desired density, complete as per clause 401. with Coarse Graded Material (Table:- 400- 2) of MORTH	Cum	8,828			
3.02	Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density,complete as per MORTH clause 406. with Coarse Graded Material (Table:- 400- 11)	Cum	4,169			
3.03	Aggregate Stabilized Base (20% 20 mm down aggregate + 20% Stone Dust + 60% soil + 4% RBI Grade-81)	Cum	851			
Sub Total (Rs)						

Rupees _____ Only

Package - I

**Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu
(Km 0/00 to Km 4/800)**

Bill No.4 BITUMINOUS COURSES

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
4.01	Providing and applying primer coat with slow setting bitumen emulsion as per IS : 8887 on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.60 kg/sqm using mechanical means.complete as per Technical Specifications,MORTH Clause 502	Sqm.	21,756			
4.02	Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.2 & 0.3 per sqm on the prepared bituminous/granular surface cleaned with mechanical broom, complete as required and directed by the Engineer and as per Technical Specifications,MORTH Clause 503.					
(i)	On granular surface & Hungry bituminous @ 3kg/10sqm	Sqm.	21,756			
(ii)	On bituminous surface @ 2kg/10sqm	Sqm.	80,872			
4.03	Stress Absorbing Membrane Interlayer (SAMI) of 10mm aggregate down with bituminous emulsion (Double coats) all complete as required and directed by the Engineer and as per Technical Specifications,MORTH Clause 522.	Sqm.	5,520			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
4.04	Providing and laying dense graded bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with 60/70 grade bituminous binder @ 4.0 to 4.5 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification, MORTH clause No. 507 complete in all respects.	Cum.	4,473			
4.05	Providing and laying dense graded bituminous macadam course using Crumble Rubber Modified Bitumen (60) grade for Paving Bitumen as per IS : 15462 (2004), IRC SP 53(2002), IRC 111(2009) Technical Specifications.	Cum.	275			
4.06	Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with 60/70 grade bituminous binder @ 5.4 to 5.6 per cent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects.	Cum.	1,884			
4.07	Providing and laying bituminous concrete wearing coat,using Crumble Rubber Modified Bitumen (60) grade for Paving Bitumen as per IS : 15462 (2004), IRC SP 53(2002), IRC 111(2009) Technical Specifications.	Cum.	275			
Sub Total (Rs)						

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu
(Km 0/00 to Km 4/800)

Bill No. 5 DRAINAGE & PROTECTIVE WORKS

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
5.01	construction of 300 mm dia semi-circular drainage chute in cement concrete M 15 with M-10 foundation concrete as per drawings and Technical Specifications,MORTH Sections 1500 and 1700 including construction of bell mouth at entry.	Rm	2,880			
5.02	Construction of Energy dissipation basin at toe of chutes in M15 with M10 foundation as per drawing and Technical Specification,MORTH Clause 1500 & 1700	Nos	360			
5.03	Stone pitching 300 mm thk. On slopes with CM 1:3 for erosion protection as per Technical Specification,MORTH Clause 2500	cum	5,357			
5.04	Providing and laying granular material underneath stone apron (flexible apron) complete as per drawing and Technical specification,MORTH clause 2504	cum	3,240			
5.05	Construction of open trapezoidal unlined drain in rural sections as per proper slope and size as shown in drawing and technical specification,MORTH Clause 309.	Rm	7,100			
5.06	Construction of open trapezoidal lined drain in stone pitching embankment as per proper slope and size as shown in drawing and technical specification,MORTH Clause 309.	Rm	1,350			
Sub Total (Rs)						

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

Bill No.6 ROAD FURNITURE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
6.01	Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing,MORTH clause 801					
(a)	Informatory Signs					
(i)	Advance Direction 1500 mm x 900 mm	Sqm.	3			
(ii)	Reassurance 600 mm x 800 mm	Nos	2			
(iii)	Place Identification Signs (Size upto 0.9Sqm)	Sqm.	4			
(iv)	Facility (standard) 800 mm x 600 mm	Nos	2			
(v)	Cautionary Signs, Triangular (Size 900 mm side).	Nos	8			
(b)	Mandatory Signs, Size.					
(i)	Circular 600 mm dia.	Nos	2			
(ii)	Octagon 900 mm height (for "STOP").	Nos	6			
(iii)	Triangular 900 mm side (for "GIVE WAY").	Nos	7			
6.02	Pavement marking with hot applied reflectorised thermoplastic paints Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.complete as per drawing and Technical Specifications,MORTH Clause 803	Sqm.	1,303			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
6.03	Providing and fixing reinforced cement concrete M-20 grade distance marker stones including excavation, foundation concrete excluding reinforcement inscription etc. complete as per drawing and Technical Specifications, MORTH Clause 804.					
	Hectometer stones	Nos	20			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
6.04	Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide strips, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC-79 and as per drawing and Technical Specifications, MORTH Clause 805..					
	Road way delineators/hazard signs	Nos	108			
6.05	Providing crash barriers for high embankments in urban area and bridge approaches all complete.					
	Providing & fixing steel beam crash barrier including posts, earthworks, plain concrete PCC M-15 grade foundation block, painting with approved paint incidentals all complete as per drawing and Technical Specifications, MORTH Clause 810.	Lm.	2,700			
6.06	Providing and fixing of road stud 100x 100 mm, die-cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973	Nos	1,087			
6.07	Providing Guard Stone for high embankments in urban area and bridge approaches all complete.	Nos	34			
6.08	Providing Cluster of Red Reflector at Median Opening	Nos	14			
Sub Total (Rs)						

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

Bill No. 7 ARBORICULTURE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
7.01	Plantation of trees as per MOEF guidelines in one/two rows depending upon space available on either side of road within ROW & central median (including planting with manure, gardening and maintenance)	Nr.	17			
Sub Total (Rs)						

Rupees _____ Only

Package - I

**Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at
Athipattu (Km 0/00 to Km 4/800)**

Bill No. 8 HIGHWAY LIGHTING

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
8.01	Supply, erection and commissioning of 6Mtr single arm Hot Dip Galvanised Octogonal decorative Street light pole with 1mtr length arm, Material for construction shall Complies to BSEN 10025, Yield strength should be 355 Mpa, Galvanization thickness 70 Microns, Base plate should be connected with gasket to avoid helical stresses, Bottom dia: 130mm & Top Dia: 75mm, sheet thickness 3 mm with 70W Street Light luminaire Model GE SPECTRA 70W CMH IP 66 with GE CMH Lamp or PHILIPS, CROMPTEN or Approved equivalent and all foundation accessories, civil foundation complete.	Nos	47			
Sub Total (Rs)						

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

Bill No. 9 STRUCTURES MAJOR BRIDGE- ENNORE CREEK BRIDGE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	FOUNDATIONS					
1	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Ordinary soil-Mechanical Means					
(i)	Depth upto 3 m	cum	1286			
(ii)	Depth 3 m to 6 m	cum	1286			
(iii)	Back Filling in Marshy Foundation Pits	cum	1310			
2	Pile load test on single vertical pile in accordance with IS:2911(Part-IV)					
a	Bore hole soil investigation	Nos	13			
b	No of Initial Pile load tests - Vertical	Nos	2			
c	No of Lateral Pile Load tests	Nos	2			
d	No of Routine Pile load tests - Vertical	Nos	2			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
3.a	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in soils as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	2280			
3.b	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in Weathered Rock/Hard Shale etc,as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	228			
4	Providing steel liner 6mm thick for piles and also additional 8mm tk liner for a depth of 1m casing in bottom,etc all complete as per detailed drawing and technical specifications,MORTH Clause 1200 & 1900.	MT	112			
5	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Pilecap including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications Sections,MORTH 1500 & 1700 in bridges and culverts.	cum	1262			
6	M15 Grade Levelling course (PCC) for Pilecap foundations Providing and laying Plain cement concrete M-15 grade including centering and shuttering in Bridges foundation all complete as per drawing and technical Specifications Sections,MORTH 1500 & 1700	cum	105			
7	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification,MORTH section 1600 or as directed by the Engineer.	tonne	622			
8	Filling in and around parallel to foundation sides in water bed level to start construction work with selected Earth brought from outside sources including conveyance by lorry load, filling in layers of not more than 150mm consolidated thick, each layer shall be well consolidated with mechanical vibrator/ rammer including, watering, consolidation and also inclusive of dewatering etc., all complete as per standard specifications and as directed by Engineer-in-charge.	Cum	5181			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	SUB-STRUCTURE					
9	RCC Grade M35					
a	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Height 5m to 10m (Dirt wall, Pier & Piercap concrete (M35)) including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications, MoRTH Sections 1500 & 1700 in bridges and culverts.	cum	981			
b	Bearing pedestals (M40)	Cum	38			
10	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MoRTH section 1600 or as directed by the Engineer.	tonne	267			
11	Supplying, fitting and fixing in position true to line and level elastomeric bearing conforming to IRC: 83 (Part-II) section IX and clause 2005 of MoRTH specifications complete including all accessories as per drawing and Technical Specifications.	Cc	768000			
	SUPER-STRUCTURE					
12	Furnishing and Placing Reinforced Cement Concrete in super-structure as per drawing and Technical Specification					
a	RCC M35 Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for T beam/I Girder Girder including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications Sections 1500 & 1700 in bridges and culverts.	cum	1137			
13	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MoRTH section 1600 or as directed by the Engineer.	tonne	238			
14	Bituminous wearing course of comprising of 50mm thick bituminous concrete laid in 2 layers of 25mm each and 6 mm thick bitumen mastic with a prime coat and as per Technical Specification, MoRTH Clause 2702	cum	55			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
15	Providing and laying 25 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per MoRTH clause 515.	Sqm	1383			
16	Providing, fitting and fixing mild steel railing complete as per drawing and Technical Specification	metre	318			
17	Drainage Spouts complete as per drawing and Technical specification	each	32			
18	150 dia perforated PVC Pipes	Rmt	159			
19	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	cum	11			
20	Reinforced cement concrete approach slab M35 Grade including formwork complete as per drawing and Technical specification	cum	20			
21	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	318			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
22	Strip Seal Expansion Joint (Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	metre	126			
23	PAINTING					
i)	For Sub structures upto HTL/HFL					
	Supply and apply two coats of a solvent free, high build thixotropic epoxy resin based chemical resistant protective coating system Sikagard 63 for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin protective coating Sikagard 67 or equivalent as approved by Engineer in charge					
	a) Foundation Epoxy resin protective coating System Primer-Sikagard®-67 or equivalent as approved by Engineer in charge					
	Consumption: 0.2 kg/m2.					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max					
	b) Chemical resistant protective coating system -Sikagard 63 or equivalent as approved by Engineer in charge					
	Coating: Sikagard®-63 (2 coats) or approved equivalent or as approved by Engineer in charge					
	Consumption: 0.6 kg/m2.					
	System requirements: Chemical resistance as per IS 4631-1968.					
	Density – 1.5 Kg/l @ +27°C					
	Solid Content – 100% (by weight)					
	Concrete:> 1.5 N/mm ² (failure in concrete) (According to Germon Standard DIN EN 13892-8)					
	Steel (SA 2.5):~ 24 N/mm ² (According to Germon Standard DIN EN 24624)	Sqm	846			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
ii	For Super Structures					
	Supply and apply two coats of a two component polyurethane resin based UV resistant protective coating system Sikagard®-PU (UR) for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin protective coating Sikagard 67 or equivalent as approved by Engineer in charge.					
	a) Epoxy resin protective coating Sikagard 67 or equivalent as approved by Engineer in charge					
	Primer: Sikagard®-67 or equivalent as approved by Engineer in charge					
	Consumption: 0.2 kg/m2.					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max.					
	b) Polyurethane resin based UV resistant protective coating system Sikagard®-PU (UR) or equivalent as approved by Engineer in charge					
	Coating: Sikagard®-PU (UR) or equivalent as approved by Engineer in charge					
	Consumption: 0.4 kg/m2.					
	System requirements:					
	Density – 1.35 Kg/l @ +27°C					
	Solid Content – 84% (by weight)					
	Bond Strength on concrete:> 1.5 N/mm ²	Sqm	4386			
24	PROTECTION WORKS					
a	Providing & laying filter media(600mm thk.) behind abutments, wing walls and retaining walls including all materials, labour, equipment etc. all complete as per drawing and Technical Specification,MoRTH Clause 305, 309 & 2500.	Sqm	130			
b	Filter material below revetment (Launching apron) Providing and laying granular material underneath stone apron (flexible apron) complete as per drawing and Technical Specification Clause	Cum	827			
c	Providing and laying Pitching 300mm thick on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and Technical specifications	Cum	104			
25	PCC Curtain Wall					
a	M20 Concrete	Cum	63			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
b	Excavation	Cum	131			
c	Providing 100mm dia weep holes in abutments, wing walls, retaining walls, return walls etc. complete as per Technical Specification, MoRTH Clause 2706	Nos	100			
Sub Total (Rs)						

Rupees _____ Only

Package - I

Improvement, strengthening, widening and realignment of NCTPS Road including construction of bridges and culverts but excluding RoB at Athipattu (Km 0/00 to Km 4/800)

Bill No. 10 - BOX CULVERTS						
Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
	BOX/SLAB CULVERTS/STRUCTURES - FOUNDATIONS/SUB STRUCTURE					
A	Dismantling of existing culverts					
1	Removing all type of hume pipes and stacking within a lead of 1000 metres including earthwork and dismantling of masonry works.	Rmt	660			
2	Backfilling after dismantling the RCC hume pipe of size 1000mm & above	Cum	1335			
3	Dismantling of Reinforced Cement Concrete by mechanical means using pneumatic tools, breaking to pieces and stock at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately	cum	325			
4	Dismantling Plain Cement concrete	Cum	40			
B	Box type Structures					
5	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Mechanical Means Depth upto 3 m	cum	3880			
	Back filling	cum	2140			
	Plain/Reinforced cement concrete in Culverts complete as per drawing and technical specifications					
	PCC Grade M15 using batching plant	cum	174			

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
	RCC Grade M35	cum	1566			
6	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MORTH section 1600 or as directed by the Engineer.	tonne	125			
	Curtain wall Grade M20	cum	219			
	Wing wall/ Return wall					
7.a	Earthwork Excavation	cum	9370			
7.b	PCC Grade M15 using batching plant	cum	191			
7.c	RCC Grade M30	cum	1989			
7.d	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MORTH section 1600 or as directed by the Engineer.	Tonne	159			
8	Floor apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification, MoRTH Clause 2503	sqm	728			
9	Flexible apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification, MoRTH Clause 2503	sqm	354			
10	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	179			
Sub Total (Rs)						

Rupees _____ Only

Package - II

**Improvement, strengthening, widening, realignment of Ennore Port Road including
construction of bridges and culverts. (Km 0/00 to Km 2/400)**

SUMMARY

S.No	Description	Amount (Rs)
A	Highways	
Bill No.1	Site Clearance and Dismantling	
Bill No.2	Earth Work	
Bill No.3	Sub-Base and Base Courses	
Bill No.4	0	
Bill No.5	Drainage & Protective Works	
Bill No.6	Road Furniture	
Bill No.7	Highway Lighting	
	Total A	
B	Structures	
Bill No.8.a	Minor Bridges-Buckingham Canal Bridge ch:2+270	
Bill No.8.b	Minor Bridges-Utility Pipe Crossing Bridge at Ch:1+270	
Bill No.9.a	Box Culvert Ch:0+983	
Bill No.9.b	Box Culvert Ch:1+822	
	Total B	
C	GRAND TOTAL (A+B)	
Rupees _____ Only)		

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.1 SITE CLEARANCE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
1.01	Clearing and grubbing road land including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned, up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness,as per Technical Specifications ,MORTH	Hect.	2			
1.02	Removal of Electric lamp Poles including excavation and dismantling of foundation concrete and lines under the supervision of department concerned, disposal with all lifts upto a lead of 1000m and stacking of serviceable & unserviceable material separatly.	Nos	15			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.2 EARTH WORKS

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
2.01	Excavation for roadwork with hydraulic excavator of 0.9 cum bucket capacity including cutting and loading in tippers, trimming bottom and side slopes, in accordance with requirements of lines, grades and cross sections, and transporting to the embankment location within all lifts and lead upto 5 Km,as per Technical Specifications,MORTH Clause 301.					
	In soils (other than soft rock and hard rock)	Cum.	4,317			
2.02	Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of table 300-2.as per Technical Specifications,MORTH Clause 305.					
(A)	with Material obtained from Borrowpits	Cum.	655			
(B)	with Material Deposited from Roadway Cutting	Cum.	1,295			
2.03	Construction of sub-grade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement of table No. 300-2,as per Technical Specifications,MORTH Clause 305.					
	with Material obtained from Borrowpits,with minimum soaked CBR of 10%	Cum.	6,552			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.3 SUB-BASE AND BASE COURSES

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
3.01	Construction of granular sub-base by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, at OMC, and compacting with vibratory roller to achieve the desired density, complete as per MORTH clause 401. with Coarse Graded Material (Table:- 400- 2)	Cum	2,327			
3.02	Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well prepared surface and compacting with vibratory roller to achieve the desired density,complete as per MORTH clause 406. with Coarse Graded Material (Table:- 400- 11)	Cum	1,825			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.4 BITUMINOUS COURSES

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
4.01	Providing and applying primer coat with slow setting bitumen emulsion as per IS : 8887 on prepared surface of granular Base including clearing of road surface and spraying primer at the rate of 0.60 kg/sqm using mechanical means.complete as per Technical Specifications,MORTH Clause 502	Sqm.	7,915			
4.02	Providing and applying tack coat with bitumen emulsion using emulsion pressure distributor at the rate of 0.2 & 0.3 per sqm on the prepared bituminous/granular surface cleaned with mechanical broom, complete as required and directed by the Engineer and as per Technical Specifications,MORTH Clause 503.					
(i)	On granular surface & Hungry bituminous @ 3kg/10sqm	Sqm.	7,915			
(ii)	On bituminous surface @ 2kg/10sqm	Sqm.	47,022			
4.03	Providing and laying dense graded bituminous macadam with 100-120 TPH batch type HMP producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with 60/70 grade bituminous binder @ 4.0 to 4.5 per cent by weight of total mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MoRTH specification clause No. 507 complete in all respects.	Cum.	3,860			

4.04	Providing and laying bituminous concrete with 100-120 TPH batch type hot mix plant producing an average output of 75 tonnes per hour using crushed aggregates of specified grading, premixed with 60/70 grade bituminous binder @ 5.4 to 5.6 per cent of mix and filler, transporting the hot mix to work site, laying with a hydrostatic paver finisher with sensor control to the required grade, level and alignment, rolling with smooth wheeled, vibratory and tandem rollers to achieve the desired compaction as per MORTH specification clause No. 509 complete in all respects.	Cum.	1,176			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No. 5 DRAINAGE & PROTECTIVE WORKS

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
5.01	construction of 300 mm dia semi-circular drainage chute in cement concrete M 15 with M-10 foundation concrete as per drawings and Technical Specifications,MORTH Sections 1500 and 1700 including construction of bell mouth at entry.	Rm	392			
5.02	Construction of Energy dissipation basin at toe of chutes in M15 with M10 foundation as per drawing and Technical Specification,MORTH Clause 1500 & 1700	Nos	56			
5.03	Stone pitching 300 mm thk. On slopes with CM 1:3 for erosion protection as per Technical Specification,MORTH Clause 2500	cum	882			
5.04	Providing and laying granular material underneath stone apron (flexible apron) complete as per drawing and Technical specification,MORTH clause 2504	cum	441			
5.05	Construction of open trapezoidal lined drain in rural sections as per proper slope and size as shown in drawing and technical specification,MORTH Clause 309.	Rm	4,214			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.6 ROAD FURNITURE

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
6.01	Providing and fixing of retro- reflectorised cautionary, mandatory and informatory sign as per IRC :67 made of high intensity grade sheeting vide clause 801.3, fixed over aluminium sheeting, 1.5 mm thick supported on a mild steel angle iron post 75 mm x 75 mm x 6 mm firmly fixed to the ground by means of properly designed foundation with M15 grade cement concrete 45 cm x 45 cm x 60 cm, 60 cm below ground level as per approved drawing ,MORTH clause 801					
(a)	Facility (standard) 800 mm x 600 mm	No.	2			
(b)	Cautionary Signs, Triangular (Size 900 mm side).	No.	2			
6.02	Pavement marking with hot applied reflectorised thermoplastic paints Providing and laying of hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250 gms per sqm area, thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC:35 .The finished surface to be level, uniform and free from streaks and holes.complete as per drawing and Technical Specifications,MORTH Clause 803	Sqm.	520			
6.03	Providing and fixing reinforced cement concrete M-20 grade distance marker stones including excavation, foundation concrete excluding reinforcement inscription etc. complete as per drawing and Technical Specifications,MORTH Clause 804.					
(a)	Hectometer stones	No.	10			
(b)	KM. stones	No.	2			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
6.04	Supplying and installation of delineators (road way indicators, hazard markers, object markers), 80-100 cm high above ground level, painted black and white in 15 cm wide strips, fitted with 80 x 100 mm rectangular or 75 mm dia circular reflectorised panels at the top, buried or pressed into the ground and conforming to IRC-79 and as per drawing and Technical Specifications MORTH Clause 805..					
	Road way delineators/hazard signs	No.	46			
6.05	Providing crash barriers for high embankments in urban area and bridge approaches all complete.					
	Providing & fixing steel beam crash barrier including posts, earthworks, plain concrete PCC M-15 grade foundation block, painting with approved paint incidentals all complete as per drawing and Technical Specifications, MORTH Clause 810.	Lm.	420			
6.06	Providing and fixing of road stud 100x 100 mm, die-cast in aluminium, resistant to corrosive effect of salt and grit, fitted with lense reflectors, installed in concrete or asphaltic surface by drilling hole 30 mm upto a depth of 60 mm and bedded in a suitable bituminous grout or epoxy mortar, all as per BS 873 part 4:1973	Nr	428			
6.07	Providing Guard Stone for high embankments in urban area and bridge approaches all complete.	Nr.	6			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No. 7 HIGHWAY LIGHTING

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
7.01	Supply, erection and commissioning of 6Mtr single arm Hot Dip Galvanised Octogonal decorative Street light pole with 1mtr length arm, Material for construction shall Complies to BSEN 10025, Yield strength should be 355 Mpa, Galvanization thickness 70 Microns, Base plate should be connected with gasket to avoid helical stresses, Bottom dia: 130mm & Top Dia: 75mm, sheet thickness 3 mm with 70W Street Light luminaire Model GE SPECTRA 70W CMH IP 66 with GE CMH Lamp or PHILIPS, CROMPTEN or Approved equivalent and all foundation accessories, civil foundation complete.	Nos	16			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No. 8.a STRUCTURES MINOR BRIDGE (Buckingham Canal Bridge ch:2+270)						
Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	FOUNDATIONS					
1	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Ordinary soil-Mechanical Means					
(i)	Depth upto 3 m	cum	433			
(ii)	Depth 3 m to 6 m	cum	433			
(iii)	Back Filling in Marshy Foundation Pits	cum	322			
2	Pile load test on single vertical pile in accordance with IS:2911(Part-IV)					
	Bore hole soil investigation	Nos	4			
	No.of initial pile load test	Nos	2			
	No.of routine pile test	Nos	2			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
3.a	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in soils as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	960			
3.b	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in Weathered Rock/Hard Shale etc,as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	96			
4	Providing steel liner 6mm thick for piles and also additional 8mm tk liner for a depth of 1m casing in bottom,etc all complete as per detailed drawing and technical specifications,MORTH Clause 1200 & 1900.	MT	47			
5	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Pilecap including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications Sections,MORTH 1500 & 1700 in bridges and culverts.	cum	545			
6	M15 Grade Levelling course (PCC) for Pilecap foundations Providing and laying Plain cement concrete M-15 grade including centering and shuttering in Bridges foundation all complete as per drawing and technical Specifications MORTH Clause 1500 & 1700	cum	47			
7	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification,MORTH section 1600 or as directed by the Engineer.	tonne	348			
	SUB-STRUCTURE					
8	RCC Grade M35					
a	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Height 5m to 10m (Dirt wall, Pier & Piercap concrete (M35)) including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications Sections,MORTH 1500 & 1700 in bridges and culverts.	cum	254			
b	Bearing pedestals (M40)	Cum	4			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
9	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification,MORTH section 1600 or as directed by the Engineer.	tonne	48			
10	Supplying, fitting and fixing in position true to line and level POT-PTFE bearing consisting of a metal piston supported by a disc or unreinforced elastomer confined within a metal cylinder, sealing rings, dust seals, PTFE surface sliding against etc as directed by the Engineer					
	Free Type	Each	2			
	Fixed Type	Each	1			
	Guided Type	Each	1			
	SUPER-STRUCTURE					
11	Furnishing and Placing Reinforced Cement Concrete in super-structure as per drawing and Technical Specification					
a	RCC M35 Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for T beam/box Girder including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications Sections ,MORTH 1500 & 1700 in bridges and culverts.	cum	384			
12	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification,MORTH section 1600 or as directed by the Engineer.	tonne	63			
13	Bituminous wearing course of comprising of 50mm thick bituminous concrete laid in 2 layers of 25mm each and 6 mm thick bitumen mastic with a prime coat and as per Technical Specification,MORTH Clause 2702	cum	16			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
14	Providing and laying 25 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per MORTH clause 515.	Sqm	409			
15	Providing, fitting and fixing mild steel railing complete as per drawing and Technical Specification	metre	80			
16	Drainage Spouts complete as per drawing and Technical specification	each	7			
17	150 dia perforated PVC Pipes	Rmt	40			
18	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	cum	10			
19	Reinforced cement concrete approach slab M35 Grade including formwork complete as per drawing and Technical specification	cum	18			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
20	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSR reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	80			
21	Strip Seal Expansion Joint (Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	metre	19			
22	PAINTING					
i)	For foundations & Sub structure Below Ground level					
	Supply and apply two coats of a solvent free, high build thixotropic epoxy resin based chemical resistant protective coating system Sikagard 63 for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin protective coating Sikagard 67 or equivalent as approved by Engineer in charge					
	a) Foundation Epoxy resin protective coating System Primer-Sikagard®-67 or approved equivalent					
	Consumption: 0.2 kg/m2.					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max					
	b) Chemical resistant protective coating system -Sikagard 63 or approved equivalent					
	Coating: Sikagard®-63 (2 coats) or approved equivalent or approved equivalent					

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	Consumption: 0.6 kg/m2.					
	System requirements: Chemical resistance as per IS 4631-1968.					
	Density – 1.5 Kg/l @ +27°C					
	Solid Content – 100% (by weight)					
	Concrete:> 1.5 N/mm ² (failure in concrete) (According to Germon Standard DIN EN 13892-8)					
	Steel (SA 2.5):~ 24 N/mm ² (According to Germon Standard DIN EN 24624)	Sqm	1105			
ii	For Super Structures					
	Supply and apply two coats of a two component polyurethane resin based UV resistant protective coating system Sikagard®-PU (UR) or approved equivalent for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin prote					
	a) Epoxy resin protective coating Sikagard 67 or approved equivalent					
	Primer: Sikagard®-67 or approved equivalent					
	Consumption: 0.2 kg/m2.					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max.					
	b) Polyurethane resin based UV resistant protective coating system <u>Sikagard®-PU (UR) or approved equivalent</u>					
	Coating: Sikagard®-PU (UR) or approved equivalent (2 Coats)					
	Consumption: 0.4 kg/m2.					

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	System requirements:					
	Density – 1.35 Kg/l @ +27°C					
	Solid Content – 84% (by weight)					
	Bond Strength on concrete:> 1.5 N/mm ²	Sqm	1625			
23	Floor Protection					
	Providing & laying filter media(600mm thk.) behind abutments, wing walls and retaining walls including all materials, labour, equipment etc. all complete as per drawing and Technical Specification,MORTH Clause 305, 309 & 2500.	m ²	162			
	Providing and laying Pitching 300mm thick on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and Technical specifications	m ³	123			
	PCC Curtain Wall	m ³	4			
	M20 Concrete	m ³	33			
	Excavation	m ³	85			
	Providing 100mm dia weep holes in abutments, wing walls, retaining walls, return walls etc. complete as per Technical Specification,MORTH Clause 2706	nos	100			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400.)

Bill No. 8b STRUCTURES MINOR BRIDGE (Utility Pipe Crossing Bridge at Ch:1+270)						
Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	FOUNDATIONS					
1	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Ordinary soil-Mechanical Means					
(i)	Depth upto 3 m	cum	199			
(ii)	Depth 3 m to 6 m	cum	199			
(iii)	Back Filling in Marshy Foundation Pits	cum	172			
2	Pile load test on single vertical pile in accordance with IS:2911(Part-IV)					
	Bore hole soil investigation	Nos	2			
	No.of initial pile load test	Nos	1			
	No.of routine pile test	Nos	1			
3.a	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in soils as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	480			
3.b	Bored cast-in-situ M35 grade R.C.C. pile excluding reinforcement complete as per drawing and technical specifications and removal of excavated earth with all lifts and lead upto 1000 m. (Pile diameter-1200 mm) in Weathered Rock/Hard Shale etc,as per drawing and Technical Specifications,MORTH Clause 1100 & 1700.	Rmt	48			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
4	Providing steel liner 6mm thick for piles and also additional 8mm tk liner for a depth of 1m casing in bottom,etc all complete as per detailed drawing and technical specifications,MORTH Clause 1200 & 1900.	MT	23			
5	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Pilecap including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications,MORTH Sections 1500 & 1700 in bridges and culverts.	cum	226			
6	M15 Grade Levelling course (PCC) for Pilecap foundations Providing and laying Plain cement concrete M-15 grade including centering and shuttering in Bridges foundation all complete as per drawing and technical Specifications ,MORTH Sections 1500 & 1700	cum	20			
7	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification,MORTH section 1600 or as directed by the Engineer.	tonne	109			
	SUB-STRUCTURE					
8	RCC Grade M35					
a	Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for Height 5m to 10m (Dirt wall, Pier & Piercap concrete (M35)) including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications,MORTH Sections 1500 & 1700 in bridges and culverts.	cum	66			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
b	Bearing pedestals (M40)	Cum	4			
9	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MORTH section 1600 or as directed by the Engineer.	tonne	13			
10	Supplying, fitting and fixing in position true to line and level elastomeric bearing conforming to IRC: 83 (Part-II) section IX and clause 2005 of MoRTH specifications complete including all accessories as per drawing and Technical Specifications.	Cc	64000			
SUPER-STRUCTURE						
11	Furnishing and Placing Reinforced Cement Concrete in super-structure as per drawing and Technical Specification					
a	RCC M35 Providing and laying reinforced cement concrete M-35 Using Batching Plant, Transit Mixer and Concrete Pump for T beam/box Girder including centering and shuttering but excluding cost of reinforcement all complete as per drawing and Technical Specifications, MORTH Sections 1500 & 1700 in bridges and culverts.	cum	94			
12	Providing & fixing in a position corrosion resistance steel (CRS) TMT bar reinforcement in foundation, sub-structure and superstructure complete as per drawing, Technical Specification, MORTH section 1600 or as directed by the Engineer.	tonne	19			
13	Bituminous wearing course of comprising of 50mm thick bituminous concrete laid in 2 layers of 25mm each and 6 mm thick bitumen mastic with a prime coat and as per Technical Specification, MORTH Clause 2702	cum	6			
14	Providing and laying 25 mm thick mastic asphalt wearing course on top of deck slab excluding prime coat with paving grade bitumen meeting the requirements given in table 500-29, prepared by using mastic cooker and laid to required level and slope after cleaning the surface, including providing antiskid surface with bitumen precoated fine grained hard stone chipping of 9.5 mm nominal size at the rate of 0.005cum per 10 sqm and at an approximate spacing of 10 cm center to center in both directions, pressed into surface when the temperature of surfaces not less than 100 deg. C, protruding 1 mm to 4 mm over mastic surface, all complete as per MORTH clause 515.	Sqm	146			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
15	Providing, fitting and fixing mild steel railing complete as per drawing and Technical Specification	metre	27			
16	Drainage Spouts complete as per drawing and Technical specification	each	2			
17	150 dia perforated PVC Pipes	Rmt	13			
18	PCC M15 Grade leveling course below approach slab complete as per drawing and Technical specification	cum	10			
19	Reinforced cement concrete approach slab M35 Grade including formwork complete as per drawing and Technical specification	cum	18			

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
20	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	27			
21	Strip Seal Expansion Joint (Providing and laying of a strip seal expansion joint catering to maximum horizontal movement upto 70 mm, complete as per approved drawings and standard specifications to be installed by the manufacturer/supplier or their authorised representative ensuring compliance to the manufacturer's instructions for installation.)	metre	19			
22	PAINTING					
i)	For foundations & Sub structure Below Ground level					
	Supply and apply two coats of a solvent free, high build thixotropic epoxy resin based chemical resistant protective coating system Sikagard 63 for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin protective coating Sikagard 67 or equivalent as approved by Engineer in charge					
	a) Foundation Epoxy resin protective coating System Primer-Sikagard®-67 or approved equivalent					
	Consumption: 0.2 kg/m ² .					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max					
	b) Chemical resistant protective coating system -Sikagard 63 or approved equivalent					
	Coating: Sikagard®-63 (2 coats) or approved equivalent or approved equivalent					

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	Consumption: 0.6 kg/m ² .					
	System requirements: Chemical resistance as per IS 4631-1968.					
	Density – 1.5 Kg/l @ +27°C					
	Solid Content – 100% (by weight)					
	Concrete:> 1.5 N/mm ² (failure in concrete) (According to Germon Standard DIN EN 13892-8)					
	Steel (SA 2.5):~ 24 N/mm ² (According to Germon Standard DIN EN 24624)	Sqm	672			
ii	For Super Structures					
	Supply and apply two coats of a two component polyurethane resin based UV resistant protective coating system Sikagard®-PU (UR) or approved equivalent for concrete substrates with a primer coat of a water based, solvent free, odourless, epoxy resin prote					
	a) Epoxy resin protective coating Sikagard 67 or approved equivalent					
	Primer: Sikagard®-67 or approved equivalent					
	Consumption: 0.2 kg/m ² .					
	System requirements:					
	Density – 1.22 Kg/l @ +27°C					
	Solid Content – 49% (by weight)					
	Relative Air Humidity - 75% r.h. max.					

Item	Description	Unit	Quantity	Rate (Rs.)		Amount (Rs.)
				In Figures	In Words	
	b) Polyurethane resin based UV resistant protective coating system <u>Sikagard®-PU (UR) or approved equivalent</u>					
	Coating: Sikagard®-PU (UR) or approved equivalent (2 Coats)					
	Consumption: 0.4 kg/m ² .					
	System requirements:					
	Density – 1.35 Kg/l @ +27°C					
	Solid Content – 84% (by weight)					
	Bond Strength on concrete:> 1.5 N/mm ²	Sqm	478			
23	Floor Protection					
	Providing & laying filter media(600mm thk.) behind abutments, wing walls and retaining walls including all materials, labour, equipment etc. all complete as per drawing and Technical Specification,MORTH Clause 305, 309 & 2500.	m ²	77			
	Providing and laying Pitching 300mm thick on slopes laid over prepared filter media including boulder apron laid dry in front of toe of embankment complete as per drawing and Technical specifications	m ³	26			
	PCC Curtain Wall	m ³	2			
	M20 Concrete	m ³	18			
	Excavation	m ³	47			
	Providing 100mm dia weep holes in abutments, wing walls, retaining walls, return walls etc. complete as per Technical Specification,MORTH Clause 2706	nos	70			
Sub Total (Rs)						

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400

Bill No.9.a CULVERTS (CH: 0+983)

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
A	Dismantling of existing culverts					
1	Removing all type of hume pipes and stacking within a lead of 1000 metres including earthwork and dismantling of masonry works.	Rmt	15			
	Backfilling after dismantling the RCC hume pipe of size 1000mm & above	Cum	35			
	Dismantling of Reinforced Cement Concrete by mechanical means using pneumatic tools, breaking to pieces and stock at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately	Cum	9			
	Dismantling Plain Cement concrete	Cum	0.90			
B	BOX/SLAB CULVERTS/STRUCTURES - FOUNDATIONS/SUB STRUCTURE					
2.00	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Mechanical Means					
	Depth upto 3 m	cum	229			
	Backfilling	Cum	129			
	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications					
	PCC Grade M15 using batching plant	cum	10			

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
	RCC Grade M35					
	Box type Structures	cum	90			
3	Filling in and around parallel to foundation sides in water bed level to start construction work with selected Earth brought from outside sources including conveyance by lorry load, filling in layers of not more than 150mm consolidated thick, each layer shall be well consolidated with mechanical vibrator/ rammer including, watering, consolidation and also inclusive of dewatering etc., all complete as per standard specifications and as directed by Engineer-in-charge.	tonne	8			
	Curtain wall Grade M20	cum	15			
C	Wing wall/ Return wall					
	Excavation	cum	669			
	M15 for levelling course	cum	14			
	RCC M35 Grade	Cum	142			
4	Filling in and around parallel to foundation sides in water bed level to start construction work with selected Earth brought from outside sources including conveyance by lorry load, filling in layers of not more than 150mm consolidated thick, each layer shall be well consolidated with mechanical vibrator/ rammer including, watering, consolidation and also inclusive of dewatering etc., all complete as per standard specifications and as directed by Engineer-in-charge.	MT	11			
5	Floor apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification,MORTH Clause 2503	Sqm	36			
6	Flexible apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification,MORTH Clause 2503	Sqm	18			

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
7	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	32			
Sub Total (Rs)						

Rupees _____ Only

Package - II

Improvement, strengthening, widening, realignment of Ennore Port Road including construction of bridges and culverts. (Km 0/00 to Km 2/400)

Bill No.9.b CULVERTS (CH:1+822)

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
A	Dismantling of existing culverts					
1	Removing all type of hume pipes and stacking within a lead of 1000 metres including earthwork and dismantling of masonry works.	Rmt	15			
2	Backfilling after dismantling the RCC hume pipe of size 1000mm & above	Cum	35			
3	Dismantling of Reinforced Cement Concrete by mechanical means using pneumatic tools, breaking to pieces and stock at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials	Cum	9			
4	Dismantling Plain Cement concrete	Cum	0.90			
B	BOX/SLAB CULVERTS/STRUCTURES - FOUNDATIONS/SUB STRUCTURE					
5.00	Excavation for Structures -Earth work in excavation of foundation of structures as per drawing and technical specification, including setting out, construction of shoring and bracing, removal of stumps and other deleterious matter, dressing of sides and bottom and backfilling with approved material as per drawing and Technical Specifications,MORTH Clause 304.					
	Mechanical Means					
	Depth upto 3 m	cum	229			
	Backfilling	Cum	129			
	Plain/Reinforced cement concrete in open foundation complete as per drawing and technical specifications					

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
	PCC Grade M15 using batching plant	cum	10			
	RCC Grade M35					
	Box type Structures	cum	90			
6	Filling in and around parallel to foundation sides in water bed level to start construction work with selected Earth brought from outside sources including conveyance by lorry load, filling in layers of not more than 150mm consolidated thick, each layer shall be well consolidated with mechanical vibrator/ rammer including, watering, consolidation and also inclusive of dewatering etc., all complete as per standard specifications and as directed by Engineer-in-charge.	tonne	8			
	Curtain wall Grade M20	cum	15			
	RCC Grade M30					
C	Wing wall/ Return wall					
	Excavation	cum	669			
	M15 for levelling course	cum	14			
	RCC M35 Grade	Cum	142			

Item No.	Descriptions	Unit	Quantity	Rate (Rs)		Amount (Rs)
				In Figures	In Words	
7	Filling in and around parallel to foundation sides in water bed level to start construction work with selected Earth brought from outside sources including conveyance by lorry load, filling in layers of not more than 150mm consolidated thick, each layer shall be well consolidated with mechanical vibrator/ rammer including, watering, consolidation and also inclusive of dewatering etc., all complete as per standard specifications and as directed by Engineer-in-charge.	MT	11			
8	Floor apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification,MORTH Clause 2503	Sqm	36			
9	Flexible apron (m ²) Providing and laying Stone Boulder on apron as per Technical Specification,MORTH Clause 2503	Sqm	18			
10	Provision of an Reinforced cement concrete crash barrier at the edges of the road, approaches to bridge structures and medians, constructed with M-20 grade concrete with HYSD reinforcement conforming to IRC:21 and dowel bars 25 mm dia, 450 mm long at expansion joints filled with pre-moulded asphalt filler board, keyed to the structure on which it is built and installed as per design given in the enclosure to MOST circular No. RW/NH - 33022/1/94-DO III dated 24 June 1994 as per dimensions in the approved drawing and at locations directed by the Engineer, all as specified	Rmt	32			
Sub Total (Rs)						

Rupees _____ Only

Section VII

Technical Specifications

PREAMBLE

TECHNICAL SPECIFICATIONS

CONTENTS

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1 PREAMBLE

1.1 The Technical Specifications contained herein shall be read in conjunction with BOQ.

1.1.1 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.

1.1.3 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

Should there be any detail of construction or materials which has not been referred to in the Specification or in the Bill of Quantities and Drawings 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.

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 and without involving any time extension.

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 In general, the topography of the road can be classified as plain terrain.

1.2.3 General Climatic Conditions

1.2.3.1 *The temperature in the region fluctuates from 37° C to 44° C in summer and from 15° C to 27° C in winter.*

1.2.3.2 Average annual rainfall in the project area is about 1200 mm. Most of it occurs during the monsoon months of October to December.

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, 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), along with other addendum/ corrigendum/ issued upto 28 days before the final date of submission of bid, issued by the Ministry of Road Transport & Highways, Government of India and published by the Indian Roads Congress (IRC), New Delhi, with a cross reference to relevant Bureau of Indian Standards (BIS) for materials or other aspects not covered by the IRC.

2.2 PART- II: Supplementary Technical Specifications

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

2.2.1 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.

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

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

2.2.4 The Sub-Clauses of the following Sections in the "Specifications for Road and Bridge Works (Fourth Revision - August 2001, Reprinted - March 2002) have been Amended / modified / added upon:

Sr.No.	Section No	Section Title	Clause No.
1	100	General	102, 105, 106, 108, 109, 110,111,112, 114, 115, 121, 123, and 124
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	401,406,407,408 and 409
5	500	Bases and Surface Courses (Bituminous)	501, 502, 503, 504, 507, 509 and 512
6	600	Concrete Pavement	601 and 602
7	700	Traffic signs, Markings and other Road Appurtenances	801, 802, 803,804,805, 806, 807, 808,609 and 810,
8	800	Quality Control for Road works	901 and 903
9	900	Materials for Structures	1002, 1006, 1007, 1009, 1010, 1012. 1014 and 1015
10	1100	Pile Foundations	1101,1103,1104.1 107 , 1113,1118 and 1119

11	1200	Well Foundations	1204, 1205, 1209, 1214, and 1607
12	1500	Form Work	1501,1502,1503,1504,1506,1509 and 1510
13	1600	Steel Reinforcement (Untensioned)	1602, 1604,1605.1606 and 1607
14	1700	Structural Concrete	1703,1704,1705,.1706,1707,1709,1710,1712,1713,1715,1719 and 1720
15	1800	Prestressing	1801,1802,1803.1804,1806,1807,1808.1815 and 1816
16	2000	Bearing	2001,2004,2005,2006,2009 and 2011
17	2100	Open Foundations	2106
18	2200	Substructures	2204 and 2210
19	2500	River Training Work and Protection	2504
20	2600	Expansion Joints	2601
21	2700	Wearing Coat and Appurtenances	2703,2704,2706 and 2709
22	2800	Repair of Structures (Includes additional clauses)	2809,2811,2812,2813,2814,2815,2816,2817,2818,2819,2820,2821,2822,2823,2824,2825,2826,2827,2828,2829,2830,2831,2832 and 2833
23	2900	Pipe Culverts	2906
24	3100	Reinforced Soil	3101,3102 and 3103

2.2.5 Additional Technical Specifications

The following Clauses have been added to the 'SPECIFICATIONS FOR ROAD AND BRIDGE WORKS (Fourth Revision - August 2001, Reprinted - March 2002)'.

- A-1 Curing using liquid membrane forming compound
- A-2 Diversion and filling of existing water courses along the road alignment
- A-3 Plantation of trees and low height shrubs
- A-4 Utility ducts
- A-5 Control blasting
- A-6 Reflective pavement markers (Road Studs)
- A-7 High mast lighting
- A-8 Structural Steel Work
- A-9 Strands/Steel for Prestressing
- A-10 PSC Concrete
- A-11 Stabilization using RBI Grade 81
- A-12 Metallising Coat for Steel Girders of bridges
- A-13 Methodology for Protective Coatings for Sub Structures and Super Structures of bridges

2.2.6 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 and BIS in that order. Where even these are silent, the construction and completion of the works shall conform to sound engineering practices as approved by the Engineer. In case of any dispute arising out of the interpretation of the above, the decision of the Engineer shall be final and binding on the Contractor.

2.3 Specification for electrical works

For electrical items for road works the code of specifications published by Public Works Department (PWD), Govt. of Tamil Nadu and Tamil Nadu Electricity Board (TNEB) deemed to be bound into this document.

- 2.4** The latest editions, till 28 days before the final date of the submission of the bid of specifications/ standards shall be applicable.

Scope of Work

The "Works" consist of Construction for the Proposed Improvements to NCTPS Road for the movement of 575MT STV in Chennai for the Tamil Nadu Road Development Company Ltd .

The works shall, *inter alia*, include the following, as specified or as directed:

A. Construction

- 2.5** The Construction of works include Highways road works, Structures of foundation, sub-structure and Super- structure of and also landscaping of its environ /domain. The Project components may comprise of Site Clearance, Earth Work, Non Bituminous works, Bituminous Works, Major & Minor Bridges, (Foundation, Sub structures & Super structures), painting and lighting including standby electrical system etc; all aspects of quality assurance of various components of works; rectification of the defects in the completed woks during the Defect Liability Period; submission of "As Built" drawings and any other related documents; and other items of works as may be required to be carried out for completing the works in accordance with the drawings and provisions of the Contract to insure safety.

B. Miscellaneous

Execution of any other items of work for the construction and completion of the Works in accordance with the provisions of the Contract including all incidental items as well as preparation and submittal of reports, plans as may be required.

During the period of the Contract the right of way and all existing roads shall be kept open for traffic and maintained in a safe and usable condition. Residents along and adjacent to the Works are to be provided with safe and convenient access to their properties all times. Traffic control and traffic diversions shall be used as necessary to protect the works and maintenance will be carried out as directed by the Engineer and provided in the Contract and any other items as required to fulfill all contractual obligations as per the Bid Documents.

PART - I
GENERAL TECHNICAL SPECIFICATIONS

1.0 This part shall comprise the "Specification for Road & Bridge Works" (Fourth Revision - August 2001), issued by the Ministry of Road Transport and Highways (MORTH), Government of India and Published by the Indian Roads Congress (IRC), Jamnagar House, New Delhi - 110001, all as deemed to be bound into this document.

1.1 Where the term crushed stone is referred to in the Specification for Road & Bridge Works of the MORTH (Clause 1007) for use as aggregate in construction of pavement layers or in construction of cross drainage works it shall mean that the aggregates shall be obtained through the use of crusher / granulator and vibratory screens of suitable capacity as approved by the Engineer.

2.0 Quality Control on Works & Materials

Quality control on materials and execution remains the primary responsibility of the contractor.

Nevertheless, the Engineer will inspect the work from time to time during and after construction and get the quality of the work tested (by him / herself, by his / her Testing & Quality Control Units and / or by any other agency deemed fit by him / her) generally as per the requirements of the Handbook of Quality Control for Construction of Roads & Runways (IRC Special Publication No. 11 & Section-900 of MORTH Specifications).

3.0 Surveying & Measuring Equipments

Equipments for surveying and measurement of the work shall be procured by the Contractor for site use. The same shall also be made available at site for use by the Engineer for any work connected with the Contract without any Charge.

PART - II
SUPPLEMENTARY TECHNICAL SPECIFICATION

**(AMENDMENTS / MODIFICATIONS / ADDITIONS TO EXISTING
CLAUSES OF GENERAL TECHNICAL SPECIFICATIONS - PART -I)**

SECTION 100 GENERAL

Clause 102 DEFINITIONS

The following abbreviations shall be added in this Clause.

MoRT&H	:	Ministry of Road Transport. & Highways, Govt. of India
WMM	:	Wet Mix Macadam
MDD	:	Maximum Dry Density (as per IS: 2720-Part 8)
CPCB	:	Central Pollution Control Board
BOQ	:	Bill of Quantities
QA	:	Quality Assurance
CECR1	:	Central Electro Chemical Research Institute

Clause 103 MATERIALS AND TEST STANDARDS

Add at the end of the clause:

The latest edition of these standards till 28 (twenty eight) days before the final date of submission of the tender shall be adopted.

Clause 105 SCOPE OF WORK

Clause 105.3 Add the following below the existing clause.

The Contractor shall establish, adhere to, monitor and maintain an adequate quality management system complying with IRC: SP-47-1998 ("Guidelines on Quality Systems for Road Bridges") and IRC: SP-57-2001 ("Guidelines for Quality System for Road Construction"). The quality management system shall be described in a Quality 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 work. The Quality 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 principals and key personnel;
 - Control of liaison and meeting with third parties;
 - Identification of the Contractor's staff responsible for overseeing each major activities;
 - Contractor's control of sub-contracts;
 - Document and data control;
 - Program for submission of method statements;
 - Procedures for 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 personnel selection based on skill and experience;
 - 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 storage 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 105.4 Delete the words"15 days in advance..... "in the first line of the Clause and replace it with. "Submission of contractor's programme of work, method etc., as covered in this Clause shall be at least 28 days in advance, unless the quality management system for the project as finalized and approved by the Engineer demands an other time schedule for various submissions and approvals in which case the quality management system requirements will prevail".

Clause 106 CONSTRUCTION EQUIPMENT

Add the following below sub para (f):

- 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.

Clause 107 CONTRACT DRAWINGS

Clause 107.3 Add the following at the end of the paragraph:

"After careful study of the drawings issued by the Engineer, the Contractor shall, prepare, where necessary all supplementary and working drawings with necessary field / construction information and the like for adequacy of construction methods and procedure etc. and shall submit the same to the Engineer for approval prior to construction progressively according to the work programme accepted by the Engineer. Engineer shall be given not less than 21 days for review of these supplementary / working drawings and as directed, the contractor shall modify the drawings incorporating the comments and requirements of the Engineer.

The Contractor shall prepare detailed construction drawings for each culvert on the basis of the drawings given in Bid Documents and get them approved by the Engineer. The drawings shall be submitted to the Engineer at least 30 days before commencement of construction of culverts."

Clause108 SITE INFORMATION

Clause 108.4 This Clause shall read as follows:

"The Contractor shall identify quarries, borrow areas and other sources of materials required for the work. He shall satisfy himself that the required materials are available in adequate quantities and complying with the requirements of specifications. No claims shall be entertained on account of non-availability of materials, and increase in leads etc. 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 items of work.”

Clause 109 SETTING OUT

Clause 109.9 Delete second and third sentences and substitute the following:
“Setting out of the road alignment and measurement of angles shall be done by using Total Station.”

Clause 109.10 Add the following as Clause 109.10:
“The Contractor shall provide necessary surveying equipment, accessories, surveyors and labourers required for setting out and related measurements, including making available these to the Engineer and to his representatives at different stages of the work. The surveying equipment shall be of high standard of manufacture as approved by the Engineer, in good working condition with adequate numbers and shall include inter-alia the following:

- i. 2 nos. of Precision automatic levels with micrometer attachment with tripods and levelling staff reading to 5 mm accuracy by direct observation and to 1 mm accuracy by estimation or better
- ii. 2 nos. of Total Stations with 2 spare batteries and a charger, three tripods plus tangents sufficient for a 4 km range, together with an electronic data reorder, 6 data packs and all necessary software for operation.
- iii. Precision staff and prism
- iv. 4 nos. of 3 metre straight edge and measuring wedge fitted with handles wedges 100 mm ht. and 1 mm accuracy.
- v. Field umbrellas as required
- vi. Ranging rods 50 mm dia 3 m long straight with one end each metallic conical and painted alternatively black and white along the length as required.
- vii. Steel tape graduated in metres, centimetre and millimetre as required and as per the following categories:
 - 10 m long
 - 20 m long
 - 50 m long
 - Reference markers and pegs
- i) 2 sets of string line arrangement with sensor paver
- ii) Towed fifth wheel bump indicator

The Contractor shall maintain the surveying equipment in good condition during the full duration of works and replace the ones which get worn out or otherwise become unworkable.

The surveying equipment and related resources shall be provided under the general obligations of the Contractor requiring no separate payment.”

Clause 110 PUBLIC UTILITIES

Clause 110.3 This clause shall read as under:
“Any utility likely to be affected by the Contractor’s work shall be brought to the notice of the Engineer / Employer and such work shall be undertaken only after getting written clearance from the Engineer.”

CLAUSE 111 PRECAUTIONS FOR SAFEGUARDING THE ENVIRONMENT

Add the following text after the heading to Clause 111:
“In addition to the requirements of Annexure A to Clause 501, the Contractor shall comply with the Environmental requirements in the following clauses“:

Clause 111.1 General

Substitute the Clause with the following:
“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 Contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from 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.

Roads used for haulage, 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.”

Clause 111.2 Borrow pits for Embankment Construction

Substitute the Clause with the following:

“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 sign boards and the operational areas shall be access-controlled.

In the case of borrow from tank beds, a regrade / improvement of the inlet channels (at least up to 100 m stretch) shall be undertaken in consultation with the concerned state government departments (the Minor Irrigation department of the State PWD) and local bodies. The Contractor shall ensure that excavation of tank beds is uniform over the entire area and that the finished profile of the bed is smooth.

In the case of borrow from the dry highlands, all borrow areas shall be reinstated by the formation of 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 all applicable states noise emission regulations. All operation areas shall be water sprinkled to contain dust levels to the National Ambient Air Quality Standards.”

Clause 111.3 Quarry Operations

Substitute the Clause with the following:

“Aggregates shall be sourced only from quarry sites that comply with the local / state environmental and other applicable regulations. Occupational safety procedures / practices for the work force in all quarries shall be in accordance with applicable laws. Quarry and crushing units shall have adequate dust suppression measures, such as sprinklers, in work areas and along all approach roads to the quarry sites. These shall preferably be located on the upwind side.”

Clause 111.5 Pollution from Hot-Mix Plants and Batching Plants

Delete the first sentence of this Clause and substitute with the following:

“Bituminous hot mix plant and 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.”

Clause 111.8 Add the following at the end of this Clause:

“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 shall be decided by the Engineer to suit site conditions.”

After Clause 111.12, add the following new Clauses 111.13 to 111.23

Clause 111.13 Haulage Roads

“Existing roads used for hauling shall be strengthened and / or widened by the Contractor in accordance with the requirements for normal as well as construction traffic. Where such roads do not exist, the Contactor shall construct project specific single lane paved roads in settlement areas and gravel roads in open areas conforming to the respective specifications.

The alignment of the haulage roads shall be set to avoid agricultural land to the extent possible. In unavoidable circumstances, suitable compensation shall be paid to the people whose land will be temporarily acquired for the duration of the operations. The compensation shall cover for the loss of income for the duration of temporary acquisition and land restoration. Prior to the construction of the haul roads, topsoil shall be stripped and stockpiled for re-use.

Material dumping sites shall be access-controlled to prevent the unauthorized entry of the people, grazing cattle and stray animals.

Haulage roads shall be reinstated upon completion of hauling for the use of local communities.”

Clause 111.14 Water Sources and Water Quality

The Contractor shall provide independent sources of water supply, such as bore wells, for use in the Works and for associated storage, workshop and work force compounds. Prior approval shall be obtained from the relevant State Authorities and all installations shall be in compliance with local regulations. Bore wells installed and used for the project shall be left in good operating condition for the use of DoH and local communities. The Contractor shall prevent any interference with the supply to or abstraction from, and prevent any pollution of, water resources (including underground percolating water) as a result of the execution of the Works.

Areas where water is regularly or repetitively used for dust suppression purposes shall be laid to fall to specially constructed settlement tanks to permit sedimentation of particulate matter. After settlement, the water may be re-used for dust suppression and rinsing. The Contractor shall protect all watercourses, waterways, ditches, canals, drains, lakes and the likes from pollution as a result of the execution of the Works. All water and other liquid waste products arising on the Site shall be collected and disposed of at a location on or off the Site and in a manner that shall not cause nuisance or pollution.

The Contractor shall at all times ensure that all existing stream courses and drains within, and adjacent to, the Site are kept safe and free from any debris and any materials arising from the Works. The Contractor shall not discharge or deposit any matter arising from the execution of the Works into any water except with the permission of the Engineer and the regulatory authority concerned.

Work force camps shall have septic tank and soak away pits. Operational areas like POL storage areas / hot mix plant areas shall comply with local / state environmental regulations and safety procedures. Storage and handling areas shall be impervious and surrounded by an impervious lined drain to catch any accidental spills. Storm water shall be stored in lined holding tanks with oil, grease tapping facility prior to disposal in to nearby watercourses. The trappings and sludge of holding tanks shall be disposed off in accordance with the procedures approved by the local regulatory authority.

Clause 111.15 Equipment and Vehicles used for the Works

Equipment and vehicles deployed for the construction activities shall not be older than 5 years. Equipment used for road and bridge works shall be based on new technology and must not (NOT) generate noise and pollutants 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. Blasting, if any, shall be carried out using small charges.

Clause 111.16 Air Quality

The Contractor shall devise 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.

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 300 mm over the edges of the side and tail boards.

The Contractor shall monitor air-quality once every week 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_x, NO_x, HC and CO. Operational areas include work sites, haulage roads, hot mix plants, quarries, crushing plants, stock piles, borrow sites, spoil disposal sites and any other area used by the plant and equipment of the Contractor.

Clause 111.17 Noise Control

The Contractor shall consider noise as an environmental pollution 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 into 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 ear plugs, and shall be rotated every four hours.

Construction operations shall be limited to daytime hours only, particularly in the settlement areas. Night work shall not be allowed unless permission in writing by the Engineer.

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.

Clause 111.19 Construction Camps

The construction camps shall conform to the State and National building regulations as applicable. 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 habitans and to avoid contamination of river and canals from wastewater drainage. To prevent such contamination, wastewater generated at the camp sites shall be discharged into 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 through 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.

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, 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 as approved by 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 approved by the Engineer. Wastewater shall be disposed in to septic tanks and soak pits etc. The Contractor shall make arrangements to clean-up 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.

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 300 mm 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 450 mm thick impervious floor apron as per Clause 2503. Each successive 1.0 m layers shall be covered with 500 mm thick soil layer, and the area will be covered with 300 mm thick layer and planted.

Clause 111.21 Transport of Hazardous Materials

Transport of all 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.

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.

Clause 111.23 Measurement

Monitoring of Air / Water / Noise and Soil quality shall be paid as per numbers of samples tested.

For Compliance of all other 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 BoQs and full compensation for such compliance shall be deemed to be covered by them.”

Clause 112 ARRANGEMENT FOR TRAFFIC DURING CONSTRUCTION

Clause 112.1 General

Delete the last sentence and add the following:

“14 days before undertaking work which would involve any obstruction whatsoever to traffic, the Contractor shall submit, for the Engineer’s approval, a Traffic Safety and Management Plan.

The plan shall include:

- i. Details of the arrangements for passing traffic during construction, design of barricades, signs, markings, lights, flags etc conforming and satisfying the requirements of IRC: SP 55-2001;
- ii. Drawings for temporary diversions in accordance with Sub- Clause 112.3 if required;
- iii. Details of arrangements proposed to be in place after the cessation of work.

Special consideration shall be given in the preparation of the Traffic Safety and Management Plan for the safety of pedestrians, traffic works and delineation of the roadway at night.”

Clause 112.2 Replace second sentence as “The treatment of shoulder shall consist of 200 mm thick wet mix macadam base as per Clause 406 covered with 20 mm thick premix carpet and Type B sand seal coat as per Clauses 512 and Clause 513 in a width of at least 1.5 m and the surface shall be maintained throughout the period during which traffic uses the same to the satisfaction of the Engineer.”

Add at the end of second paragraph as follows

“Where it is absolutely necessary that the camber of the existing road is to be corrected before the commencement of the additional carriageway in order to avoid ponding of rain water, the same unidirectional camber has to be provided first.”

Clause 112.3 Passage of Traffic along a Temporary Diversion

Substitute the Clause as under:

Clause 112.3.2 “On completion on one side of carriageway, traffic shall be diverted to new carriageway in order to carry out the strengthening work on existing carriageway. Traffic shall be diverted through a temporary diversion to be constructed at the both ends of completed carriageway. Such diversion shall have minimum 20 m length along the length of the road stretch and shall be in full width of median. It shall have the following crust composition if its location does not match with the location of median opening:

- i. 300 mm thick subgrade in 7m width with earth of minimum CBR 5% as per Clause 305;
- ii. 200 mm thick granular sub base as per grading I of Table 400-1 of Clause 401;
- iii. 225 mm thick wet mix macadam as per Clause 406;
- iv. 20 mm thick premix carpet covered with Type B seal coat as per Clauses 512 and 513.

Clause 112.4 Traffic Safety and Control

Last line of fifth para shall be read as under:

“The signs shall be of approved design and of reflectory type.”

Clause 112.6 Measurements for Payment and Rate

Substitute the clause as follows:

- (a) “The provision of treated shoulder including construction of temporary cross drainage structures, if required, as described in Clause 112.2 including their

maintenance, dismantling and clearing debris, where necessary, shall be considered as incidental to the works and shall be Contractor's responsibility.

- (b) The Construction of temporary diversion including temporary cross drainage structures as described in Clauses 112.3.1 shall be measured in running metre and the work as per Clause 112.3.2 will be measured in sq.m. and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools etc), maintenance as per Clause 112.5, final dismantling, and disposal.
- (c) The Construction of temporary diversion for diverting traffic from one carriageway to another carriageway as described in Clause 112.3.2 shall be measured in square meter and the unit contract rate shall be inclusive of full compensation for construction (including supply of material, labour, tools etc), maintenance as per Clause 112.5, final dismantling, and disposal.
- (d) All traffic safety and control devices used during the construction as per Clause 112.4 including providing, erecting and maintaining barrier, signs, markings, flags, lights and providing flag man etc. shall be measured and paid in km. month."

Clause 114 SCOPE OF RATES FOR DIFFERENT ITEMS OF WORK

Clause 114.2 Item (ii) shall read as under:

"A detailed resources based construction programme including resource 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 programme 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.

The first issue of the detailed construction programme including the detailed description of the system and the procedures shall be submitted to the Engineer for approval not later than *15 days as per contract data (item 12) after the date of receipt of the letter of acceptance.*

The Contractor shall submit to the Engineer, for approval and consent, the updated and revised programme at every *30 days as (per contract data item 18)* interval or as directed by the Engineer. The updated and revised programme shall be submitted showing the actual progress achieved (physical and financial) and the effects of the progress achieved on the timing of the remaining work including any change to the sequence of the activities."

Add the following as item (xvii) of the Clause 114.2:

"Monthly progress reports in a format acceptable to the Engineer shall be submitted by 5th of every month. The reports shall state the progress which has been achieved during the preceding compared with the planned progress; illustrate delays in proportion to the progress planned, analyse the consequences and state planned corrective actions as well as remedial measures proposed."

Clause 114.4 Add the following as Clause 114. 4

"If any work executed by the Contractor does not meet the specifications, it shall be deemed as rejected. The Engineer, in his sole discretion, may consider a proposal by the Contractor to retain, an element or a part of the structure. The Contractor's proposal shall be supported by calculations, drawings and other data to prove the soundness of the proposal and shall clearly describe the additional measures required to ensure the intended performance of the structure. Rate and cost for rehabilitation of the structure

shall be settled mutually between the Engineer and the Contractor. In case of failure to arrive at an agreed rate and cost; the Engineer's decision regarding the rate and cost shall be final and binding."

Clause 115 METHODOLOGY AND SEQUENCE OF WORK

The Clause shall read as follows:

The Contractor shall submit a methods statement within 28 days after the date of letter of acceptance. The methods statement shall be submitted in two parts.

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 programme (refer to clause 114.2) 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, pre-stressing strands and bearings. 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, hot mix plant, aggregate processing plant etc;
- d) Details of facilities / approaches for transportation of men, equipment and materials like concrete for construction of pavements, foundations and substructure in river bed;
- 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 quality management system shall accompany the methods statement under Clause 105.3.

Special parts of the methods statement shall be submitted to the Engineer by the Contractor for each important item of work like construction of embankments and subgrade, pavements, pile foundations, concreting, pre-stressing, repair and rehabilitation of existing structures, concrete superstructure and for any other item as directed by the Engineer. These statements shall be submitted at least 28 days in advance of the commencement of the activity or item of work, unless otherwise stipulated in the Contract. These statements shall give information on:

- i. Details of personnel both for execution and quality control of the work;
- ii. Equipment deployment with details of number of units, capacity, standby arrangements;
- iii. Sequence of construction, details of temporary or enabling works like, diversions, cofferdams, formwork including specialized formwork for superstructure, details of borrow areas, method of construction of embankment and subgrade, pavements, piles, concreting procedures, details of proprietary processes and products (e.g. details of prestressing systems, proprietary piling systems, bearings, expansion joints 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 quality management system 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.

The following Clause shall be added:

Clause 115.1 Approval of Proprietary Product / Process / System

"Only proprietary products 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.
- 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 for these additional tests shall be borne by the Employer only in case the product satisfies the specifications."

Clause 120 Deleted

Clause 121 FIELD LABORATORY

Clause 121.2 Description

Substitute the words "shown in drawings" in first sentence of first para by "per provisions indicated in the Clause and at a location approved by the Engineer".

Replace "electric supply etc" in the second sentence of first para with words"

uninterrupted power supply etc.”

Delete the first sentence of second para and substitute the following:

“The floor space required for the field laboratory shall be not less than 500 sq. m.”

The fourth sentence of second para “The furnishings..... in Table 100-2” shall be read as under:

“A good semi furnished office accommodation shall be provided to the Materials Engineers of the Supervision Team as per the direction of the Engineer.”

Add as third para:

“There shall also be provided a concrete paved area, for storing samples adjacent to the laboratory, of about 300 sq.m. and another 200 sq.m. shall be suitably roofed with open sides giving protection against sun and rain.

Within 14 days of the Letter of Acceptance, the Contractor shall prepare and submit a layout plan and details of the laboratory building and submit the 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 60 days after the receipt of Letter of Acceptance, and the field laboratory with all equipment / instrument shall be to the entire satisfaction of the Engineer. During the 60 days period starting from the Letter of Acceptance, the laboratory tests shall be performed in another laboratory proposed by the Contractor and approved by the Engineer.”

Clause 121.3 Laboratory Equipment

This Clause shall read as under:

“The following items of laboratory equipment procured from reputed manufacturers duly approved by the Engineer shall be provided in the field laboratory. The equipment and instruments shall be new and shall be quality certified by Bureau of Indian Standards (BIS). It shall include but not be limited to the following:

A	General	
i.	Balance	
	a. 10 kg capacity semi-self indicating electronic type, Accuracy 1 gm	1 No
	b. 500 gm capacity semi-self indicating electronic type, Accuracy 0.01 gm	2 Nos
	c. Chemical balance (electronic) 100 gm capacity, Accuracy 0.0001 gm	1 No
	d. Triple Beam balance 25 kg capacity, Accuracy 1 gm	1 no.
	e. Pan balance 5 kg capacity, Accuracy 0.5 gm	3 Nos
	f. Platform scale 300 kg capacity	1 No
ii.	Ovens-electrically operated, thermostatically controlled (including thermometer), stainless steel interior	
	a. Temperature range ambient to 320°C, Sensitivity 5°C, capacity 300 Litre	1 No.
	b. Temperature range, ambient to 200°C, sensitivity 1°C, capacity 250 Litre.	1 No.
iii.	Sieves: as per IS :460-1962	
	a. Test sieve set 450 mm internal dia as per BIS of required sieve sizes complete with lid and pan	2 Set
	b. Test sieve set 200 mm internal dia (brass frame and steel / or brass wire cloth mesh) as per BIS of required sieve sizes complete with lid and pan.	2 Set
iv.	Sieve shaker capable of taking 200 mm dia and 450 mm dia sieves electrically operated with time switch assembly as per BIS	1 No.

v.	200 tonnes compression testing machine electric cum manually operated fitted with three gauges 0-2000 KN. x 10 KN, 0-1000 KN x 5 KN and 0-500 KN x 2 KN	1 No.
vi.	Stop watches 1 / 5 sec. accuracy	3 Nos.
vii.	Glassware comprising beakers, pipettes, dishes, measuring cylinders (50 to 1000cc capacity) glass rods and funnels, glass thermometers range 0° C to 100°C and metallic thermometers range 300° C.	1 Doz. each
viii.	Hot plates 200 mm dia (2000 watt.)	3 Nos
ix.	Enamel trays	
	a 600 mm x 450 mm x 50 mm	6 Nos
	b 450 mm x 300 mm x 40 mm	6 Nos
	c. 300 mm x 250 mm x 40 mm	4 Nos
	d. Circular plates of 250 mm dia	4 nos
x.	Spatula set	2 sets
xi.	Water testing kit	1 set
xii.	First aid box	1 set
xiii.	Digging tools (pixels, shovels, fork etc)	As reqd
xiv.	Miscellaneous tools (sledge hammer, lump hammer, wooden pegs etc)	As reqd
xv.	Maximum and Minimum Thermometer	2 Nos
B	For Soils and Aggregates	
i.	Liquid limit and plastic limit	
	a. Liquid limit device with Casagrande and grooving tools and as per IS - 2720	1 No
	b. Single point LL device	1 No
	c Moisture content cups of 50 ml and 30 ml capacity	150 No
	d. Ground glass plate with rounded edges 600 mm x 600 mm x 10 mm	2 Nos
ii.	Laboratories compaction	
	a Compaction apparatus (heavy) to the requirements of IS-10074-1982, complete with collar, base plate and 4.5kg rammer.	3 Nos
	.b Vibratory hammer to the requirements of Test 14 - BS	1 set
iii	Sand pouring cylinder (150 mm) with conical funnel and top and base late (with 152 mm dia of sand cone) to the requirements of ASTM D 1556	2 sets
iv.	Sampling tins with lids 100 mm dia x 75 mm ht. 0.5kg capacity and miscellaneous items like moisture, tins with lid etc	30 Nos
v.	Laboratory C.B.R. testing equipment to the requirements of IS, consisting following:	2 sets
	a. floor mounted electro-mechanical load frame 5 tonne capacity with automatic strain control	1 No
	b. CBR moulds complete with collar, base plate etc	18 Nos
	c. Swell stands for holding dial gauge	9 Nos
	d. CBR plunger with penetration dial gauge holder	1 Nos
	e. Surcharge weight with central hole of 2 kg weight	40 Nos
	f. Spacer disc with handle	2 Nos
	g. Perforated brass swell plate with adjustable cap on handle	18 Nos
	h. Soaking tank for accommodating 18 CBR moulds	1 No
	i. High tensile steel calibrated proving rings of 1000 kg. 2500 kg and 5000 kg capacity	1 set
	j. Dial gauge, 25 mm travel, 0.01 mm / division	12 Nos
	k. Tripod stands for holding dial gauge holder	18 Nos
	l. Aluminium Ties	
	50 mm x 30 mm	As reqd
	55 mm x 35 mm	As reqd
	70 mm x 45 mm	As reqd
	70 mm x 50 mm	As reqd
	80 mm x 50 mm	As reqd
vi.	Speedy moisture tester complete with carrying case and chemicals	2 Nos
vii.	Reagent grade Sodium Sulphate for soundness test of aggregate	30 kgs.

	to the requirements of AASHTO T- 104	
viii.	Flakiness auger (to BS 812)	1 No
ix.	Post-hole auger (to BS 812)	3 sets
x.	Core cutter apparatus with 10cm dia. and diamond cutting edge	2 sets
xi.	Flakiness and Elongation test gauge	2 sets
xii.	Standard measures of 30, 15, 3 litre capacity along with tamping rod	2 sets
xiii.	Unconfined compression test apparatus	1 set
xiv.	Water still, 3 litre / hr. with fittings and accessories	1 set
xv.	Aggregate Impact Test Apparatus as per IS 2386 (Part IV) 1963	1 No
xvi.	Los Angeles abrasion Test Apparatus as per IS 2386 (Part IV) 1963	1 No
C	For Bitumen and Bituminous Mixes	
i.	Constant temperature bath for accommodating bitumen test specimen, electrically operated, and thermostatically controlled, stainless steel interior, 50 litre capacity, temperature range ambient to 80° C	2 Nos
ii.	Bitumen Penetrometer automatic type, including adjustable weight arrangement, and needles to the requirements of AASHTO T -49	1 set
iii.	Centrifuge type motorized bitumen extraction apparatus to the requirements of AASHTO T164 with stock of solvent & filter paper	1 set
iv.	Bitumen laboratory mixer planetary action, 2 litre capacity, including required accessories electrically operated and fitted with heating jacket	1 No
v.	Marshall compaction apparatus to the requirements of AASHTO 245 as per ASTM 1559-62 T and complete with electrically operated automatic loading unit, compaction pedestal, heating unit, head breaking assembly, flow meter, load transfer bar, specimen moulds 100 mm dia with base plate. collars, specimen extractor, compaction hammer 4.53kg x 457 mm fall, (excluding constant temperature bath)	1 set
vi.	Dial type thermometer reading 0-200°C range, accuracy 2° C	As reqd
vii.	Digital reading thermometer for measuring temperature in Asphalt mixes	1 No
viii.	Thin Film Oven Test apparatus to the requirements of AASHTO T 179 including accessories	1 No
ix.	Ring and Ball Apparatus as per IS 1205-1978	1 set
x.	Asphalt Institute Vacuum Viscometer as per IS 1206 (Part-II)- 1978	1 set
xi.	Apparatus for Determination of Ductility test as per IS 1208-1978	1 set
xii.	Pen Sky-Martars closed tester for testing flash and fire point as per IS 1209-1978	1 set
xiii.	Apparatus for Float Test - IS 1210-1978	1 set
xiv.	Apparatus for Determination of water content (Dean and Shark Method) IS-1211-1978	1 set
xv.	Apparatus for Determination of Loss on heating IS-1212-1978	1 set
xvi.	Apparatus of Determination of specific Gravity IS-1202-1978	1set
	<i>Core cutting Machine</i>	2 Nos.
D	For Cement, Cement Concrete and Materials	
i.	Vicat needle apparatus for setting time with plungers, as per IS- 269-1968	1 set
ii.	Moulds	
	a. 150 mm x 300 mm ft Cylinder with capping component along with the capping set and compound as per IS	48 Nos
	b. Cube 150 mm , moulds and 100 mm (each Size) as per IS	36 Nos
iii.	High frequency mortar cube vibrator for cement testing	1 No
iv.	Concrete mixer power driven, 1 Cu. Ft. capacity	1 No
v.	Variable frequency and amplitude vibrating table size 1m x 1m, as per the relevant British Standard	1 No

vi.	Concrete permeability apparatus	1 No
vii.	Flakiness and Elongation index test apparatus	2 sets
viii.	Chloride testing kit for chemical analysis of chloride content	1 No
ix.	Flow table as per IS 712-1973	4 Nos
x.	Vibrating hammer as per BS specification	1 No
xi.	Equipment for slump test (C-143) / compacting factor Apparatus complete	4 Nos
xii.	Equipment for determination of specific gravity for fine and coarse aggregate as per IS 2386 (Part 3)1963	4 Nos
xiii.	Flexural attachment to compression testing machine	2 Nos
xiv.	Needle vibrator	4 Nos
xv.	Air entrainment meter ASTM C-231	1 No
xvi.	0.5 cft / 1.0 cft cylinder for checking bulk density of aggregate with tamping rod	2 Nos
xvii.	Soundness testing apparatus for cement	1 set
xviii.	Chemicals solutions and consumable	As reqd
xix.	ION Exchange kit for rapid determination of sulphate content	
xx.	Water still	1 No

All equipment shall conform to accepted international standards and shall be subject to the approval of the Engineer.

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.”

Clause 121.4 Ownership

This clause shall read as under:

“Land for the laboratory shall be provided by the Contractor.”

The field lab, building and equipment shall be property of contractor after completion of the contract.

Clause 121.5 Maintenance

This clause shall read as under:

“The contractor shall arrange to maintain the field laboratory including sample store yards in a satisfactory manner until the issue of Taking over Certificate for the whole work. Maintenance includes all activities described in Clause 120.4 and maintenance of equipment and running of the same including chemicals and consumables.”

Clause 121.6 Measurement for payment - Deleted

Clause 121.7 Rates

This clause shall read as under:

“The construction, supply, installation, maintenance, and operation including all expenses involved in connection thereto for the field laboratory shall be incidental to the work, and shall not be paid separately.”

Clause 122 Deleted.

Clause 123 PROVIDING AND MAINTAINING WIRELESS COMMUNICATION SYSTEM

Deleted.

SECTION 124 Deleted

SECTION 125 Deleted

SECTION 126 Deleted

SECTION 200 SITE CLEARANCE

Clause 201 CLEARING AND GRUBBING

Clause 201.1 Scope

Replace with following para:

“Clearing and grubbing shall be performed in advance of earthwork and 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 upto 150 mm , which in the opinion of the Engineer is unsuitable for incorporation in the work or can not be auctioned 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 the 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 and stumps and making the surface in proper grade by suitable equipment and compacted by power roller to the required compaction as per Clause 305.3.4. The work also includes handling, salvaging and disposal of cleared material.”

Clause 201.5 Measurements for Payment

The last sentence of first para shall read as “Removal of stumps and roots of trees less than 300 mm in girth left over after trees have been cut by any other agency shall be considered incidental to the work. The removal of stumps and roots of trees above 300 mm girth left over after trees have been cut by any other agency shall be paid in numbers according to their category of girth.”

Clause 201.6 Rates

Clause 201.6.1 Delete “as well as stumps left over after cutting of trees carried out by another agency” from the second sentence.

Clause 201.6.2 *Substitute the last few words namely “upto a lead of 1000m” with “leads”.*

Clause 201.6.4 Add new Clause

“The Contract unit rate for removal of stumps and roots of trees of girth above 300 mm left over after cutting of trees carried out by another agency shall include excavation and back filling to required density, where necessary, and compaction, handling, salvaging, piling and disposing of the cleared materials with all lifts and leads.”

Clause 202 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES / PAVEMENTS

Clause 202.3 Dismantling Pavements and Other Structures

Add at the end of first para as follows:

“Existing bituminous layer in the specified width shall be removed as per Clause 501.8.3.2 if there is no need to remove granular layers.”

Clause 202.5 Disposal of Materials

The first para shall be read as:

“All materials obtained from dismantling / milling shall be the property of the Contractor The Contractor shall be free to use this material in work as indicated below, or may sell / dispose the material as deemed fit by him except existing pavement crust which shall be reused:

The Contractor shall be free to use dismantled / milled material, either as is where is basis or, by suitably modifying the material or, by crushing the material or, by breaking the material and screening the same, provided it meets the specifications and is approved by the Engineer.”

Clause 202.6 Measurements for Payment

This Clause shall be read as:

“The work on dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable:

- | | | |
|--------|--|-----------------------|
| (i) | Dismantling brick / stone masonry / concrete (plain / reinforced) |cum |
| (ii) | Dismantling pavement structures such as Sub bases / Bases, bituminous courses, concrete wearing course |cum |
| (iii) | Dismantling pipes, guard rails, road kerbs |running
metre |
| (iv) | Dismantling guard stones / km stones / sign posts / hectometre stones |each |
| (v) | Dismantling RCC railing |running
metre |
| (vi) | Dismantling angle type expansion joint of bridges |running
metre |
| (vii) | Dismantling of railing kerb |running
metre |
| (viii) | Dismantling of concrete edge strip without damaging existing structure |running
metre |
| (ix) | Dismantling of drainage spouts including cleaning entire area, enclosure of metallic bearing |each |
| (x) | Dismantling of stone pitching / boulder apron / brick soling / stone soling |cum |
| (xi) | Dismantling of telephone and electric poles including their foundation |each |

Clause 202.7 Rates

Add at the end of this Clause:

“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 material within all lead and lifts.”

SECTION 300 EARTHWORK, EROSION CONTROL AND DRAINAGE

Clause 301 EXCAVATION FOR ROADWAY AND DRAINS

Clause 301.1 Scope

Insert the following between the words “roadway” and “side drains” in the second line:

“road shoulders, verge, medians, channel training at culvert / bridges”.

Clause 301.2.1 Classification

Add para (f) as under:

“Hard Rock (controlled blasting)

Hard rock requiring blasting as described under (c) but where full scale blasting is prohibited for any reason and excavation has to be carried out by less quantity of explosive placed at pre-determined critical locations so that maximum returns can be had.”

Clause 301.3.3 Excavation- General

Delete the last two sentences of fifth para “If trees were..... to the work” .

Add the following paragraph at the end:

“Temporary supports to the sides of excavation, necessary to support the foundation of adjoining structures and to prevent any ground movement shall be provided by the contractor. Where temporary supports are provided, these shall be designed and removed so that no ground movement occurs on removal. The contractor shall submit his proposal in this respect to the Engineer for approval prior to the commencement of excavation.”

Clause 301.3.5 Rock Excavation

The first sentence of first para shall read “rock, when encountered in road excavation, shall be removed upto 100 mm below the base of WMM.”

Clause 301.3.7 Excavation of road shoulders / verge / medians for widening of pavement or providing treated shoulders

The title of this Clause shall read as under:

“Excavation of road shoulders / verge / medians for widening of pavement or providing treated / paved shoulders and medians”

Add at the end of para as follows:

“If there are chances of damage to the existing pavement due to involvement of excessive cutting, the Contractor shall take adequate safety measure to safeguard the crust of existing pavement and may provide dry stone wall caged in GI wire of adequate strength after getting concurrence from the Engineer. This work shall be considered incidental to the Work and no extra payment shall be made.”

Clause 301.3.11 Disposal of excavated materials

Begin the first para with words “Except in areas where the excavated material shall be pushed down to valley within 100 m lead,” before the sentence “All.....”.

Add at the end of first para ”If directed the suitable excavated material can be used beyond 1000 m lead with payment on actual haulage as per Clause 301.9.6. In mountainous terrain, excavated material shall be pushed down to the valley to make working space. However, if it is required to push the excavated material beyond 100m lead, the same may be resorted after prior permission of the Engineer but with no extra payment on account of additional lead.”

Clause 301.6 Preparation of Cut Formation

Second para shall be read as under:

“In rocky formation, the rock shall be cut 100 mm below the specified elevation of base of WMM and the surface irregularities shall be corrected. The gap between rock cut and base of WMM shall be filled with 100 mm thick granular sub base as per grading I of Table 400-1 of Clause 401. The unsuitable material shall be disposed of in accordance with Clause 301.3.11.”

Clause 301.8 Measurement for Payment

First para shall read as follows:

“Excavation for roadway and side drains shall be measured by taking cross section at suitable intervals on completion of clearing and grubbing and before the commencement of earthwork and after its completion and computing volumes in cu.m by the method of average end areas for each class of material encountered.”

Fourth para shall read as follows:

“Work involved in excavation for roadway and drains shall be measured in unit indicated below:

- (i) Excavation in all classes of soil in non-mountainous terraincum
- (ii) Excavation in ordinary rock in non-mountainous terraincum
- (iii) Excavation in hard rock with blastingcum
- (iv) Excavation in hard rock without blastingcum
- (v) Excavation in hard rock with Controlled blastingcum
- (vi) Preparation of rocky sub gradesq.m.
- (vii) Stripping, storing and reapplication of top soilcum
- (viii) Disposal of surplus material beyond initial 1000m lead
 - Beyond initial lead but upto 5 kmcum
 - 5 km- 10 km cum
 - beyond 10 km

Clause 304 EXCAVATION FOR STRUCTURES

Clause 304.3.2 Excavation

At the end of first para add the following:

“The Contractor shall ensure the stability and structural integrity of adjacent existing foundations and structures and if necessary shall, at his own expenses, install temporary or permanent sheet piles, coffer dams, shoring or similar support or protection to the satisfaction of the Engineer.”

Clause 304.3.4 Preparation of Foundation

In second and third paras, substitute “concrete M15” in place of “1:3:6 nominal mix”

Clause 304.3.7 Backfilling

Delete the word “Mechanical tamper” in seventh line and substitute it with “Roller / or plate vibrator”.

Clause 304.4 Measurement for Payment

In the second sentence of first para after the words”.... Cutting of slopes,” insert the words “protection / support of existing structures,”.

Clause 305 EMBANKMENT CONSTRUCTION

Clause 305.2 Materials and General Requirements

Clause 305.2.1 Physical Requirements

Clause 305.2.1.2 Add the following after the second para:

“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 soils. The location and the extent of these soils with medium to high swelling potential shall be defined as instructed by the Engineer.”

Clause 305.2.1.4 Delete second sentence “However, the Engineer.....requirements of these specifications”.

Clause 305.2.2.2 Borrow materials

First para of this Clause shall be read as under:

“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 meeting the prescribed specifications 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 Forest, Government of India and the local bodies, as applicable shall be the sole responsibility of the Contractor.”

After seventh para substitute the Table 300-2 as under:

Compaction Requirements of Embankment and Subgrade

Sr. No	Type of Work / Material	Relative compaction as %age of maximum laboratory dry density as per IS:2720 (Part 8)
1	Subgrade and earthen shoulders	Not less than 97%
2	Embankment	
	a) upto 6m height b) exceeding 6m height	Not less than 95 Not less than 97
3	Expansive clays	Such material is not allowed
4	Median and verge (below agriculture soil)	Not less than 95

Para 8 given below the Table 300-2 shall read as under:

“The Contractor shall at least 21 working days before commencement of construction of embankment and the subgrade, submit the following to the Engineer for approval:

- i. Values of maximum dry density and optimum moisture content obtained in accordance with IS:2720 (Part 8) for each fill material proposed to be used in the construction of embankment and subgrade;

- ii. Graphs of Density versus moisture content through which values of maximum dry density and optimum content determined and given in (i) above;
- iii. Dry density-moisture content-CBR relationships based on heavy compactive efforts conforming to IS: 2770 (Part 8) for each fill material proposed to be used in the subgrade.

The compaction shall be carried out on approved dry density-moisture relationship.”

Clause 305.3 Construction Operations

Clause 305.3.4 Compacting ground supporting embankment / subgrade

Add the following sentence at the end of second para:

“Backfilling layers in pits, trenches and below the original ground shall 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 line of the proposed additional carriageway at a depth between 0.5 m to 1.0 m. Samples of natural ground collected at each location, and tested in accordance with IS:2720 (Part 8). The relative density (i.e. 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.”

Clause 305.3.5.1 Replace the first sentence as follows:

“The embankment and subgrade material shall be spread in layers of uniform thickness, provided demonstrated successfully and approved by the Engineer, not exceeding 250 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per clause 305.3.6.”

Clause 305.3.5.2 *In third para delete the words “IS: 2720 (Part 7) or and “as the case may be” in fifth and sixth line.*

Clause 305.3.6 Compaction

The second para shall read as under:

“Vibratory roller of not less than 8-10 tonne static weight with plain or pad foot drum or pneumatic tyre roller of 15-20 tonne weight having tyre pressure of at least 7 kg / sq cm shall be used for compaction.”

Insert the following sentence before the last sentence of fifth para:

“The co-relation between sand replacement densities and nuclear gauge densities shall be used *on trials* with minimum 30 coherent density measurements.”

Clause 305.4.1 Earthwork for widening existing road embankment

First sentence of second para shall read as “Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of small vibratory roller or any other equipment approved by the Engineer.”

Clause 305.4.3 Earthwork over existing road surface

Substitute the Clause 305.4.3 (i) by the following:

“If the existing road surface lies within 1.0 m of the new subgrade level, the bituminous course of existing road crust shall be removed in its full depth so as to provide ample bond and sound internal drainage.”

Clause 305.4.4 Embankment and Sub-grade around structures

First sentence of fifth para shall read as "Where it may be impracticable to use conventional rollers, compaction shall be carried out with the help of small vibratory roller or any other equipment approved by the Engineer."

Clause 305.8 Measurement for Payment

First para shall read as follows:

"Earth embankment / subgrade construction shall be measured by taking cross section at suitable intervals on completion of clearing and grubbing and before the commencement of earthwork and after its completion and computing volumes in cu.m by the method of average end areas."

Clause 305.9 Rates

Clause 305.9.1 Add "including removal of top soil" after word "material" appearing in first line of item (v)

Clause 306 SOIL EROSION AND SEDIMENTATION CONTROL - Deleted

Clause 307 TURFING WITH SODS - Deleted

Clause 309 SURFACE / SUB-SURFACE DRAINS

Clause 309.2 Surface Drains

Add the following after end of the fourth para:

"In urban section, inspection chambers as shown in drawings shall be constructed at the start, junctions and at the point of change in grade. In case of covered drain where it meets a slab or box culvert en-route, meeting arrangement shall be designed so as to avoid any water leakage.

Filling in median shall be leveled so as to drain out the water through median drain without causing any siltation in drain or erosion in median fill.

Catch pits shall be provided at the meeting point of - (a) two different types of drains, (b) culvert and drain and (c) bridge and drain."

Clause 309.4 Measurement for Payment

This Clause shall read as follows:

"Construction of drains shall be measured as finished work in position as below:

- (a) Excavation in unlined ditch drainas per Clause 301
- (b) Open cross chute drain as shown in drawingrunning metre
with PCC M 20, levelling concrete M15
- (c) Paved open / covered drain
Levelling concrete M 15 gradecu.m
Coursed rubble masonry in cement mortarcu.m
1:3
PCC / RCC M 20 grade (excludingcu.m
reinforcement)
HYSD Reinforcementtonne
RCC Gratingnos
Precast RCC slab in M 20 gradecu.m
- (d) Inspection chambers including MS grating,nos
drainage pipes
- (e) Catch pitsnos

Clause 309.5 Rates

This Clause shall read as under:

"The Contract unit rate for surface drains shall be payment in full for all items such as excavation, dressing the sides and bottom; providing lining, turfing, pitching, masonry,

concrete providing, laying and jointing pipes; providing, laying and compacting backfill and bed of granular material; providing and fixing cover including full compensation for all materials, labour, tools, equipment and other incidentals to complete the work as shown on drawing with all leads and lifts. The levelling and sloping of road side land, provision of inlets, gratings, outlet pipes, bedding etc. wherever required shall be incidental to construction of drain.”

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

Clause 401 GRANULAR SUB BASE

Clause 401.2 Materials

Clause 401.2.1 First para of this Clause shall read as under:

“The material to be used for the work shall be a mix consisting of crushed stone aggregate, natural sand, gravel in the required proportion depending upon the grading of each fraction so as to result in the mix grading confirming to *Grading I* given in Table 400-1. The mix shall be prepared mechanically under control conditions. Use of moorum for GSB, either alone or in combination with other type of material, shall NOT be allowed. The material shall be free from organic or other deleterious constituents.”

Substitute second para by the following:

“Where the layer is intended to serve as a drainage layer in addition to being a part of the structural pavement the material must satisfy drainage criteria and for such requirement material passing sieve 2.36 mm and down shall be as per Table 400-1 A. In addition, the portion of 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).”

Table 400-1A

IS Sieve Designation	Percent by weight passing the IS sieve
	Grading -I
2.36 mm	10-15
0.85 mm	4-10
0.425 mm	Less than 3

Clause 401.2.2 Physical Requirements

Add at the end of this Clause as under:

“The Contractor shall, at least 21 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 commence only upon the Engineer’s approval of the material.”

Clause 401.4.1 Preparation of subgrade

Add after the first paragraph

“The existing pavement, where it is to be overlaid by a granular base and embankment as per Clause 305.4.3 shall be scarified as per clause 501.8.3.2 or as directed by the Engineer. Where the existing pavement contains multiple bituminous layers the scarification shall be to the underside of the lowest bituminous layer. General areas within the Works where multiple bituminous layers exist will be advised by the Engineer.

After scarification and removal of the bitumen surface from the existing pavement to be overlaid to the satisfaction of the Engineer, the existing pavement shall be lightly sprinkled with water if necessary and rolled with three passes of an 80-100kN smooth wheeled roller. The existing pavement shall then be proof rolled with an 8 tonne single drum vibrating roller in the presence of the Engineer who shall determine the suitability

of the existing pavement for overlay.

Alter proof rolling, the surface of the existing pavement shall be lightly “tyred” as directed by the Engineer where the overlay includes a sub-base layer but the compacted depth of the sub-base layer is less than 75 mm. In other cases “tyring” is not necessary.”

Clause 406 WET MIX MACADAM SUB-BASE / BASE

Clause 406.2.1.1 Physical Requirements

Add at the end of first para as under:

“The fraction of materials passing through 4.75 mm sieve shall be crusher run screening only. The river sand or quarry sand shall not be permitted either as such or mixed with crusher-run-screening in the Wet Mix Macadam. Use of moorum in any form is disallowed. Contractor shall obtain Engineer’s approval for the Job Mix Formula (JMF) for WMM mix before laying. If the source of materials changes, each time separate JMF approval shall be required.”

Delete the second sentence beginning with “If crushed gravel.....” and ending with “.....fractured faces” and add as under:

“The constituents of the aggregates shall be produced by integrated crushing and screening plant (impact or cone type crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages.”

Add the following at the end of the last para:

“Soundness test shall be carried out in accordance with IS: 2386 (Para 5) 1963. The average loss of weight of coarse aggregate after 5 cycles shall not exceed 12% when tested with sodium sulphate and 18% when tested with magnesium sulphate as specified in IS: 383-1970.”

Clause 406.3.3 Preparation of Mix

The first para shall be read as follows:

“Wet mix macadam shall be prepared in an approved Wet Mix Macadam mixing plant of 200 ton / hr capacity having provision for controlled addition of water and forced / positive mixing arrangement.”

Clause 406.3.4 Spreading of Mix

Replace the second para as follows:

“The mix shall be spread by a WMM paver finisher preferably in full width of the pavement including hard shoulder. The provision of string line arrangement duly supported on steel pegs installed at 5 metre centre to centre shall be made by the Contractor during laying of WMM layer with sensor fitted paver finisher to obtain guiding signals for maintaining levels, lines, grades etc. The laying in two operations to cover full width with Paver Finisher shall be allowed only if segregation of WMM along longitudinal joint does not take place. For portions where paver finisher can not be used, motor grader may be permitted subject to approval of the Engineer.”

Clause 406.3.5 Compaction

Delete second sentence of first para.

Clause 406.4 Opening to Traffic

The Clause shall be read as follows:

“No vehicular traffic of any kind shall be allowed on the finished WMM surface.”

Clause 409.2 Materials

Part (a) shall read as under:

“Cast-in-situ reinforced cement concrete of Grade M20 as per Section 1700 of the

Specifications wherever covered drain shall be constructed below.”

In part (b) delete the word “tile” wherever appears.

Part (c) shall be deleted.

Clause 409.3 Construction Operations

Clause 409.3.1 The para shall read as under:

“Base and walls of covered drain below footpath and separator shall be first constructed. Connection with inlets and outlets through inspection chambers or drainage pipes or gratings or catch basins shall be established as provisions in drawings or as directed by the Engineer.”

Clause 409.3.3 Add at the end of this Clause “Over walls of covered drain cast-in-situ or precast RCC slab as directed by the Engineer shall be placed.”

Clause 409.4 Measurement for Payment

This Clause shall be read as under:

“Except in case where slab over covered drain is treated as footpath, footpath and separator shall be measured in square meter inside of kerb.”

Clause 409.5 Rates

Substitute second sentence with “Cost of providing cement concrete (plain / RCC) in covered drain shall be paid in respective items of BoQ.”

SECTION 500 BASE AND SURFACE COURSES (BITUMINOUS)

Clause 501 GENERAL REQUIREMENTS FOR BITUMINOUS PAVEMENT LAYERS

Clause 501.2 Materials

Clause 501.2.2 Delete “crushed gravel or other hard material” from second line of first para. Third para is deleted.

Clause 501.3 Mixing

In third and fourth lines of first para, replace the word “adequate capacity” with “Hot mix plant of batch type with minimum capacity of 120 ton per hour”.

Clause 501.5.3 Spreading

Replace first para as under:

“Bituminous mix shall be spread with paver fitted with electronic sensing device and string line arrangement (supported by steel pegs @ 5m apart) on either side of paving width for automatic levelling, surface evenness and profile control. Use of string lines is compulsory to provide signal to electronic sensing device fitted with a paver finisher.”

Clause 501.6 Compaction

Substitute the sentence in second para beginning with “the intermediate rolling.....” with “Intermediate rolling shall be done with a pneumatic roller of 150-200 KN weight having tyre pressure of at least 0.7 Mpa.

Add new seventh para as under:

“Rolling shall be continued till the density achieved, satisfied the requirement of Clause 903.4.2.”

Clause 507 DENSE GRADED BITUMINOUS MACADAM

Clause 507.2.1 Bitumen

Delete words "indicated in Table 500-10" and insert "grade of S 65 in third and fourth lines.

Add the following sentence at the end of the Clause:
"The wax content in bitumen shall not exceed 4.5%".

Clause 507.2.2 Coarse Aggregates

Delete the words "crushed gravel or other hard material" from the first sentence of first para.

Substitute second para with the following:
"The constituents of the aggregates shall be produced by integrated crushing and screening plant (impact or cone type crusher of capacity 200 ton / hr) and, unless otherwise instructed by the Engineer, crushing shall be carried out in at least two stages."

Clause 507.2.4 *The first sentence shall read as "Filler shall consist of finely divided hydrated lime or cement as approved by the Engineer".*

Clause 507.2.5 Aggregate Grading and Binder Content

In Table 500-10, the following shall be substituted:

Grading	1	2
Layer Thickness	75 mm to 100 mm	50 mm to 75 mm
Bitumen Content % by mass of total mix ²	Min 4.0	Min 4.5
Bitumen Grade (pen)	S65	S65

The note-1 below Table 500-10 shall read as:
"The grading of the aggregates mix as used in work shall be a smooth curve within and approximately parallel to the envelope in Table 500-10."

Clause 507.3.3 Insert the following para between paras 3 & 4

Mix design shall be carried out in accordance with modified Marshall Method described in Asphalt Institute Manual MS-2.

Clause 507.4.8 Spreading

Following sentence shall be added to this clause:
"Temperature of mix at the time of preparation, transportation, laying and compaction as per table 500-5.."

Clause 507.9 Rate

Add the words "except for items of prime coat and tack coat" after the words "required operations" in second line of first para the second sentence in the first para the bitumen content shall we modified to 4.5 percent instead of 4.25 percent.

Clause 509 BITUMINOUS CONCRETE

Clause 509.2.1 Bitumen

This Clause shall read as under:
"The bitumen shall be paving bitumen penetration grade S 65 complying with IS:73. The wax content in bitumen shall not exceed 4.5%".

Clause 509.2.12 Coarse aggregates

The Stone polishing Value as measured by BS: 812 (Part 114) shall not be less than 55. The aggregates shall satisfy the physical requirements as given in Table 500-8 except that the maximum value for the water absorption should be 1per cent

Clause 509.2.5 Aggregate Grading and Binder Content

Aggregates gradation : The mineral aggregates, including mineral filler shall be so graded or combined as to conform to the grading set forth in Table 500-23.

TABLE 500-23. AGGREGATES GRADATION FOR BITUMINOUS CONCRETE

IS Sieve Designation	Per cent passing the sieve by weight
26.5 mm	100
19 mm	90- 100
9.5 mm	56 -80
4.75 mm	35-65
2.36 mm	23-49
300 micron	5-19
75 micron	2-8

Clause 509.3 Mixture Design

Requirement of mix: Apart from conformity with the grading and quality requirements of individual ingredients, the mix shall meet the requirements set forth in Table 500-24. TABLE 500.24.

REQUIREMENTS OF BITUMINOUS CONCRETE MIX

Description	Requirements
Marshall stability (ASTM Designation: D-1559) determined on Marshall specimens Minimum compacted by 75 compaction blows on each end	820 kg (1800 lb) Minimum
Marshall flow (mm)	2-4
Per cent air voids in mix	3-5
Per cent voids in mineral aggregate (VMA)	Minimum 11-13 per cent
Per cent voids in mineral aggregates filled by bitumen (VFB)	65-75
Binder content, per cent by weight of total mix	Minimum 4.5
Water Sensitivity (ASTM D1075) Loss of stability on immersion in water at 60°C	Mm. 75 per cent retained strength
Swell Test (Asphalt Instt, MS-2, No, 2)	1.5 per cent Max,

Binder content: The binder content shall be so fixed as to achieve the requirements of the mix set forth in Table 500-24. Marshall method for arriving at the binder content shall be adopted.

Clause 509.4.7 Spreading

Following sentence shall be added to this clause:
"Temperature of mix at the time of preparation, transportation, laying and compaction shall be as per Table 500-5".

Clause 509.9 Rate

Add the words "Excluding for item of tack coat, after the words cl.507.9"

SECTION 800 TRAFFIC SIGNS, MARKINGS & OTHER ROAD APPURTENANCES

CLAUSE 801 TRAFFIC SIGNS

Clause 801.1 General

Clause 801.1.2 This Clause shall read as follows:

"The signs shall be reflectorised. They shall be retro-reflectorised type and made of encapsulated lens type reflective sheeting vide Clause 801.3, fixed over aluminium sheeting as per these specifications."

Clause 801.2.6 This clause shall read as under

"The aluminium sheet used for signs shall be 2.0 mm thick."

Clause 801.3 Traffic Signs Having Retro-reflective Sheetings

Clause 801.3.1 General Requirements

The fifth sentence of this clause should read as under

"The reflective sheeting shall be of High Intensity grade with encapsulated lens."

Delete last sentence of this clause.

Clause 801.3.3 Engineering Grade Sheeting

Delete this clause.

Clause 801.3.6 This Clause shall read as under:

"Cut-out messages and borders, wherever used, shall be made out of retro-reflective sheeting as per Clause 801.3.2, except those in black which shall be of non-reflective sheeting."

Clause 801.3.7 Add following in the Clause:

"All the facility information and place identification signs shall have blue (Indian standard colour No. 166: French Blue) background and white letters."

Clause 801.3.11 Warranty and Durability

The first and second sentences of this clause shall read as under:

"The Contractor shall obtain from the manufacturer a seven-year warranty for satisfactory field performance including stipulated retro-reflectance of the retro reflective sheeting of high intensity grade and submit the same to the Engineer. In addition, a seven year warranty for satisfactory in-field performance of the finished sign with retro-reflective sheeting of high intensity grade, inclusive of the screen printed or cut-out letters / legends and their bonding to the retro-reflective sheeting shall be obtained from the Contractor / Supplier and passed on to the Engineer."

Clause 801.4.1 The third and fourth sentences of the Clause shall read as follows:

“Sign posts shall be of MS angle ISA 75 mm x 75 mm x 6 mm. Back frame shall be MS ISA 35 mm x 35 mm x 3 mm. Post shall be embedded in concrete M-15 grade as shown in drawings for safeguard against theft. The cost of sign post and its foundation complete including excavation and concrete shall be deemed to be included in the rate of signboard.”

Clause 801.4.2 Add following at the end of this Clause:

“The back side of signboard shall be painted with two coats of grey colour epoxy paint. The sign post shall be painted in black & white alternate bands with two coats of epoxy paint.”

Clause 801.5 Measurement for Payment

This clause shall read as:

“The measurement of cautionary, mandatory information, route marker, chevron and direction & place identification sign shall be in numbers.”

CLAUSE 803 ROAD MARKINGS

Clause 803.2 Materials

This clause shall read as under:

“Road markings shall be hot applied thermoplastic compound and the material shall meet the requirements as specified in Clause 803.4.

The road markings shall be laid in one layer with appropriate road marking machine approved by the Engineer. Before the road-marking machine is used on the permanent works, the satisfactory working of machine shall be demonstrated on a suitable site, which is not part of the permanent works. The rate of application shall be checked and adjusted as necessary before application on a large scale is commenced, and thereafter daily.”

Clause 803.3 Ordinary Road Marking Paint

This Clause shall be deleted.

Clause 803.5 Reflectorized Paint

This Clause shall be deleted.

Clause 803.6 Application

Add the following Sub-Clause at the end of this Clause:

Clause 803.6.6 Tolerances

i. General

Road traffic markings shall be constructed to accuracy within the tolerances given below:

- The width of lines and other markings shall not deviate from the specified width by more than 5%.
- The position of lines, letters, figures arrows and other markings shall not deviate from the true position specified by more than 20 mm.
- The alignment of any edge of a longitudinal line shall not deviate from the true alignment by more than 10 mm in 15 m.

- The length of segments of broken longitudinal lines shall not deviate from the specified length by more than 150 mm.

In broken lines, the length of segments and the gap between segments shall be as indicated on the drawings. If these lengths are altered by the Engineer, the ratio of the lengths of the painted sections shall remain the same.

Line and curves, whether broken or unbroken, shall not consist of chords but shall not follow the correct radius.

ii. Faulty Workmanship or Materials

If any material not complying with the requirements is delivered at the Site or used in the Works, or if any sub-standard work is carried out, such material or work shall be removed, replaced or repaired as required by the Engineer, at the Contractor's own cost. Rejected traffic markings and paint that has been splashed or has dripped onto the surfacing, kerbs structures or other such surfaces shall be removed by the Contractor at his own cost, in such a way that the markings of split paint will not show up again later."

CLAUSE 804 HECTOMETRE / KILOMETRE STONES

Clause 804.3 The first sentence of this Clause shall read as under:

"The hectometre / kilometre stones shall be made of concrete of grade as shown in the drawing."

Clause 804.5 Rate

Add at the end of the Clause "The cost of foundation as shown in the drawings including necessary excavation and concreting shall be incidental to the work and no extra payment shall be made."

CLAUSE 805 ROAD DELINEATORS

Clause 805.2 This clause shall read as follows:

- Triangular Object Marker shall be 300 mm side with three red reflectors, made out of 2 mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type as per clause 801. The background border symbols shall be made by screen printing of desired colour as per sign details. The sign plate shall be fixed with 6 mm dia. aluminum rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 35 mm x 35 mm x 3 mm. The sign shall be fixed with nut-bolts and welding on MS angle ISA 40 mm x 40 mm x 5 mm and 500 mm high.
- Rectangular hazard marker 900 mm x 300 mm made out of 2 mm thick aluminum sheet, face to be fully covered by high intensity grade white retro reflective sheeting of encapsulated lens type. The background border symbols shall be made by screen printing of desired colour as per sign details. The sign plate shall be fixed with 6 mm dia aluminum rivets on MS angle iron frame. The angle iron frame shall be made with angle of size 35 mm x 35 mm x 3 mm. The sign shall be fixed with nut-bolts and welding on MS angle ISA 40 mm x 40 mm x 5 mm and 150 mm high.
- Roadway Indicators shall be 1000 mm high made with 100 mm rectangular aluminum die cast pipe. One reflector of high intensity grade retro reflective sheeting with encapsulated lens shall be provided on top of the reflector. The white & red reflector shall be provided alternatively of 40 mm width, so that total width of reflector shall be 120 mm. A wire mesh cover of 150 mm height shall be provided on top.
- All components of signs & supports shall be thoroughly descaled, cleaned, primed and painted with two coats of epoxy paint. The sign back side shall be with grey

colour and post shall be white colour / alternate white & black bands. The post below ground shall be painted with three coats of red lead

Clause 805.4 Rate

Add at the end of the Clause "The cost of foundation as shown in the drawings including necessary excavation, drilling and concreting if any shall be incidental to the work and no extra payment shall be made."

CLAUSE 806 BOUNDARY STONES

Clause 806.1 General

Add at the end of first para "The boundary stones shall be of concrete as shown in drawing."

Clause 806.3 Rate

Add at the end of the Clause "The cost of foundation as shown in the drawings including necessary excavation and concreting shall be incidental to the work and no extra payment shall be made."

SECTION 900 QUALITY CONTROL FOR ROAD WORKS

Clause 901 GENERAL

Clause 901.1 This Clause shall read as under:

"All materials to be used, all methods adopted and all works performed shall be strictly in accordance with the requirements of these specifications. The Contractor shall set up a field laboratory at locations approved by the Engineer and equip the same with equipment as per Clause 121 and adequate personnel in order to carry out all required tests and quality control works as per specifications and / or as per Clause 121 and / or as directed by the Engineer. The list of laboratory equipment and the facilities to be provided shall be as per Clause 121 and shall be got approved from the Engineer in advance."

Clause 901.1 This Clause shall read as under:

"The contractor shall provide necessary cooperation and assistance in obtaining the samples for tests and carrying out the field tests as required by the Engineer from time to time. This may include provision of laboratory, equipment, transport, consumables, personnel, including labour, attendants, assistance in packing and dispatching and any other assistance considered necessary in connection with the tests."

Clause 901.5 *Add the words "laboratory, transport, consumable, personnel" before the word labour in the fourth sentence."*

Clause 903.4 Tests on Bituminous Construction

Clause 903.4.1 Add at the end of this Clause:

"The density test shall be carried out by 150 mm diameter core cutter machine on dense bituminous macadam and bituminous concrete as per the frequency specified. The Contractor shall arrange the core extraction machine at his cost and shall take cores of the executed bituminous works jointly with Engineer without any extra cost."

In Table 900-4, Serial No.6 for Dense bituminous macadam and bituminous concrete, modify the frequency (minimum) values for item No. (vii), (ix) and (xvii) as under:

Add new Clause 903.4.3 after the Clause 903.4.2

“Bituminous concrete wearing course shall be tested immediately after laying / finishing for riding quality by measuring roughness of the finished layer by duly calibrated Towed Fifth Wheel Bump Integrator.”

Sr. No.	Type of Construction	Test	Frequency (minimum)
6	Dense bituminous macadam / semi dense bituminous macadam / bituminous concrete	(vii) Sand equivalent test	Three tests on aggregates for each 400 ton of mix subject to two tests per plant per day
		(ix) Polished stone value	Initially one set of three representative specimens for each source supply. Subsequently when warranted by changes in the quality of aggregates
		(xvii) Density of compacted layer	One test per 500m ² subject to the condition that 10% of density tests shall be done within 300 mm from the edges

Add the following note at the end of Table 900-4:

Note:

- (a) The laboratory and field test shall be performed on materials and works at the frequency values indicated against each. The supervision Personnel shall ensure that there are no deviations in this regard.
- (b) The Contractor shall prepare a detailed manual for Quality Assurance including the methodology for the respective tests, the data formats and the methodology for the analysis and interpretation of test results based on the reference standards and practices indicated in the specifications and obtain the approval of the Engineer.
- (c) Daily, weekly and monthly reports on the testing done, results obtained thereof must be prepared indicating the location of sampling and testing., deviations from the acceptance norms for materials and works and actions taken in respect of removal of defective works must be prepared by the Contractor and authenticated by the Supervision Personnel that these tests were done in their presence and that the testing has been carried out as per the prescribed methodology.

Clause 903.5.2.4 Summary of control tests

In Table 900-6, item 5(i) “strength of concrete”, change test frequently to:
 “On each day’s work, at least six pairs of beams and six pairs of cubes for total daily production less than 300 cu.m . Two additional beams and two additional cubes for each 1000 cu.m in excess of 300 cu.m.”

SECTION 1000 MATERIALS FOR STRUCTURES

Clause 1002 SOURCES OF MATERIALS

This Clause shall read as follows:

“The Contractor shall identify the source of materials like coarse aggregate and sand notify the Engineer regarding the proposed sources prior to delivery.

Samples of materials from the source, 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 provide acceptable material from new sources other than the previous source at his own expenses conforming to specifications.

The 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 materials 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 provide new sources of acceptable material conforming to specifications from other sources at his own expense.

Clause 1006 CEMENT

Cement to be used in the works shall be any of the following types with the prior approval of the Engineer:

- a) Ordinary Portland Cement, 33 Grade, conforming to IS:269.
- b) Rapid Hardening Portland Cement, conforming to IS: 8041.
- c) Ordinary Portland Cement, 43 Grade, conforming to IS:8112
- d) Ordinary Portland Cement, 53 Grade, conforming to IS:12269
- e) Sulphate Resistant Portland Cement, conforming to IS:12330

Cement conforming to IS:269 shall be used only after ensuring that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cu.m of concrete.

Cement conforming to IS:8112 and IS:12269 may be used provided the minimum cement content mentioned elsewhere from durability considerations is not reduced. From strength considerations, these cements shall be used with a certain caution as high early strengths of cements in the 1 to 28 – day range can be achieved by finer grinding and higher constituent ratio of C3S/C2S where C3S is Tricalcium Silicate and C2S is Dicalcium Silicate. In such cements, the further growth of strength beyond say 4 weeks may be much lower than that traditionally expected. Therefore, further strength tests shall be carried out for 56 and 90 days to fine tune the mix design from strength considerations.

Cement conforming to IS :12330 shall be used when sodium sulphate and magnesium sulphate are present in large enough concentration to be aggressive to concrete. The recommended threshold values as per IS:456 are sulphate concentrations in excess of 0.2 per cent in soil sub-strata or 300 ppm (0.03 per cent) in ground water. Tests to confirm actual values of sulphate concentration are essential when the structures is located near the sea coast, chemical factories, agricultural land using chemical fertilizers and sites where there are effluent discharges or where soluble sulphate bearing ground water level is high. Cement conforming to IS:12330 shall be carefully selected from strength considerations to ensure that the minimum required design strength can be achieved without exceeding the maximum permissible cement content of 540 kg/cu.m of concrete.

Cement conforming to IS: 8041 shall be used only for precast concrete products after specific approval of the Engineer.

Total chloride content in cement shall in no case exceed 0.05 per cent by mass of cement. Also, total sulphur content calculated as sulphuric anhydride (SO₃) shall in no

case exceed 2.5 per cent and 3.0 per cent when tri-calcium aluminate per cent by mass is upto 5 or greater than 5 respectively.

Add the following at the end of list of types of cements:

- f. Portland Blast Furnace Cement (site blending of blast furnace shall not be permitted) IS:455
- g. Low heat Portland Cement IS:12600

Add the following at the end of this Clause:

“Manufacturer’s test certificate shall be submitted to the Engineer by the Contractor for every consignment of cement. The certificate shall cover all tests for chemical requirements, physical requirements and chloride content.

Independent tests of samples drawn from the 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 test shall be borne by the Contractor. In case, the cement is stored beyond 90 days from the date of delivery at site, the following test 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 tonnes.”

Clause 1007 COARSE AGGREGATES

Delete from the first sentence “crushed gravel inert material” appearing in fourth and fifth lines of first para.

Add the following at the end of second para.

“Costs of all tests shall be borne by the Contractor.”

Delete fourth para and add the following:

“The maximum value of elongation index and flakiness index for plain, reinforced and Prestressed concrete should not exceed 15% each, taken separately, and not to exceed 25% taken together. The flakiness and elongation Index should be measured using methods as per IS: 2386. The coarse aggregates shall satisfy the requirements of grading as given in Table 1000-1.”

Add the following at the end of the Clause:

“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 aggregates reactivity shall be measured and reported for getting approval for the source of aggregates at the beginning of the work using methods given in IS : 2386. The tests may be repeated if the source changes, or if the type of rock being exploited for the selected aggregate changes.”

Clause 1008 SAND / FINE AGGREGATES

Delete from third line the words “crushed gravel” and from the fourth line “gravel” in second para.

Add the following at the end of this Clause:

"The alkali aggregate reactivity shall be measured and reported for getting approval for the source."

Clause 1009 STEEL

Clause 1009.2 Steel for Prestressing

Add (e) to the list of codes to which acceptable prestressing steel shall conform:

- (e) Stress relieved low relaxation seven-ply strand for prestressed concrete
- IS: 14268

Clause 1009.3 Reinforcement / Untensioned steel

In the Table 1000.3, replace "IS: 1786 High Yield Strength Deformed Bars (HYSD)" with "Fe 500D IS: 1786 Thermo Mechanically Treated (TMT) deformed bars". Any other reference to HYSD bars in the specifications shall be read as TMT bars.

Clause 1010 WATER

In para (c) the permissible limit for chlorides (Cl) shall be read as "250 mg / lit for structures having length more than or equal to 30 m. In case of structures of lengths 30 m and below, the permissible limits of chlorides may be increased upto 500 mg / lit."

Clause 1012 CONCRETE ADMIXTURES

Clause 1012.1 Add the following at the end of second para:

"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."

The third para shall read as follows:

"For all admixtures being used the packing shall be marked with the name of the supplier / manufacturer, brand name (name of 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 iron 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 & minimum allowable temperature;
- c) Other instructions (e.g. requirements of stirring);

C. Dosage

Maximum and minimum, to be specified as a percentage of weight of cement.

Add the following at the end of the Clause.

“After selecting a few acceptable brands & types of admixture based on the manufacturer’s data / technical literature, independent acceptance tests shall be carried out for the same using the approved combinations of cement / sand / aggregates intended for use in the Project. After establishing the basic acceptability using strength criteria (compression & tensile strengths) a number of trial mixes be designed using different proportions of admixtures / cement / water etc. to establish the data bank on the behaviour 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 production lots.

Retrials shall be conducted with change in source / type of cement.

Workmanship

The dosage shall be finalized on the basis of field trial and special mechanical devices shall 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 shall be available for consultation / trouble shooting of problems associated with their product. The conditions of storage shelf life etc., as specified by the manufacturer shall be strictly observed. The manufacturer’s Quality Assurance Plan during process of production shall be obtained and filed for reference / record.

SECTION 1500 FORMWORK

Clause 1501 DESCRIPTION

Add the following at the end of this clause :

“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 program of all the structures 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, and removal and subsequent use in the next and subsequent structures.

Notwithstanding Engineer’s approval of mobilization plan, if due to any reason, the Contractor has to arrange additional formwork, to meet the requirements of the construction programme, it shall be done by the Contractor without any extra cost.”

Clause 1502 MATERIALS

This Clause shall read as under:

“All materials shall comply with the requirements of IRC: 87-1984.

Materials and components used for formwork shall be examined for damages or excessive deterioration before use / reuse and shall be used only if found suitable after necessary repairs.

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 shall 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

Clause 1503.2 The following shall be added to this Clause:

“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. The loading from the form work 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.

Subsoil characteristics shall be taken into account while designing the staging to avoid untoward failures. All the pipes etc. used for staging shall be free from kinks, bends etc.”

Clause 1505 Substitute the following Clause in place of the existing clause:

“Formed & Unformed Surface Finishes

The surface finishes for formed and unformed surfaces are classified and defined as below:

Surface irregularities for the various classes of finishes are termed either ‘abrupt’ or ‘gradual’. Fins or offsets caused by displaced or misplaced form sheeting, lining or form sections, by loose knots in form lumber or by otherwise defective form lumber are considered abrupt irregularities. All other cases are described as gradual irregularities. Gradual irregularities will be measured with a template consisting of a straight edge for plain surfaces or its equivalent for curved surfaces. The length of template for testing gradual irregularities on formed surfaces shall be 1.5 m in length. The permissible gradual irregularities being measured over this length of the template shall form the base for the type of finishes.

- (i.) Finishes F1, F2 and F3 shall describe formed surfaces
- (ii.) Finishes UI, U2 and U3 shall describe unformed surfaces.

Class F1 Finish

The class F1 finish shall apply to all formed surfaces for which class F2 or F3 is not specified. It shall generally be formed by steel frame mounted with steel sheet. It shall be so constructed that there shall be no loss of material from the concrete during placement and compaction. After hardening, the concrete shall be in the required positions and shall have the shape and dimensions called for in the drawings. Any abrupt irregularities shall not exceed 10 mm. All fins and drifts in excess of the above limits shall be made good by chipping and grinding if required by the Engineer. Small blemishes caused by entrapped air or water may be expected but the surface shall be free from voids, honeycombing or other large blemishes. Class F1 finish shall be generally specified for all surfaces buried in ground or not visible during service or for surfaces that are to receive further rendering treatment such as plastering etc. Unless otherwise specified in the item of BoQ the surface finish shall be understood to be Class F1.

Class F2 Finish

Class F2 finish shall be obtained by use of properly designed forms with steel sheet lining. The abrupt irregularities shall not exceed 5 mm and gradual irregularities shall be less than 8 mm. Small blemishes caused by entrapped air or water may be permitted but the surface shall be free from honeycombing, voids and large blemishes. Surface irregularities in excess of those stipulated shall be removed by chipping or rubbing with abrasive stone.

Class F3 Finish

Class F3 finish shall be formed by specialty designed close jointed rigid forms having lining or high quality form plywood. The surface irregularities shall be limited to nil for abrupt irregularities and 3 mm for gradual irregularities. Class F3 finish may be obtained from class F2 finish by carefully removing all abrupt irregularities including fins and projections by rubbing / grinding. If steel forms are used they shall have steel sheet backing faced with plywood.

In addition, finish F3 shall include filling air holes with mortar and treatment of the entire surface with sack rubbed finish. It shall also include clean up of loose and adhering

debris. For a sack rubbed finish, the surface shall be prepared within two days after removal of the forms. The surface shall be wetted and allowed to dry slightly before mortar is applied by sack rubbing. The mortar used shall consist of one part cement to one and one half parts by volume of fine (I.S. No. 16 mesh) sand. Only sufficient mixing water to give the mortar a workable consistency shall be used. The mortar shall then be rubbed over the surface with a fine burlap or linen cloth so as to fill all the surface voids. The mortar in the voids shall be allowed to stiffen and solidify after which the whole surface shall be wiped clean with clean burlap such that all air holes etc., are filled and the entire surface presents a uniform appearance without air holes, irregularities etc.

Class U1 finish

This is the screeded finish used on surfaces over which other finishes such as wearing coats etc., are to be placed. It is also the first step in the formation of U2 and U3 finishes. The finishing operation consists of levelling and screeding the concrete to produce an even and uniform surface so that the gradual irregularities are not greater than 5 mm. Surplus concrete should be removed immediately after consolidation by striking it off with a sawing motion of a straight edge or template across a wooden or metal strip that has been set as a guide. Unless the drawings specify a horizontal surface or show the slope required the tops of narrow surfaces, such as stair treads, walls, curbs and parapets shall be sloped approximately 10 mm per 300 mm width. Surfaces to be covered with concrete topping, terrazzo and similar surfaces shall be smooth screeded and leveled to produce even surfaces, irregularities not exceeding 5 mm.

Class U2 Finish

This is a floated finish used on all outdoor unformed surfaces not prominently exposed to view such as tops of piers etc. The floating may be done by hand or power driven equipment. It should not however be started until some stiffening has taken place in the surface concrete and the moisture film or 'shine' has disappeared. The floating should work the concrete no more than is necessary to produce a surface that is free from screed marks. All joints and edges shall be finished with edging tools. It shall include the repair of gradual irregularities exceeding 5 mm. All abrupt irregularities shall also be repaired unless a roughened texture is specified.

Class U3 Finish

This is a trowel finish used on all surfaces exposed to view at close quarters such as tops of parapets and kerbs etc. Steel trowelling shall not be started until after the moisture film and 'shine' have completely disappeared from the floated surface and the concrete has hardened enough to prevent an excess of fine material and water from being worked to the surface. Excessive trowelling, especially if started too soon, tends to produce crazing and lack of durability. Too long a delay will result in a surface too hard for proper finishing. Steel trowelling shall be performed with a firm pressure that will flatten and smooth the sandy surface free of blemishes, ripples and trowel marks. It shall include the repair of all abrupt irregularities and the repair of gradual irregularities exceeding 5 mm. It shall also include finishing the joints and the edges of concrete with edging tools.

Clause 1506 PRECAUTIONS

Add the following at end of this Clause:

- (vii.) "Adequate support against sideway and lateral loads due to construction, operations and wind shall be provided.
- (viii.) 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.
- (ix.) Forms shall be rigid and of adequate section to reduce deflections. Forms shall have sufficient rigidity to resist horizontal pressure caused by flowing concrete resulting from use of super plasticizers. The formwork shall resist the lateral pressure caused due to fast rate of placement by concrete pumps."

Clause 1508 REMOVAL OF FORMWORK

Add the following as fifth para.

“For prestressed units, the side forms shall be released, as early as possible and the soffit forms shall permit, without restraint, deformation of the member, when pre stress is applied. Form supports and forms for cast-in-situ members shall not be removed until sufficient pre stress 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

This Clause shall read as under:

“After forms are stripped, all materials shall be examined for any damage and damaged pieces, if any, shall be removed either as rejected or for rectification if possible. The materials found fit 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 re-fixing, each formwork shall be got approved by the Engineer.

Formwork and staging shall be so used as to ensure quality of the exposed surface. However, if in the opinion of the Engineer, any particular panel / member has become unsatisfactory for use at nay stage, the same shall be rejected and removed by the Site.

All bent steel props shall be straightened before reuse. The maximum deviation from straightness shall not exceed 1/600 of length. However the maximum number of uses shall be limited to 20 times since only steel formwork is to be used. The maximum permissible axial loads in used props shall be suitably reduced depending upon their condition.”

Clause 1510 SPECIALIZED FORMWORK

Replace the words ‘slip-form work’ by ‘climbing formwork’ in the first sentence of this Clause.

The first sentence of second para of this Clause shall read as follows:

“Slip-forming is not permitted.”

Replace the word “plywood” by ‘marine plywood’ in the fourth para of this Clause.

Clause 1513 RATE

Add the following at the end of the first para:

“The unit rate of respective items shall also deem to include all costs for preparation of erection scheme, designs of false work and formwork and their approval.”

Add the new Clause 1514 as under:

Clause 1514 TOLERANCES

“All works shall he carried out true to the lines, levels and grades shown on the drawings and within the tolerances specified below. The forms shall be so designed and erected that the following tolerances are not exceeded unless more stringent and specific specifications have been required by the design and specified in the drawings / instructions. The contractor shall establish, erect and maintain in an undisturbed condition until final completion and acceptance of the project, control points and bench marks necessary and adequate to establish these tolerances.

Elements	Limits
For all elements, departure from established alignment	10 mm
Departure from established grades	10 mm
Variation from plumb or specified batter in lines and surfaces of piers, walls and abutments	10 mm in 3.0 m if exposed, 20 mm in 3.0 m if backfilled
Variation from level or indicated grade in	10 mm in 3.0 m if exposed, 20

Elements	Limits
slabs, beams, horizontal and railing offsets	mm in 3.0 m if backfilled
Variation in cross sectional dimensions of columns, piers, slabs, wall beams and similar parts	+5 mm , -5 mm
Variation in slab thickness	+5 mm , - 5 mm
Footings	
Plan dimensions	+15 mm , - 15 mm
Misplacement or eccentricity	2% of footing width in the direction of displacement and not exceeding 30 mm
Reduction in thickness	5% of specified thickness unless specified to be more stringent
Variation in size and locations of slab or wall openings	10 mm

The alignment Tolerances shall be as under

Tolerance in direction where 'd' is the dimension of members

Member with a depth of upto 200 mm	+ d / 40
More than 200 mm	5 mm

SECTION 1600 STEEL REINFORCEMENT (UNTENSIONED)

Clause 1602 GENERAL

The second para shall read as under:

“Reinforcement shall be thermo mechanically treated (TMT) deformed bars of grade Fe 500D conforming to IS: 1786. Only uncoated steel shall be used as reinforcement.”

Clause 1604 BENDING OF REINFORCEMENT

The first para shall read as follows:

“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 shall be coherent and systematic. A separate bar bending schedule shall be prepared for auxiliary bars like spacers, chairs etc.

Clause 1605 PLACING OF REINFORCEMENT

Para (c) (i) shall read as follows:

“Cover blocks shall be made of concrete or cement mortar with 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.”

Add the following as Clause 1605 (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
1000< d<2000	< 0.01xd

Clause 1606 BAR SPLICES**Clause 1606.1** The first sentence shall read as follows:

“To the extent possible, all reinforcement shall be furnished in full length as indicated in drawings.”

Add the following as second para:

“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.”

Clause 1606.2 WELDING**Clause 1606.2.1** Add the following at the end of the para:

“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

Add the following as the last para:

“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.”

SECTION 1700 STRUCTURAL CONCRETE**Clause 1703 GRADES OF CONCRETE**

Add the following at the end of this Clause:

“The concrete mixes leaner than M15 shall be called as nominal mix concrete.

Nominal mix concrete is that concrete for which, concrete is not to be designed by tests and in which the proportions of materials are in accordance with the drawing and the specification Clause mentioned below:

- iii) All the materials for this concrete shall conform to section 1000.
- iv) Minimum cement content and maximum water cement ratio for above said nominal mix concrete shall conform to Clause 1703.2 Table 1700-3(A) unless otherwise specified in the drawings.
- v) Mixing of above said nominal mix concrete shall conform to Clause 1708.
- vi) Transporting, Placing and Compaction of above said nominal mix concrete shall conform to Clause 1709.”

Clause 1704 PROPORTIONING OF CONCRETE

Add the following as Clause 1704.6:

“In proportioning concrete, the quantity of both cement and aggregates 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. The determination of moisture content in the aggregates shall also be made in the weight of aggregates to allow for the variation in weight of aggregate due to variation in their moisture content.”

Clause 1704.4 Additional Requirements

In para (a) substitute “0.06%” for “0.1%”, “0.06%” for “0.2%” and “0.1%” for “0.3%” for the three items respectively.

Clause 1704.6 Add the following as 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 0.25 mm 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

This Clause shall read as under:

“Duly tested admixtures / 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, sulphides, sulphates and any other material liable to adversely 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

Table 1700-7 shall modify as given below:

Components	Maximum Nominal size of coarse aggregate (mm)
(i) RCC well curb	20
(ii) RCC / PCC well staining, PCC below foundations and approach slab, annular filling around foundations	40
(iii) Well cap or pile cap, solid wall type abutments, pier, median walls, splayed wing walls and their foundations	40
(iv) RCC works in T-beam and slab / solid slab / voided slab and box girder super structure, wearing coat, kerb, crash barrier, approach slab, dirt walls, coping on masonry wing walls, hollow	20

	abutments and piers, pier / abutment caps, pedestals, dirt walls, piles all components of counterfort type abutments, columns, cantilever return walls etc.	
(v)	All PSC works	20
(vi)	Any other item	As specified by the Engineer

Clause 1707 EQUIPMENT

The first para shall read as under:

“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 of a minimum capacity of 40 cum / hr. The plant shall be approved by the Engineer.”

Part (a) of third para of this Clause shall read as follows:

“The accuracy of measuring devices shall fall within the following limits:

Measurement of cement in each batch	±	1% of the quantity of cement
Measurement of water in each batch	±	1% of the quantity of water
Measurement of aggregate	±	2% of the quantity of aggregate in each batch
Measurement of admixture	±	1% of the quantity admixture in each batch

Add the following para at the end of this Clause:

“Batching, mixing, transportation and placing of concrete

Once the concreting of a section is started, it has to be completed as a continuous operation. Before starting an important placement, the Contractor shall submit to the Engineer an equipment list to ensure that sufficient equipment is available for batching, mixing, transporting and placing concrete and once the concreting of a section is started, it can be completed as a continuous operation within a reasonable time.”

Clause 1709 TRANSPORTING, PLACING AND COMPACTION OF CONCRETE

Add the following para at the end of the Clause:

“For placing concrete with pumps : Pipe lines from the pump to the placing area shall 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 the Site needs. The pumping of concrete shall be preceded by a priming mix to lubricate the pump and pipelines. 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, 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; aluminium alloy pipelines shall not be used.”

Clause 1710 CONSTRUCTION JOINT

In the first para of Appendix 1700 / 1, add “the coarse aggregate shall be made visible to a depth of 5 mm to 10 mm” after the words “the surface shall be roughened”.

In the third para of Appendix 1700 / 1 under heading “Preparation of the Surface of the Joint” add the following at the end of para:

“Bush hammering shall not be permitted since it loosens the coarse aggregates and results in extensive micro cracks.”

In Appendix 1700 / 1 under heading “Concreting of Joints” add the following at the end of third para:

“At vertical construction joints, a fine mesh on the liner surface of the stopping board shall be placed to facilitate the removal of laitance, if directed by the Engineer.”

Clause 1712 ADVERSE WEATHER CONDITION

Clause 1712.1 Hot Weather Conditions

Add the following at the end of first para:

“Where the Contractor proposes to use ice cool the concrete or mixing water or any of the ingredients, the Contractor shall provide a refrigeration plant to avoid use of contaminated ice.

Placement of concrete shall not be permitted when day temperature exceeds 40° C.”

Clause 1713 PROTECTION AND CURING

Clause 1713.1 Water Curing

Add the following at the end of first para:

“Wherever possible, use of water sprinklers or perforated pipes shall be used for curing of concrete for all major bridges, RoBs and grade separators. Such arrangement must be maintained for a minimum period of 14 days after concreting.

Approved concrete curing compounds shall be preferred where water curing can not be done reliably.”

Clause 1715 TOLERANCES

Clause 1715.1 Sectional Dimensions

Add the following as the second sentence of the Clause:

“In the absence of any information in drawings or specifications, for particular cases, the following limitations shall apply:

Dimension (mm) ‘a’	Tolerances (mm) $\delta_a = (a_{nominal} - a_{actual})$
$a \leq 200$	$ \delta_a < 5$
$200 < a \leq 2000$	$ \delta_a < 3.5 + 0.0075a$
$2000 < a$	$ \delta_a < 16.5 + 0.001a$

Clause 1715.2 Deviations from Position etc.

Deviation from specified position in plan

- a) Variation in levels at top + 10 mm
- b) Variation of reduced levels of bearing areas + 5 mm
- c) Variation in plumb over full height of piers + 10 mm
- d) Surface irregularities measured with 3 m straight edge
 - i) all surfaces except bearing areas + 5 mm
 - ii) bearing areas + 3 mm
- e) Variation in length of superstructure - overall and length between bearings + 10 mm or + 0.1 % of the span length, whichever is lesser

SECTION 2100 OPEN FOUNDATIONS

Clause 2106 TOLERANCES

Reference to Tolerance shall be made to Clause 1715.

SECTION 2200 SUB-STRUCTURE

Clause 2204 PIERS AND ABUTMENTS

The second para shall be replaced as follows:
"Slip forming will not be allowed."

Add the following para at the end of the 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

This Clause shall read as follows:

"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.

The necessary material (thermocole, bituminous fibrous board or equivalent material) and labour, tools etc. required for maintaining 20 / 40 mm gap between faces of various structures (old / new) wherever required / as shown in drawing shall be incidental to work and shall not be measured / paid separately."

SECTION 2600 EXPANSION JOINTS

Clause 2601 DESCRIPTION

Add the following para at the end of this Clause:

"The expansion joints may require to be installed both on new structures and on existing structures as shown on the drawings or as directed by the Engineer"

The provision of expansion joints shall be in accordance with the revised interim specification for expansion joints given in MOST circular no. RW / NH-34059 / 1 / 96-S&R dated 30th Nov. 2002 and corrigendum of same no. dated 25th Jan. 2001.

The expansion joints shall be procured only from those manufacturers / suppliers of expansion joints who are empanelled with MoRT&H.

SECTION 3000 MAINTENANCE OF ROAD

Clause 3002 RESTORATION OF RAIN CUTS

Clause 3002.4 Measurement for Payment

This Clause shall be deleted.

Clause 3002.5 Rate

This Clause shall be read as under:

"The contract unit rate for maintenance of road shall be inclusive of this item of work."

Clause 3003 MAINTENANCE OF EARTHEN SHOULDER - Deleted

Clause 3004 BITUMINOUS WORKS IN CONNECTION WITH MAINTENANCE AND REPAIRS

Clause 3004.1 General

Delete fourth para and add the following at the end of the Clause:

“Material used in the maintenance operation shall be as specified in the BOQ or in the respective specifications.”

Clause 3004.2.1 Scope

Add at the end of this Clause as under:

“The minimum area and depth for a pothole shall be 25 sq.cm and 1 cm respectively. The areas to be patched / repaired shall be located by the Engineer. Pot hole or patching area shall be cut / trimmed either with jack hammer or hand tools like chisels, pick-axes etc., such that the areas are in the shape of rectangles or squares.”

Clause 3004.2.2 Materials

This Clause shall read as under:

“All materials used for pot-hole and patch repair of other than bituminous surface and for underlying layers shall be of the same type as of original construction. Bituminous Macadam as per Clause 504 shall be used for repair of bituminous surface.”

Clause 3004.2.4 Backfilling Operation

This Clause shall read as under:

“Bituminous macadam shall be prepared in accordance with the Clause 504. The bituminous mix shall be placed in layers of thickness of not more than 100 mm (loose) and shall be compacted in layers with smooth wheel roller to the compaction standards defined in Section 900. While placing the final layer, the mix shall be spread slightly above the adjoining surfaces so that after rolling, the surface shall be flush with the adjoining surface.”

Clause 3004.2.5 Measurement for Payment

Add the following at the end:

“Prime coat and tack coat if any shall be considered incidental to work and no extra payment shall be admissible.”

ADDITIONAL TECHNICAL SPECIFICATIONS

A-1 CURING USING LIQUID MEMBRANE FORMING COMPOUND

A-1.1 General

Liquid membrane forming compound are sometimes permitted to be used by the Engineer for curing concrete for part or whole of the total curing period as specified in sections dealing with concrete construction. These Membranes reduce the loss of water from concrete during early hardening period and some type of compounds also help in reducing the temperature rise of concrete exposed to the radiation from the sun. These specifications cover the type and use of such compounds. However, the use of the same will need specific permission from the Engineer, who may require a number of tests to be carried out for establishing the conformity of the product to these specifications and to establish that the curing compound and the method of use does not have any unacceptable effect on the quality of concrete. The cost of the initial acceptance testing and the quality control testing shall be borne by the Employer, if the method has been specified as a requirement by the Engineer. If on the other hand, it is suggested by the Contractor as an alternative to wet-curing, the full cost of testing shall be borne by him and deemed to be included in his rates for concreting. The cost of curing in any case shall be deemed to be part of the concrete rates and shall not be paid extra.

All equipment, material etc., needed for curing and protection of concrete shall be at hand and ready for installing before actual concreting beings. Detailed plans, methods and procedures shall be firmly established, shall be settled and got approved in writing from the Engineer sufficiently in advance of the actual concreting.

The equipment and method proposed to be utilized shall provide for adequate control and avoid interruption or damage to the work of other agencies.

A-1.1.1 Curing Compound

The curing compound shall be conforming to ASTM-C-309-81, Type-2, white pigmented compound. The solids dissolved in vehicle shall be either A (no restrictions) or Class B (resin as defined in ASTM D-883) as approved by the Engineer.

White pigmented compound (Type-2) shall consist of finely divided white pigments and vehicle solids, ready mixed for immediate use without alteration. The compound shall present a uniform white appearance when applied uniformly to a fresh concrete surface at the specified rate of application. It shall be of such consistency that it can be readily applied by spraying to provide uniform coating at temperatures above 4°C. If two coats are to be applied then it should be applied at an interval of approximate one hour. They shall adhere to freshly placed concrete that has stiffened or sufficient resist marking during the application and to damp hardened concrete and shall form a continuous film when applied at a rate of 0.2 litre / m. When dry, the covering shall be continuous flexible and without visible breaks or pin holes and shall remain as unbroken film at least 28 days after application. It shall not react deleteriously with the Concrete.

The compound shall meet with the requirement of water retention test as per ASTM designation C-156-80. The loss of water in this test shall be restricted to not more than 0.55 kg / m² of exposed surface in 72 hours.

The white pigmented compound (type 2) when tested as specified in accordance with method E-79 of ASTM shall exhibit a day light reflectance of not less than 60% of that of magnesium oxide.

It shall fulfill the requirement of drying time when tested in accordance with ASTM-C-309-81. The compound applied shall be dry to touch in not more than 4 hours. After 12 hours it shall not be tacky or tack off (peel off) concrete when walked upon nor it shall impart a slippery surface.

The liquid compound should be of a sprayable consistency.

A-1.1.2 Supply and Testing

Acceptance Testing

Prior to the approval of the brand / trade name of compound and the source of supply and manufacturer acceptance testing shall be carried out to demonstrate the conformance of the compound to Clause A-1.1.1. In addition, testing shall be performed to demonstrate that no adverse / undesirable change in quality of concrete or concrete surface takes place as a result / by-product of the use of the compound. These tests should be designed to check properties such as loss of strength at 28 days of surface layer, or of concrete cube, change in surface texture, change in adhesion to subsequently applied layers like plaster, flooring, tiling etc. The type and number of tests are to be as specified by the Engineer.

A-1.1.3 Routine Testing

1. The liquid membrane forming curing compound should be brought in the manufacturer's original clear containers. Each container shall be legibly marked with the name of the manufacture, the trade name of the compound, the type of compound and class of vehicle / solids, the nominal percentage of volatile material and batch or lot number. The lot numbers will be assigned to the quantity of compound mixed supplied and tested as single product. The manufacturer shall exercise the care in filling the container so that all are equally representative of the compound produced.
2. Curing compound to be used on site shall be got tested at least 14 days in advance so that the result of water retention tests, reflectance test, drying etc, are available before it can be permitted for use. All of the filled containers represented by the approved sample shall then be sealed - to prevent leakage, substitution or dilution

The Engineer shall mark each container represented by the samples with a suitable identification mark for later identification and correlation and shall be kept in store with double lock arrangements. One key shall be kept with the Contractor and the other with the Engineer. Random samples shall be collected from every batch of the compound: Frequency of random sampling shall be done as directed by the Engineer. The contractor shall provide samples and labour for collecting samples free of cost. Testing shall be carried out by agency approved by the Engineer and in presence of his representative.

A-1.1.4 Method of Application

The compound shall be sprayed using mechanical sprayer of approved design to ensure uniform and continuous membrane on the concrete surface. The coverage shall be at the rate specified by the manufacturer or at the rate of 4m per litre or as specified by the manufacturer and approved by the engineer. Field trials shall be conducted to decide effective coverage rate, which depends upon surface finish. The Engineer after verification of the field trials and based on the actual experience shall order the rate of application as needed for achieving the proper curing. With a view to ensure thorough and complete coverage, approximately one half of the compound for a given area should be applied by moving the spray gun back and forth in one direction and the remaining half at right angles to this direction. In case the application is still not found uniform, the contractor shall have to apply the second coat as and when directed by the Engineer. If a second coat is to be applied, it should be applied approximately after an interval of one hour. The curing compound shall generally be applied as soon as the bleeding water or shine disappears, leaving dull appearance.

If surface treatment by roughing, hand brushing etc., is required (e.g. as in case of road pavements) the curing compound should be applied immediately after the same.

Equipment for spraying curing compound shall be of pressure tank type (5 to 7kg / cm²) with provision of continuous agitation. A curing jumbo with multiple traveling spray fans shall be provided for effective spray. Spraying on concrete lining shall be done in such a way that the green concrete is not disturbed or damaged or any foot impression left. Necessary schemes for spraying by mechanized means shall be got approved by the Engineer. However, in emergency for very small areas / patches, it can be applied with wire or bristled brush.

A-2 DIVERSION AND FILLING OF EXISTING WATER COURSES ALONG THE ROAD ALIGNMENT

Where water courses have to be diverted from the sites of embankments or other works, the original channels shall be cleared of all vegetation and soft deposits as directed by the Engineer and carefully filled in with suitable materials deposited and compacted as specified. The new channel shall be formed as directed by the Engineer.

A-2.1 Measurement for payment

The work involved in filling existing water courses shall be measured as follows:

- i. The work involved in filling existing water courses shall be measured under clearing and grubbing item on area basis.
- ii. Excavation and removal of soft deposits shall be measured in cubic metre.
- iii. Filling with suitable material shall be measured in cubic metre.
- iv. The works involved in forming the new channel shall be measured under the relevant items of work.

A-2.2 Rates

Clause 201.6.1 shall apply for clearing of vegetation growth.

Clause 301.9.3 shall apply for removal of soft deposits and filling with suitable materials. The contract unit rates for the item of new channel formation shall be payment in full for carrying out the operations required for the relevant items.”

A-3 PLANTATION OF TREES AND LOW HEIGHT SHRUBS

A-3.1 Scope

The work shall consist of:

- a. Plantation of trees on roadside or other designated locations.
- b. Planting of saplings in median.
- c. Planting of low height shrubs within median area.

A-3.2 Materials

A-3.2.1 Dump manure - It shall be of well decayed (at least six months) organic or vegetable matter, obtained in the dry state from the municipal dump or other similar sources approved by the Engineer. The manure shall be free from earth, stone, brickbats or other extraneous matter.

A-3.2.2 Farmyard Manure -It shall be well decayed (should be at least covered in dump) free from grits and any other unwanted materials.

A-3.2.3 Good Earth - The soil shall be agricultural soil of sandy - 10 cm texture, free from Kankar, moorum, shingle, stone, brickbats, building rubbish and any other foreign matter. The earth shall be free from clods or lumps of sizes bigger than 75 mm in any direction. It shall have PI value ranging between 6 to 8.5.

A-3.2.4 Oil Cake - The cake (Neem / Castor / Groundnut) shall be free from bush, dust, grit and any other foreign matter.

A-3.2.5 Sapling of Trees - The sapling of tress shall be of short growing type for median and for road side plantation, they shall be of quality and variety as approved by the Engineer, leafy type and draught resistant variety native to the area and be of good quality of minimum of 2 m height or caliper dia of 25 mm as directed by the Engineer.

A-3.2.6 Sapling for low Height Shrubs - The saplings (not less than 300 mm in height) shall be of draught resistant variety normally grown for hedges in the area, approved by the Engineer.

A-3.3 Construction Operations

A-3.3.1 The planting and refilling earth after mixing with oil cake, manure and watering - Holes of circular shape of 90 cm dia and 100 cm in depth in ordinary soil shall be excavated and the excavated soil, broken to clods of sizes not exceeding 75 mm in any direction, shall be staked outside the hole. Stones, brickbats, unsuitable earth and other rubbish, all roots, and weeds etc. other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the site as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities required to replace such discarded stuff shall be brought and staked at site by the Contractor, depth not more than 50 cm from ground level. The pit shall be treated for termite by raking the soil upto 50 mm and treated with 5% aldrin or chlordone dust in soil.

A-3.3.2 The tree hole shall be manured with powdered neem / castor oil cake along with farm yard manure / dump manure screened through 16 mm sieve and these shall be uniformly mixed with the excavated top soil after the manure has been broken down to powder (size of particles not to exceed 6 mm in any direction) in equal proportion. A 2m high sapling of tree shall be placed at the center of the hole and then the mixture shall be filled into the hole upto the level of adjoining ground and then profusely watered to enable the soil to subside. The refilled soil shall than be dressed evenly with its surface about 50 to 70 mm below the adjoining ground level or as directed by the Engineer.

A-3.3.3 The planting shall be completed soon after completion of median construction.

A-3.4 Circular mild steel Tree guard with Bars

- a) The tree guard shall be 90 cm in diameter.
- b) The tree guards shall be formed of (i) 3 nos 25 x 25 x 3 mm angle iron verticals 1.95m long excluding splayed outward at lower end upto on extent of 5 cm, (ii) 3 nos 25 x 5 mm MS Flat rings fixed as per design (iii), 15 nos 1.55 m long 6m dia bars. Each ring shall be in two parts in the ratio of 1:2 and their ends shall be turned in radially for a length of 4cm at which they are bolted together with 8 mm dia and 30 mm long MS bolts and nuts.
- c) The vertical iron shall be welded to rings along the circumference of ring. The lower end of the angle iron verticals shall be splayed outwards upto on extent of 5 cm. The lower end of the flat of lower ring shall be at the height of 1.95 m. The middle ring shall be in the center of top and lower ring. The bars shall be welded to the rings as directed by the Engineer. The entire tree guard shall be given two coats of paint of approved brand and of required shade over a priming coat of ready mixed primer of approved brand. The design of the tree guard shall be approved by the Engineer.

A-3.5 Planting of low height shrubs

- a) The low height shrub saplings shall be planted in two rows, one each along each edge of the median. Bed for the saplings shall be prepared with necessary manuring and the live saplings shall be planted in lines parallel to the median edge to the directions of the Engineer. Spacing between saplings in a row shall be such that a thick shrub can be grown, and this shall generally be not further away than 3 m.
- b) The planting shall be completed soon after completion of the medians.

A-3.6 Grassing of median areas

The included area of the median between the shrubs shall be seeded and mulched to develop grass over in accordance with clause 308.

A-3.7 Maintenance

The saplings of trees and low height shrubs planted shall be watered and maintained by the contractor till issue of final taking over certificate. Maintenance shall also include watering, weeding out of undesirable plants, replacement of dead plant, manuring and trimming of the hedges.

A-3.8 Measurement for payment

Planting of tree saplings excluding provision of trees guards and maintenance shall be measured in numbers.

Planting of low height shrubs along median along median edges including maintenance shall be measured as length of double rows in running kilometre.

Provision of tree guards shall be measured in numbers.

Seeding and mulching of the median area between the shrubs shall be measured as per Clause 308.

A-3.9 Rates

The contract unit rates for planting of trees and shrubs shall include the cost of labour and material involved in all the operations described above including cost of saplings and maintenance as mentioned above, the cost of sapling and staking the requisite quantity of manure and oil cake and other incidentals. The contract unit rates for providing and fixing tree guard shall include the cost of labour, material involved, painting in green colour in two coats, transportation, digging foundation for fixing and other incidentals.

A-4 UTILITY DUCTS

A-4.1 Scope

The work shall consist of providing and laying P.C.C. Utility Ducts in accordance with the requirements of these specifications with RCC manhole at either end of duct and PVC pipe.

A-4.2 Materials

The PVC pipes shall conform to IS: 14787.

A-4.3 Jointing

The Pipes shall be jointed by collar joint and or directed by the Engineer.

A-4.4 Back Filling

Where directed by the Engineer shall be carried out in accordance with the Clause 305 of the specifications.

A-4.5 Closing of Ends

The ends of Pipes shall be closed with plastic covers to prevent ingress of foreign materials.

A-4.6 Measurement of Payments

The utility ducts shall be measured from end to end in running metres.

A-4.7 Rate

The contract rate for ducts shall include the cost of PCC duct, RCC manhole, PVC pipes including collars and covers, handling and storing of Pipes, laying in positions and jointing complete and all incidental works necessary for completion. Excavation including back filling where necessary shall not be measured and paid separately and the same be included in the rate for Utility Ducts.

A-5 CONTROL BLASTING

A-5.1 General

The specifications for excavation in rock are covered in Section 300. The following specifications are additional and supplementary to the same.

A-5.2 Control Blasting

Whenever required by the Engineer, the rock blasting shall be controlled so that vibrations generated during the blasting do not cause damage to the building and installation around built up areas. Similarly, the rock pieces should not fly off the pits and thus damage the buildings and installation and life and limb of people around. Apart from the general precautions mentioned in the specifications in Clause 302, the following protective measures and limits for use of explosives are given as guidelines. The Contractor shall carefully check the site conditions and submit the details of the scheme they propose to adopt for controlling the blast prior to execution.

A-5.3 Protective Measures

- a) Short delay blasting with light charges shall be used.
- b) The blast hole shall be covered with 0.6 to 1.0 sq.m. mild steel plate of minimum 6 mm thickness.
- c) Reinforcement rod mesh not less than 20 mm dia at 150 mm centre to centre in both directions shall be placed over the steel plates.
- d) Steel plate and reinforcements shall be inspected after every blasting operation and all twists shall be removed before reuse to the satisfaction of the Engineer.
- e) The thickness of the covering plate and the kind of dead weight is to be duly approved by the Engineer.

When blasting is necessary adjacent to partially / completely built structures the contractor shall take all precautions necessary to prevent flying rock from causing damage to the structures.

A-5.4 Blasting Within Certain Limits

No blasting shall be allowed for any of the excavation until freshly placed concrete of nearby structures has reached a minimum strength of 7 Mpa.

Normally, blasting shall be resorted to only after 7 days of concreting work in case of OPC (10 days in case of PPC) in adjacent structures.

In no case shall blasting be allowed closer than 15m to any structure after placement of concrete has started.

When minor blasting is necessary after placement of concrete has started in any structure, the maximum size of charge for distance from 100m and above shall be limited to the following:

Distance in m	Safe particle velocity 10 mm/sec. Charge in kgs per delay	Safe particle velocity 3 mm/sec. Charge in kgs per delay.
100	10.7	2.06
150	24.02	5.8
200	43.0	10.03
250	67.3	23.2
300	96.9	23.2
350	131.9	31.6
400	172.3	41.2
450	218.2	52.2
500	269.3	64.5

Any deviation in the above recommended limits will be adopted only after the specific approval of the Engineer. The contractor shall submit the scheme with charges and delays proposed to be used for blasting for approval of the Engineer.

It is generally recommended that where the blasting is to be done, within 20 m of the nearest point of permanent building, the area shall be line drilled on periphery before blasting.

The Contractor shall be responsible for all damage caused by blasting whether to permanent or temporary structures and shall replace or repair the structures at his own cost.

A-5.5 Precautions After Blasting

After the blast, the supervisor must carefully inspect the work and satisfy himself that all the charges have exploded. After the blast takes place in underground works, the workmen shall not be allowed to go to the face till toxic gases have disappeared from the face.

If it is suspected that part of the blast has failed to fire or is delayed, sufficient time shall be allowed to elapse before entering the danger zone. When fuse and blasting caps are used, a safe time should be allowed and then the supervisor alone shall leave the shelter to inspect the blasting zone.

None of the drillers are to work near the misfired hole until one of the two following operations have been carried out by the Supervisor:

Either (i) the Supervisor should very carefully (when the tamping is of damp clay) extract the tamping with a wooden scraper or jet of water or compressed air (using a pipe of soft material) and withdraw the fuse with the primer and a fresh detonator with fuse should be placed in these holes and fired out, or (ii) the hole may be cleared of 30 cm of tamping and its direction then be ascertained by placing a stick in the hole. Another hole may then be drilled at least 60 cm away and parallel to it and about 30 cm less in depth, this hole shall then be charged and fired. The balance of the cartridges and detonators found in the muck shall be removed.

Before leaving his work, the Supervisor of the concluding shift shall inform the Supervisor of the relieving shift of any case of misfires and should point out the position with a red cross denoting the same and also stating what action, if any, he has taken in the matter.

The Supervisor should also at once report at the office of the Contractor and the Engineer all cases of misfire, the cause of the same and what steps were taken in connection with these.

The names of the day and night shift supervisors must be noted daily in the Contractor's office.

If a misfire has been found to be due to a defective detonator of dynamite the whole quantity or box from which the defective article was taken, must be thoroughly inspected by the Contractor.

Drilling in holes not completely exploded by blasting shall not be permitted.

A-5.6 Personnel

Excavation by blasting shall be permitted only under the personal supervision of competent and licensed blasters and trained workmen.

All supervisors and workmen in-charge of preparation, handling, storage and blasting work shall be adequately insured by the Contractor.

Storage shall be in charge of a very reliable person approved by the Engineer who may, if necessary conduct police enquiries as to his reliability, antecedents etc. The contractor shall have to produce a security for the person in-charge of the explosives, if and when required by the Engineer, of the civil authorities of the district.

The Contractor shall make sure that his supervisors and workmen are fully conversant with all the rules to be observed in storing, handling and use of the explosives. It shall be ensured that the supervisor-in-charge is thoroughly acquainted with the details of the handling of explosives and blasting operations.

A-6 REFLECTIVE PAVEMENT MARKERS (ROAD STUDS)

A-6.1 General

Reflective pavement marker (RPM) or road stud is a device which is bonded to or anchored within the road surface for lane marking & delineation for night time visibility. It reflects incident light in directions close to the direction from which it came.

A-6.2 Definition

Coefficient of luminous intensity (OIL) or specific intensity- The ratio of luminous intensity of the retro reflector in the direction of observation to illuminance at the retro reflector on a plane perpendicular to the direction of the incident light expressed in terms of millicandel as per incident lux (mcd / lx).

Horizontal entrance angle- The angle in the horizontal plane between the direction of incident light and the normal to the leading edge of the marker.

Observation angle-The angle at the reflector between the illumination axis and the observation axis.

Retro-reflection- Reflection in which the radiation is returned in direction close to the direction from which it came, this property being maintained over wide variations of the direction of incident radiation.

Head- That part of the road stud which is above the road surface when the road stud is

fixed in position in the road.

Upper Surface- That part of the external surface of the road stud which is visible when the road stud is fixed in position in the road.

Anchorage- That part of a road stud which is below the road surface when the road stud is fixed in position in the road.

A-6.3 Material

Plastic body of RPM / road stud shall be moulded from ASA (Acrylic Styrene Acrylonitrile) or HIPS (High- Impact Polystyrene) or ABS or any other suitable material approved by the Engineer. The marker shall support a load of 13635 kg tested in accordance with ASTM D4280. Reflective panels shall consist of number of lenses containing single or dual prismatic cube capable of providing total internal reflection of the light entering the lens face. Lenses shall be moulded of methyl methacrylate conforming to ASTM 0788 or equivalent.

A-6.4 Design

The slope or retro reflecting surface shall preferably be $35 \pm 5^\circ$ to base. The area of each retro reflecting surface shall not be less than 13.0 sq.cm.

A-6.5 Optical performance

A-6.5.1 Unidirectional

Each reflector or combination of reflectors on each face of the stud shall have a CIL not less than that given in table below:

Entrance angle	Observation angle	CIL in mcd / lx for white
0° U 5° L&R	0.3°	220
0° U 10° L&R	0.5°	120

Note: - The entrance angle of 0° U corresponds to the normal aspects of the reflectors when the reflecting road stud is installed in horizontal road surface.

A-6.5.2 Tests

Co-efficient of luminance intensity can be measured by procedure described in ASTM E809 "Practice For Measuring Photometric Characteristics" or as recommended in BS: 873 Part IV— 1973.

Under test conditions, a stud shall not be considered to fail the photometric requirements if the measured OIL at any one position of measurement is less than the values specified in table provided that;

- (i.) the value is not less than 80% of the specified minimum, and
- (ii.) the average of the left & right measurements for the specific angle is greater than the specified minimum.

A-6.6 Fixing of reflective markers

A-6.6.1 Requirements

- (i.) The enveloping profile of the head of the stud shall be smooth and the studs shall not present any sharp edges to traffic.
- (ii.) The reflecting portions of the stud shall be free from crevices or ledges where dirt might accumulate.
- (iii.) All road studs shall be legibly marked with the name, trade mark or other means of identification of the manufacturer.

- (iv.) Marker height shall not exceed 20 mm.
- (v.) Marker width shall not exceed 130 mm and shall not be less than 100 mm.
- (vi.) The base of the marker shall be flat within 1.3 mm. If the bottom of the marker is configured, the outer most faces of the configuration shall not deviate more than 1.3 mm from a flat surface.

A-6.6.2 Placement

The reflective marker shall be fixed to the road surface using the adhesives and the procedures recommended by the manufacturer. No nails shall be used to affix the marker as nails are hazardous for the roads.

Regardless of the type of adhesive used, the markers shall not be fixed if the pavement is not surface dry and the surfacing has not been open to traffic for a period of not less than 14 days.

The portions of the highway surface, to which the marker is to be bonded by the adhesive, shall be free of dirt, curing compound, grease, oil, moisture, loose or unsound layers, paint and any other material which would adversely affect the bond of adhesives.

Use a wire brush, if necessary to loosen & remove dirt, then brush or blow clean.

The adhesive shall be placed uniformly on the cleaned pavement surface or on the bottom of the marker in a quantity sufficient to result in complete coverage of the area of contact of the marker with no voids present and a slight excess after the marker has been lightly pressed in place.

For epoxy installations, excess adhesive around the edge of the marker excess adhesive on the pavement and adhesive on the exposed surfaces of the markers shall be immediately removed. Soft rags moistened with mineral spirits or kerosene may be used if necessary to remove adhesive from exposed faces of pavement markers.

A-6.7 Warranty & Durability

The contractor shall obtain from the manufacturer a two year in-field test / evaluation report for performance as per the table mentioned above and submit to the Engineer. In addition, a two year warranty for satisfactory in-field performance of the finished road marker shall also be given by the contractor who carries out the work of fixing of reflective road markers. In case the markers are displaced, damaged, get worn out or lose their reflectivity compared to stipulated standards, the contractor would be required to replace all such markers within 15 days off the intimation from the Engineer at his own cost and with no extra remuneration to be paid for such work.

A-6.8 Measurement for payment

The measurement of reflective road markers shall be in numbers of markers supplied and fixed.

A-6.9 Rate

The contract unit rate for reflective road markers shall be payment in full compensation for furnishing all labour, material, tools, equipment including all incidental costs necessary for carrying out the work at site conforming to the specifications complete as per approved drawings or as directed by the Engineer.

A-7 HIGH MAST LIGHTING

A-7.1 Scope

This work consists of providing and erecting a high mast pole with sodium vapor lamp and other accessories at the locations approved by the Engineer.

A-7.2 General Requirement

The layout of masts, their height and spacing shall be fixed in consultation with the Engineer so that the minimum illumination level of 20 lux at the road level is achieved.

The lighting system comprises of 30m high hot dip galvanised mast designed to withstand forces exerted with wind speeds of 180 km per hour with 3 second gust, as per IS:875 (Part 3)-1978, fitted with a base flange, door at the base of mast with heavy duty internal lock, lantern carriage, suitable winching arrangement for safe working load of 750 kg and high powered electrically driven power tools for raising and lowering of lantern carriage, flexible 8 core electric cable, lightning conductor, ear thing terminal, and fixing 2 nos aviation obstruction lights on top of the mast.

The lamp shall be sodium vapour of 1000 W.

A-7.3 Measurement and Rates

It is a specialized work and the Contractor shall arrange to provide detailed design and drawings as incidental to the work. The Contract unit rate shall include all labour, equipment required to erect the mast, material and technical expertise required to complete the work as per these specifications. This shall include the minimum one year warranty for free service repair except for sodium vapor lamp.

The work shall be measured and paid in number of high mast pole and lamp assembly.

A-8 STRUCTURAL STEEL WORK

A-8.1 General

A-8.1.1 This specification covers the fabrication and transportation to site and erection on prepared foundations and structural steel work consisting of beams, columns, vertical trusses, bracings, shear connections etc.

8.1.2 Fabrication, erection and approval of steel structures shall be in compliance with:

-These General Specifications and IS: 800 - 1984

-Design Drawings and supplementary drawings to be supplied to the contractors during execution of the work

8.1.3 Providing shop primer coat for steel structures. Grouting of holding-down bolt pockets and below base plates where required.

8.1.4 In case of conflict between the Clauses mentioned here and the Indian Standards, those expressed in this specification shall govern.

8.2 Scope

8.2.1 The fabrication and erection of the steel work consists of accomplishing of all jobs here-in enumerated including providing all labour, tools and plant all materials and consumables such as welding electrodes, bolts and nuts, oxygen and acetylene gases, oils for cleaning etc. of approved quality as per relevant IS. The work shall be executed according to the drawings, specifications, relevant codes etc. in an expeditious and workman like manner, as detailed in the specifications and the relevant Indian Standard Codes and Standard Practice and to the complete satisfaction of the Engineer-In-Charge.

8.3 Fabrication Drawings

8.3.1 The contractor shall prepare all fabrication and erection drawings on the basis of design drawings supplied to him and submit the same in triplicate to the Engineer-In-Charge for review, Engineer-In-Charge shall review and comment, if any, on the same. Such review, if any, by the Engineer-In-Charge, does not relieve the contractor of any of his

required guarantees responsibilities. The contractor shall however be responsible to fabricate the structural strictly conforming to specifications and reviewed drawings.

8.3.2 Fabrication drawings shall include the following:

- Member sizes and details
- Types and dimensions of welds and bolts
- Shapes and sizes of edge preparation for welding
- Details of shop and field joints included in assemblies.

Bill of material

- Quality of structural steels, welding electrodes, bolts, nuts and washers etc. to be used.
- Erection assemblies, identifying all transportable parts and sub-assemblies, associated with special erection instructions, if required.
- Calculations where asked for, for approval.

8.3.3 Connections, splices etc. other details not specifically detailed in design drawings shall be suitably given on fabrication drawings considering normal detailing practices and developing full member strengths. Where asked for calculations for the merit shall also be submitted for approval.

8.3.4 Any alternate design or change in section is allowed when approved in writing by the Engineer-In-Charge.

8.3.5 However if any variation in the scheme is found necessary later, the contractor will be supplied with revised drawings. The contractor shall incorporate these changes in his drawings at no extra cost and resubmit for review.

8.3.6 Engineer-in-Charges/Consultants review shall not absolve the contractor of his responsibility for the correctness of dimensions, adequacy of details and connections. One copy will be returned reviewed with or without comments to the contractor for necessary action. In the former case further three copies of amended drawings shall be submitted by the contractor for final review.

8.3.7 The contractor shall supply three prints each of the final reviewed drawings to the Engineer-In-Charge within a week since final review, at no extra cost for reference and records.

8.3.8 The Engineer-In-Charge will verify the correct interpretation of their requirements.

8.3.9 If any modification is made in the design drawing during the course of execution of the job, revised design drawings will be issued to the contractor. Further changes arising out of these shall be incorporated by the contractor in the fabrication drawings already prepared at no extra cost and the revised fabrication drawings shall be duly got reviewed as per the above Clauses.

8.4 Materials

8.4.1 Rolled Sections

The following grades of steel shall be used for steel structures :

Structural steel will generally be of standard quality conforming to IS: 226. Whenever welded construction is specified plates of more than 20 mm thickness will generally conform to IS: 2062.

8.4.2 Welding Materials

Welding electrodes shall conform to IS: 814.

Approval of welding procedures shall be as per IS: 823.

8.4.3 Bolts, Nuts & Washers

Bolts and nuts shall be as per IS: 1367 and tested as per IS: 1608. It shall have a minimum tensile strength of 44 Kg/mm² and minimum elongation of 23% on a gauge length of 5.65 (A-Original cross sectional area of the gauge length). Washers shall be as per IS: 2016.

8.4.4 All materials shall conform to their respective specifications. The use of equivalent or higher grade or alternate materials will be considered only in very special cases subject to the approval of the Engineer-in-Charges in writing.

8.4.5 **Receipt & Storing of Materials**

Steel materials supplied by the contractor must be marked for identification and each lot should be accompanied by manufacturer's quality certificate, conforming chemical analysis and mechanical characteristics.

All steel parts furnished by supplier shall be checked, sorted out, straightened, and arranged by grades and qualities in stores.

Structural's with surface defects such as pitting, cracks, laminations etc. shall be rejected if the defects exceed the allowable tolerances specified in relevant standards or as directed by the Engineer-In-Charge.

Welding wire and electrodes shall be stored separately by qualities and lots inside a dry and enclosed room, in compliance with IS: 816 - 1969 and as per instructions given by the Engineer-In-Charge. Electrodes shall be perfectly dry and drawn from an electrode even, if required.

Checking of quality bolts of any kind as well as storage of same shall be made conforming to relevant standards.

Each lot of electrodes, bolts, nuts, etc. shall be accompanied by manufacturer's test certificate.

The contractor may use alternative materials as compared to design specification only with the written approval of the Engineer-In-Charge.

8.4.6 **Material Tests**

The contractor shall be required to produce manufacturer's quality certificates for the materials supplied by the contractor. Notwithstanding the manufacturer's certificates, the Engineer-In-Charge may ask for testing of materials in approved test houses. The test results shall satisfy the requirements of the relevant Indian Standards.

Whenever quality certificates are missing or incomplete or when material quality differs from standard specifications the contractor shall conduct all appropriate tests as directed by the Engineer-In-Charge at no extra cost.

Materials for which test certificates are not available or for which test results do not tally with relevant standard specifications, shall not be used.

8.5 **Fabrication**

Fabrication shall be in accordance with IS: 800 Section V in addition to the following:

Fabrication shall be done as per approved fabrication drawings adhering strictly to work points and work lines on the same. The connections shall be welded or bolted as per design drawings. Work shall also include fabricating built up sections.

Any defective material used shall be replaced by the contractor at his own expense, care being taken to prevent any damage to the structure during removal.

All the fabricated and delivered items shall be suitably packed to be protected from any damage during transportation and handling. Any damage caused at any time shall be made good by the Contractor at his own cost.

Any faulty fabrication pointed out at any stage of work shall be made good by the contractor at

his own cost.

8.5.1 **Preparation of Materials**

Prior to release for fabrication, all rolled sections warped beyond allowable limit shall be pressed or rolled straight and freed from twists, taking care that a uniform pressure is applied.

Minor warping, corrugations etc. in rolled sections shall be rectified by cold working.

The sections shall be straightened by hot working where the Engineer-In-Charge so direct and shall cooled slowly after straightening.

Warped members like plates and flats may be used as such only if wave like deformation does not exceed $L/1000$ but limited to 10 mm (L-Length).

Surface of members that are to be jointed by lap or fillet welding or bolting shall be even so that there is no gap between overlapping surfaces.

8.5.2 **Marking**

Marking of members shall be made on horizontal pads, of an appropriate racks or supports in order to ensure horizontal and straight placement of such members. Marking accuracy shall be at least ± 1 mm.

8.5.3 **Cutting** Members shall be cut mechanically (by saw or shear or by oxyacetylene flame). All

sharp, rough, or broken edges, and all edges of joints which are subjected to tensile or oscillating stresses, shall be ground.

No electric metal arc cutting shall be allowed.

All edges cut by oxyacetylene process shall be cleaned of impurities prior to assembly.

Cutting tolerances shall be as follows:

- a) For members connected at both ends ± 1 mm.
- b) Elsewhere ± 3 mm.

The edge preparation for welding of members more than 12 mm thick shall be done by flame cutting and grinding. Cut faces shall not have cracks or be rough. Edge preparation shall be as per IS: 823 - 1964.

8.5.4 **Drilling**

Bolts holes shall be drilled.

Drilling shall be made to the diameter specified in drawings.

No enlarging of holes filling, by mandrolling or oxyacetylene flame shall be allowed.

Allowed variations for holes (out-of-roundness, eccentricity, plumb-line deviation) shall be as per IS: 800.

-Maximum deviation for spacing of two holes on the same axis shall be ± 1 mm.

-Two perpendicular diameters of any oval hole shall not differ by more than 1 mm.

Drilling faults in holes may be rectified by reaming the holes to the next upper diameter, provided that spacing of new hole centers and distance of hole centers to the edges of members are not less than allowed and that the increase of hole diameter does not impair the structural strength. Hole reaming shall be allowed if the number of faulty holes does not exceed 15% of the total number of holes for one joint.

8.5.6 Preparation of Members for Welding

Assembly of structural members shall be made with proper jigs and fixtures to ensure correct positioning of members (angles, axes nodes etc.)

Sharp edges, rust of cut edges, notches, irregularities and fissures due to faulty cutting shall be chipped or ground or filled over the length of the affected area, deep enough to remove faults completely.

Edge preparation for welding shall be carefully and accurately made so as to facilitate a good joint.

Generally no special edge preparation shall be required for members under 8 mm thick.

Edge preparation (beveling) denotes cutting of the same so as to result in V, X K or U seam shapes as per IS: 823.

The members to be assembled shall be clean and dry on the welding edges. Under no circumstances shall wet, greasy, rust or dirt covered parts be assembled. Joints shall be kept free from any foreign matter likely to get in to the gaps between members to be welded.

Before assembly the edges to be welded as well as adjacent areas extending for at least 20 mm shall be cleaned (until metallic polish is achieved).

When assembling members, proper care shall be taken of welding shrinkage and distortions, as the drawing dimensions cover finished dimensions of the structure.

The elements shall be got checked and approved by the Engineer-In-Charge or their authorized representative before assembly.

The permissible tolerances for assembly of members preparatory to welding shall be as per IS: 823-1964.

After the assemble has been checked, temporary tack welding in position shall be done by electric welding, keeping in view finished dimensions of the structure.

8.5.7 Welding procedures

Welding shall be carried out only by fully trained and experienced welders as tested and approved by the Engineer-In-Charge. Any test carried out either by the Engineer-In-Charge of their representative or the inspectors shall constitute a right by them for such tests and the cost involved thereon shall be borne by the contractor himself.

Qualification tests for welders as well as tests for approval of electrodes will be carried out as per IS: 823. The nature of test for performance qualification of welders shall be commensurate with the quality of welding required on this job as judged by the Engineer-In-Charge.

The steel structures shall be automatically, semi-automatically or manually welded.

Welding shall begin only after the checks mentioned in Clause 7.5.1 to 7.5.6 have been carried out.

The welder shall mark with his identification mark on each element welded by him. When welding is carried out in open air, steps shall be taken to protect the face of welding against wind or rain. The electrodes, wire and parts being welded shall be dry.

Before beginning the welding operation, each joint shall be checked to ensure that the parts to be welded are clean and root gaps provided as per IS: 823.

For continuing the welding of seams discontinued due to some reason, the end of the discontinued seam shall be melted in order to obtain a good continuity. Before resuming the welding operation, the groove as well as the adjacent parts shall be well cleaned for a length of approx. 50 mm.

For single butt welds (in V, 1/2 V or U) and double butt welds (in K, double U etc.) the re-welding of the root is mandatory but only the metal deposit on the root has been cleaned by back gouging or chipping.

The welding seams shall be left to cool slowly. The contractor shall not be allowed to cool the welds quickly by any other method.

For multi-layer welding, before welding the following layer, the formerly welded layer shall be cleaned metal bright by light chipping and wire brushing. Backing strips shall not be allowed.

The order and method of welding shall be so that -

- No unacceptable deformation appears in the welded parts.
- Due margin is provided to compensate for contraction due to welding in order to avoid any high permanent stresses.
- The defects in welds must be rectified according to IS: 823 and as per instruction of Engineer-In-Charge.

8.5.8 Weld Inspection

The weld seams shall satisfy the following :

- shall correspond to design shapes and dimensions.
- shall not have any defects such as cracks, incomplete penetration and fusion, undercuts, rough surfaces, burns, blow holes and porosity etc. beyond permissible limits.

During the welding operation and approval of finished elements, inspections and tests shall be made as shown in annexure-B.

The mechanical characteristics of the welded joints shall be as in IS: 823.

8.5.9 Preparation of Members for Bolting

The members shall be assembled for bolting with proper jigs and fixtures to sustain the assemblies without deformation and bending.

Before assembly, all sharp edges, shavings, rust dirt, etc. shall be removed.

Before assembly, the contacting surfaces of the members shall be cleaned and given a coat of primer as per IS: 2074.

The members which are bolt assembled shall be set according to drawings and temporarily fastened with erection bolts (minimum 4 pieces) to check the co-axiality of the holes.

The members shall be finally bolted after the deviations have been corrected, after which there shall not be gaps.

Before assembly, the members shall be checked and got approved by the Engineer-In-Charge.

The difference in thickness of the sections that are butt assembled shall not be more than 3% or maximum 0.8 mm whichever is less. If the difference is larger, it shall be corrected by grinding or filling.

Reaming of holes to final diameter or cleaning of these shall be done only after the parts have been check assembled.

As each hole is finished to final dimensions (reamed if necessary) it shall be set and bolted up. Erection bolts shall not be removed before other bolts are set.

8.5.10 Bolting up

Final bolting of the members shall be done after the defects have been rectified and approval of joints obtained.

The bolts shall be tightened starting from the centre of joint towards the edge.

8.5.11 Planning of Ends

Planning of ends of members like column ends shall be done by grinding when so specified in the design.

Planning of butt welded members shall be done after these have been assembled, the spare edges shall be removed with grinding machines or files.

The following tolerances shall be permitted on member that have been planed.

- On the length of the member having both ends planed, maximum ± 2 mm with respect to design.
- Level differences of planed surfaces, maximum 0.3 mm.
- Deviation between planed surface and member's axis maximum 1/1500.

8.5.12 Holes for Field Joints

Holes for field joints shall be drilled in the shop to final diameters and tested in the shop, with trial assemblies.

When three-dimensional assembly is not possible in the shop, the holes for field joints may be drilled in shop and reamed on site after erection, on approval by the Engineer-In-Charge.

For bolted steel structures, trial assembly in shop is mandatory.

The tolerance for spacing of holes shall be ± 1 mm.

8.5.13 Tolerances

All tolerances regarding dimensions, geometrical shapes and sections of steel structures, shall be as per Annexure B, if not specified in the drawing.

8.5.14 Marking for Identification

All elements and members prior to dispatch for erection shall be shop marked.

The members shall be visibly marked with a weather proof light colored paint. The size and thickness of the numbers shall be chosen as to facilitate the identification of members.

For the small members that are delivered in bundles or crates, the required marking shall be done on small metal tags securely tied to the bundle, while the crates shall be marked directly.

Each bundle or crate shall be packed with members for one and the same assembly; in the same bundle or crate, general utility members such as bolts, quests etc. may be packed.

All bill of materials showing weight, quality and dimension of contents shall be placed in the crates.

The members shall be marked with a durable paint, in a visible location, preferably at one end of the member so that these may be easily checked during storage and erection.

All members shall be marked in the shop before inspection and acceptance.

When the member is being painted, the marking area shall not be painted but bordered with white paint.

The marking and job symbol shall be registered in all shop delivery documents (transportation, for erection etc.)

8.5.15 Shop Test Pre-assembly

For steel structures that have the same type of welding the shop test pre-assembly shall be performed on one out of every 10 members minimum.

For bolted steel structures, shop test pre-assembly is mandatory for all elements as well as for the entire structure in conformity with Clause 5.12.

8.6 Shop Inspection and Approval

8.6.1 General

The Engineer-In-Charge or their representative shall have free access at all responsible times to the contractor's fabrication shop and shall be afforded all reasonable facilities for satisfying himself that the fabrication is being undertaken in accordance with drawings and specifications.

Technical approval of the steel structure in the shop by the Engineer-In-Charge is mandatory.

The contractor shall not limit the number and kinds of tests, final as well as intermediate once, or extra tests required by the Engineer-In-Charges.

The contractor shall furnish necessary tools, gauges, instruments etc. and technical non-technical personnel for shop tests by the Engineer-In-Charge, free of cost.

8.6.2 Shop Acceptance

The Engineer-In-Charge shall inspect and approve at the following stages:

The following approvals may give in shop:

- Intermediate approvals of work that cannot be inspected later.
- Partial approvals
- Final approvals

Intermediate approval of work shall be given when a part of the work is preformed later:

- Cannot be inspected later
- Inspection would be difficult to perform and results would not be satisfactory.

Partial approval in the shop is given on members and assemblies of steel structures before the primer coat is applied and includes :

- Approval of materials
- Approval of field joints
- Approval of parts with planed surfaces
- Test erection
- Approval of members
- Approval of markings
- Inspections and approvals of special features, like Rollers, loading platform mechanism etc.

During the partial approval, intermediate approvals as well as all former approvals, shall be taken in to consideration.

8.6.3 Final approval in the Shop

The final approval refers to all elements and assemblies of the steel structures, with shop primer coat, ready for delivery from shop to be loaded for transportation, or stored.

The final approval comprises of :

- Partial approvals
- Approval of shop primer coat
- Approval of mode of loading and transport
- Approval of storage (for materials stored)

8.7 Painting and Delivery

8.7.1 Preparation of parts for shop painting

Painting shall consist of providing one coat of red oxide zinc chromate primer to steel members before dispatch from shop.

Primer coat shall not be applied unless :

- Surface have been wire brushed, cleaned of dust, oil, rust etc.
- Erection gaps between members, spots that cannot be painted or where moisture or other aggressive agents may penetrate, have been filled with an approved type of oil and putty.
- The surface to be painted are completely dry.
- The parts where water of aggressive agents may collect (during transportation, storage, erection and operation) are filled with putty and provided with holes for drainage of water.
- Members and parts have been inspected and accepted
- Welds have been accepted.

The following are not to be painted or protected by any other product:

- Surface which are in the vicinity of joints to be welded at site.
- Surfaces bearing markings
- Other surfaces indicated in the design.

The following shall be given a coat of hot oil or any approved resistant lubricant only.

- Planed surfaces
- Holes for links

The surfaces that are to be embedded or in contact with the concrete shall be given a coat of cement wash.

The surfaces which are in contact with the ground, gravel or brick work and subject to moisture shall be given bituminous coat.

The other surfaces shall be given a primer coating.

Special attention shall be given to locations not easily accessible, where water can collect and which after assembly and erection cannot be inspected, painted and maintained. Holes shall be provided for water drainage and in accessible box type sections shall be hermetically sealed by welds.

As per schedule of quantities, the contractor shall paint further coats of red-oxide & two or more coats of synthetic enamel paint including touch up of the shop primer after erection and placing in position of the steel structures.

8.7.2 **Packing, transportation, delivery**

After final shop acceptance and marking, the item shall be packed and loaded for transportation.

Packing must be adequate to protect item against warping during loading and unloading.

Proper lifting devices shall be used for loading, in order to protect items against warping.

Slender projecting parts shall be braced with additional steel bars, before loading, for protection against warping during transportation.

Loading and transportation shall be done in compliance with transportation rules. If certain parts cannot be transported in the lengths stipulated in the design, the position and type of additional splice joints shall be approved by the Engineer-In-Charge.

Items must be carefully loaded on platforms of transportation means to prevent warping, bending or falling during transportation.

The small parts such as fish plates, quests etc. shall be securely tied with wire to their respective parts.

Bolts, nuts and washers shall be packed and transported in crates. The parts shall be delivered in the order stipulated by the Engineer-In-Charge and shall be accompanied by document showing :

- Quality and quantity of structure or members
- Position of member in the structure
- Particulars of structure
- Identification number job symbol.

8.8 **Field Erection**

8.8.1 The erection work shall be permitted only after the foundation or other structure over which the steel work will be erected is approved and is ready for erection.

8.8.2 The contractor shall satisfy himself about the levels, alignment etc. for the foundations well in advance, before starting the erection. Minor chipping etc. shall be carried out by the contractor on his expense.

8.8.3 Any faulty erection done by the contractor shall be made good at his own cost.

8.8.4 Approval by the Engineer-In-Charge or their representatives at any stage of work does not relieve the contractor of any of his required guarantees of the contract.

8.8.5 **Storage and preparation of parts prior to erection**

The storage place for steel parts shall be prepared in advance and got approved by the Engineer-In-Charge before the steel structures start arriving from the shop.

A platform shall be provided by the Contractor near the erection site for preliminary erection work.

The contractor shall make the following verifications upon receipt of material at site.

- for quality certificates regarding materials and workmanship according to these general specifications and drawings.
- Whether parts received are complete without defects due to transportation, loading and unloading and defects, if any, are well within the admissible limit.

For the above work sufficient space must be allotted in the storage area.

Steps shall be taken to prevent warping of items during unloading.

The parts shall be unloaded, stored and stored so as to be easily identified.

The parts shall be stored according to construction symbol and markings so that these may be taken out in order or erection.

The parts shall be at least 150 mm clear from ground on wooden or steel blocks for protection against direct contact with ground and to permit drainage of water.

If rectification of members like straightening etc. are required, these shall be done in a special place allotted which shall be adequately equipped.

The parts shall be clean when delivered for erection.

8.8.6 **Erection & Tolerances**

Erection in general shall be carried out as required and approved by the Engineer-In-Charge.

Positioning and leveling of the structure, alignment and plumbing of the stanchion and fixing every member of the structure shall be in accordance with the relevant drawings and to the complete satisfaction of the Engineer-In-Charge.

The following checks and inspection shall be carried out before during and after erection.

- damage during transportation

- accuracy of alignment of structures
- erection according to drawings and specifications
- progress and workmanship.

In case there be any deviations regarding positions of foundations or anchor bolts, which would lead to erection deviations, the Engineer-In-Charge shall be informed immediately. Minor rectifications in foundations, orientation of bolts holes etc. shall be carried out as part of the work, at no extra cost.

The various parts of the steel structure shall be so erected so to ensure stability against inherent weight, wind and erection stresses.

The structure shall be anchored and final erection joints completed after plan and elevation positions of the structural members have been verified with corresponding drawings and approved by the Engineer-In-Charge.

The bolted joints shall be tightened so that the entire surface of the bolt heads and nuts shall rest on the member. For parts with sloping surfaces tapered washers shall be used.

8.9 Final acceptance and handing over the structure

8.9.1 At acceptance, the contractor shall submit the following documents :

- Shop and erection drawings - either in tracings or reproducible.
- 4 copies of each of the following :
 - shop acceptance documents
 - Quality certificate for structural's, plates, etc. (electrodes, welding wire, bolts, nuts, washers etc.)
 - List of certified welders who worked on erection of structures.
 - Acceptance and intermediate control procedure of erection operations.

8.9.2 Approval by the Engineer-In-Charge at any stage of work does not relieve the contractor of any of his required guarantees of the contract.

8.10 Method of Payments

8.10.1 Payment for steel work shall be made on basis of admissible weight of the structure accepted, the weight being determined as described in such Clause 7.10.2 below:

The rate for supply, fabrication and erection, shall include cost of all handling and transportation to Owner's store/site of work where supply and fabrication only are involved, trimming, straightening, edge preparation, preparation and getting reviewed of fabrication drawings, and providing one or more coat of Red-oxide zinc chromate primer as specified in the schedule of quantity.

In the case, Owner supplies materials the rate shall include cost of steel materials taking delivery of the materials, from owner's store all handling and rehandling, loading and unloading, transport to site or work, returning of surplus materials to owner's stores etc. complete as well as the cost of all handling and transport, scaffolding, temporary supports, tools and tackles, touching up primer coat, grouting etc.

- 8.10.2 The actual lengths installed shall be measured and the weight of structural material/plate shall be calculated wherever necessary on the basis of IS handbook. If sections are different from IS section, then manufacturers handbook shall be adopted. No allowance in weights shall be made for rolling tolerance.
- 8.10.3 Sections built out of plates, structural shall be paid on the actual weight incorporated except for gussets which will be paid on the weight of the smallest rectangle enclosing the shape. No deductions shall be made for skew cuts in rolled steel sections.
- 8.10.4 Welds, bolts, nuts, washers, etc. shall not be measured. Rate for structural steel work shall be deemed to include the same.
- 8.10.5 No other payment either for temporary works connected with this contract or for any other item such as welds, shims, pacing plates etc. shall be made. Such item shall be deemed to have been allowed for in the rate quoted for steel work.
- 8.11 **Grouting of Pockets**
- 8.11.1 Grouting of pockets and under base plates will be done only after the steel work has been leveled and plumbed and the bases of stanchions are supported by steel shims. The space below the base plate and pockets shall be thoroughly cleaned.
- 8.11.2 The mortar used for grouting shall not be leaner than 1:2 (1 cement : 2 sand) (grade 300 in case of concrete) and shall be mixed to the minimum consistency required. It shall be poured under suitable head and tamped until the space has been completely filled.
- 8.12 **Tolerances allowed in the erection of plant building without cranes** The maximum tolerances for line and level of the steel work shall be ± 3.00 mm on any part of the structure. The structure shall not be out of plumb more than 3.5 mm on each 10 M. section of height and not more than 7.0 mm per 30 M. section.
- These tolerances shall apply to all parts of the structure unless the drawings issued for erection purposes state otherwise.
- 8.13 All the Structural steel shall be painted with one coat of shop primer, one coat of field primer and two coats of synthetic enamel finish paints. The DFT for Primer and finish paint shall be as per Manufacturer's specification.

ANNEXURE – A

INSPECTION

Inspection	Coverage	Procedure	Evaluation findings and remedy of defect
Inspection of weld seam appearance	All welds	Naked eye or lens	All faulty welds shall be rectified.
Checking of sizes	At least one for each weld seam	Ordinary measuring instruments (rule, templates)	Should faulty weld be found all welds shall be checked & all defects shall be rectified.
Mechanical tests for welding procedure performance and electrodes		As per IS : 823	As per IS : 823

ANNEXURE - B

INADMISSIBLE WELD DEFECTS AND TOLERANCE ALLOWED FOR WELDS

Defects	Detailing of sketching of defects	Allowed tolerance and remedy of defects	Cause of defects	Mode of finding defects
Unsatisfactory appearance	uneven width rugged	at discretion cut weld & reweld	uneven welding progress, voltage fluctuations, varying Arc length, negligence, inexperience welder	external (visual) inspection
Unsatisfactory shape	shallow or jutting welds	No variance from design shape shall be allowed	negligence	Visual inspection template checking.
Incomplete weld		not allowed fill in weld		template checking
Molten metal flow		not allowed fill in weld	excessive melting wrong handling of electrode.	visual inspection
Pits		not allowed cut & reweld	wrong welding technique	visual inspection
Surface cracks		not allowed cut & reweld	Great stresses, sudden cooling, wrong type of electrode.	visual inspection
Incorrect Sectional Dimensions a) Depth		b1 = ± 2mm b2 = ± 2mm b = ± 1mm c = ± 1mm	negligence	Template checking
b) Weld		Chisel & grind		

Insufficient	For weld lengths 11 + 5mm for 12 + 10mm for shorter seams cut and reweld or complete to length	Negligence	Rule checking
Back cuts	if 0.5mm for 10mm & C 1mm for 10mm replace relevant members	Burned material excessive melting	Visual Inspection
Surface porosities	Max. 5% of weld seam area cut and reweld	Frequent interruptions or welding electrodes inadequately covered	Visual inspection

INADEQUATE APPEARANCE OF WELD MAY BE ALLOWED IF NO OTHER DEFECTS THAT MIGHT DIMINISH WELD STRENGTH ARE PRESENT. SECTIONAL WELD SHAPE MUST COMPLY WITH DESIGN INDICATIONS. NO CONCAVE WELDS SHALL BE ALLOWED FOR SPECIFIED CONVEX WELDS, OR VICE VERSA. TOLERANCE FOR CONCAVITY OR CONVEXITY OF WELDS SHALL BE $1 \times a$ ("a" BEING THE HEIGHT OF THE TRIANGLE WITHIN THE SECTION SHOWN), BUT NOT MORE THAN 0.6 mm.

GENERAL NOTES FOR STRUCTURAL STEEL WORKS

1. The rates for all items under this section include :
 - a) Steel forging, reducing to required shape, size and figure, drilling, tapping, counter sinking for screws, filling etc. and satisfactory workmanship required to fabricate, finish, erect and fix in position, all structural steel and iron in a good and perfect manner.
 - b) Providing all bolts and nuts including holding down and anchor bolts, round, squared or tapered washers, anchor plates, rivets, packing pieces, gusset plates, cleats, wedges, brackets, separators etc. (net weight to be computed and paid).
 - c) All wastage's and cut pieces.
 - d) Welding as per specifications and drawings but weight of welds not to be paid.
 - e) Weight of various members to be taken as standard ISI weights. No allowances being made for rolling margins in steelwork.
 - f) Providing all spikes, nails, service bolts, clamps, jigs etc.
 - g) Making all necessary templates, patterns moulds and platforms for layout etc.
 - h) All smithy work, unloading, getting in, hoisting, erecting and fixing in position at all heights and locations.
 - i) Painting two top coat of Red oxide primer before hoisting and erecting in position.
 - j) The steel shall be procured from the approved manufacturers.

Structural steel shall be procured from approved manufacturers. List of Approved Manufacturers is given below:

S. No.	Name of approved Manufacturers
	M/s. SAIL
	M/s. TISCO
	SAR

Piling works

A.9 Concrete Piles

Materials – General

Unless otherwise specified in this section all materials shall conform to the requirements specified in separate sections for Concrete, Formwork and Reinforcement. Minimum grade of concrete shall be as per month specifications. Minimum cement content for concrete in cast in place piles shall be as per Outline Design Specification.

Cement

The cement to be used for piling and all foundation work shall generally be OPC.

However, Portland slag cement conforming to IS: 455

Reinforcement

- a. The reinforcement shall be Fe 500 conform to the requirements specified in IS extending for the full length of the pile and shall project 60 times bar diameters above the cut off level or as specified in the drawing.
- b. The reinforcement shall be assembled before placing in the moulds and all hoops and links shall be of uniform length firmly wired into position. Ends of helical reinforcement shall be firmly secured. Diagonal fork spacers shall be of an noticed pattern. The cover to all bars shall be not less than 45 mm but increased cover thickness may be provided where piles are exposed to the action of harmful chemicals (as in the case of concrete in contact with earth faces contaminated with such chemicals), acid, vapour, saline atmosphere, sulphurous smoke (as in case of steam operated railways), etc, and such increase of cover may be between 15 mm and 50 mm beyond 40 mm as may be specified by the Contractor s Designer and given notice to the Employer s Representative.
- c. Joints in main longitudinal bars will be permitted only where each bar cannot be supplied in one complete length. Where permitted, staggered joints shall be provided at agreed centres, designed to develop the full strength of the bar across the joint, provided with adequate extra links or stirrups in position from those of adjacent longitudinal bars.
- d. Welding of cold worked high tensile requirement bars at joints in main longitudinal bars will not be permitted, unless given a notice by the Employer s Representative, in which case the requirements of IS: 9417 – 1989 shall be fulfilled. Welding of hot rolled high tensile steel bars shall be permitted provided the method used for the same will not adversely affect the properties of bars.

Casings and Tremie Pipes

The casings and tremie pipes shall be in mild steel. The temporary casing plates and permanent liners shall have adequate wall thickness and strength to withstand driving stresses, stresses due to soil pressure, etc. Without damage or distortion all joints shall be water tight. The internal diameter of the casing shall not be less than the nominal diameter of pile.

Cast In-Situ Bored Piles

General

- a. The Contractor shall check and notify to the Employer s Representative the casing position for each pile during and immediately after placing the casing. Piles shall be constructed in a sequence submitted in advance to the Employer s Representative. During boring, the Contractor shall take soil, rock or groundwater samples and transport them to an noticed testing laboratory or carry out soil tests in-situ. A complete record of the construction of each pile shall be kept by the Contractor and submitted to the Employer s Representative for his agreement.
- b. Diameters of the piles shall be the concrete shaft diameters and shall not be less than the diameters specified in the drawing and given notice by the Employer s Representative. Where enlarged bases are required, these shall be mechanically formed and concentric with the pile shaft to within a tolerance of two per cent of the shaft diameter and shall not be smaller than the required dimension. The sloping surface of the frustrum forming the enlargement shall make an angle not less than 55° to the horizontal.
- c. The diameters of piles shall be verified by Koden method or other methods given notice to by the Employer s Representative.
- d. These shall be formed by boring to the founding strata specified on the drawings or as directed at site. The sides of the boring shall be prevented from collapse by one of the following methods:
 - Providing permanent mild steel liner (cased pile)
 - Providing removable mild steel casing (uncased pile)

- e. In any event , permanent liners of not less than 8 mm thick shall be provided for at least 7m depth from bottom of the pile cap.
- f. An adequate temporary casing shall be used where required for ensuring stability of the strata near ground level until concrete has been placed in the pile. A pile excavation shall be backfilled without delay where a rapid loss of drilling fluid occurs and no further excavation at the location of that pile shall be carried out unless a notice is obtained from Employer s Representative.
- g. Where temporary casings or an alternative method for maintaining stability of a boring are used, these shall be subject to notice from the Employer s Representative. Temporary casings shall be free from distortion and of uniform cross-section throughout each continuous length. During concreting, they shall be free from internal projections, encrusted concrete or other materials to the satisfaction of the Employer s Representative. For minimum standards the length of such casing shall be as per IS: 2911 – 1979.
- h. Piles constructed in a stable cohesive soil without temporary casings or other form of support shall be bored and concreted without prolonged delay to the notice of the Employer s Representative.
- i. On completion of boring, loose, disturbed or remolded soil shall be removed from the base of the pile and prior to placing concrete. After each pile has been cast, any empty bore which may remain shall be protected and carefully backfilled as soon as possible to the notice of the Employer s Representative.

Boring

- a. Boring shall be done using Rotary hydraulic drilling rigs with oscillator arrangement/ equipments and methodology suitable for different kinds of strata encountered.
- b. As a general guideline, size of cutting tool shall in no case be less than the diameter of the pile minus 75mm. However the size of cutting tool shall be chosen by Contractor depending on the type of substrata and equipment employed by Contractor so that executable pile shall not have diameter less than nominal diameter of pile as specified in drawing. The Contractor shall also ensure that there is no reduction in poured concrete quantities. These calculations shall be based on consumption of concrete poured in bore (as recorded in pour log) and actual concrete required in bore on theoretical basis i.e. based on nominal diameter of pile and actual bore hole length (based on actual sounding of founding level). More than 5% reduction in consumption of poured concrete quantities in pile may be rejected.
- c. Use of drilling mud in stabilising sides of the pile borehole may also be necessary together with temporary or permanent casing wherever sub soil and ground water conditions are likely to cause mud flows or instability of pile bore or sand boiling. However, this will be permitted only when deemed necessary by the Employer s Representative. In such situations the properties of bentonite used & quality control shall be as per requirement given below.

Fresh Bentonite slurry shall satisfy the following properties at all times :

Mud density shall not exceed 1.05 g/cc
pH value 9 to 11.5

- d. The method of placing and the workability of the concrete shall be such as to ensure that a continuous monolithic concrete shaft of the full cross section is formed. The method of placing shall be given a notice to by the Employer s Representative and shall be carried out after inspection without such interruption as would allow the previously placed batch to have hardened. No contamination of the concrete by spoil, liquid or other foreign matter shall be allowed.

- e. Prolonged delays in the commencement of concreting after the completion of the boring shall not be permitted. The time interval between the completion of boring and placing of concrete shall not exceed 6 hours.
- f. The concrete shall have a minimum slump of 150mm. Suitable precautions shall be taken for prevention of segregation. Internal vibrators shall not be used unless the Contractor is satisfied that segregation will not result because of vibration and unless the method of use has been given notice by the Employer's Representative.
- g. The Contractor shall take all precautions to ensure that the mix and placing of the concrete does not result in arching of concrete in a casing. Slump measured at the time of discharge into the pile boring shall be in accordance with requirements as specified in IS:2911 Part I Section 2 – 1979. Internal vibrators shall not be used to compact concrete unless the Contractor is satisfied that no segregation or arching of the concrete will result.
- h. Where concrete is placed in dry borings, measures shall be taken to avoid segregation and bleeding and to ensure that the concrete at the bottom of the pile is not deficient in grout.
- i. The concrete for piles underwater or in drilling mud shall be placed with a tremie pipe. The tremie pipe shall not be less than 200mm diameter for 20mm aggregate.

Marsh Cone viscosity 30-40 seconds
 The sand content of Size > 0.075mm shall not be more than 1 percent.
 Liquid limit of bentonite shall not be less than 450 percent.
 Bentonite shall be saturated for minimum 24 hours before use.

When using bentonite mud, flushing shall be done with fresh bentonite slurry after lowering of reinforcement cage and tremie. The bottom of the hole shall be cleaned very carefully before concreting work is taken up. Cleaning / flushing methodology shall be submitted to Employer's Representative for his agreement prior to commencement of piling.

- j. Where mud flow conditions exist or the aggressive action of ground water is to be avoided, or in the case of piles built in flowing water or in cases where significant length of piles could be exposed due to scour – the casing should be left permanently in the ground
- k. Pumping from a bore hole shall not be permitted unless a casing has been driven into a stable stratum which prevents flow of external ground water from other strata in significant quantities.
- l. In case of end bearing piles founded on rock, cutting of rock shall be by hydraulic rig using diamond bits / conventional winches with chiseling. Scheme adopted shall be such that noise and vibration parameters specified in tender document /Environment manual are not violated. Drilling in rock shall be carried out by hydraulic rig using diamond bits
- m. On completion of boring, loose, disturbed or remolded soil shall be removed from the base of the pile and prior to placing concrete, each pile boring shall be inspected and given notice by the Employer's Representative. After each pile has been cast, any empty bore which may remain shall be protected and carefully backfilled as soon as possible to the satisfaction of the Employer's Representative.

Concreting

This should also satisfy requirements as per IS: 2911 Part I Section 2 – 1979. (Segregation free discharge into the water or drilling fluid within the limits as per international standard practices.) Before concreting is commenced, measures to remove any accumulation of silt or other material at the base of the pile or boring shall be taken by the Contractor. The joint between the hopper and tremie pipe as well as the joints in the tremie pipe

shall be water tight and the tremie pipes shall be thoroughly cleaned after each use.

It is essential that the water level within the pile bore be in equilibrium before commencement of concreting.

- a. The Contractor shall ensure that heavily contaminated drilling mud has not accumulated at the base of boring since this could impair free flow of concrete from the tremie pipe.
- b. If the specific gravity of the drilling mud at the base of the bore exceeds 1.20 the placing of concrete shall not proceed.
- c. The first charge of concrete shall be placed in the hopper over a sliding plate of the bottom of the hopper. The charge should be adequate in volume to ensure flushing action to prevent mixing of water or drilling mud and concrete.
- d. Alternatively floating plugs of noticed specification may be used before the first charge of concrete.
- e. The tremie pipe shall at all times penetrate the previously placed concrete for minimum depth of 2 m as a precaution against accidental withdrawal. The tremie pipe shall not be withdrawn until the completion of concreting. At all times a sufficient quantity of concrete shall be maintained within the pipe to ensure that the pressure from it exceeds that from the seepage water.
- f. Spot measurements shall be taken at suitable intervals to check that the tremie pipe has an adequate penetration into previously placed concrete.
- g. Concreting of the pile shall be in one single and continuous operation. In case of long piles of large diameter, large size mixers or more number of mixers shall be used so that the entire concreting operation is completed in not more than two hours.
- h. The top of concrete in a pile shall be brought above the cut-off level since the top concrete is loose and is weak because of contamination with water/drilling mud. This ensures good concrete at the cut-off level.
- i. Cut off level (COL) of piles (50mm inside the pile cap) shall be as indicated in working drawings or as given notice by Employer s Representative.
- j. In case of concrete being placed by tremie method and pile cut off level being less than 1.0meter below the ground level, concrete shall be cast to the piling platform level to permit overflow of concrete for visual inspection. In case COL of pile is more than 1.0 meter below working level then concrete shall be cast to a minimum of one meter above COL. Before concreting Contractor shall fixed the height above COL up to which the concrete is to be cast.
- k. In the circumstances where COL is below ground water level, the need to maintain a pressure should be observed & accordingly length of extra concrete above COL shall be determined by the Contractor and Employer s Representative s notice obtained before concreting.
- l. Any defective concrete in the head of the completed pile shall be cut away and made good with new concrete.
- m. When a casing is being extracted, sufficient quantity of concrete shall be maintained within the bore to ensure the pressure from external ground water and soil is adequately exceeded by the pressure of concrete. Otherwise necking of the pile may result.

- n. No concreting shall be placed in the bore once the bottom of the casing has been lifted above the top of concrete. While concreting the pile, the overflowing bentonite slurry from pile should be carefully pumped out to a water tight container/tank so that it does not spill over. The contaminated bentonite should be disposed off as per the methodology given notice by the Employer s Representative.
- o. After each pile has been cast any empty bore shall be protected by putting steel cage/Jali over it and carefully backfilled as soon as possible with approved materials.
- p. **Complete boring and concreting records shall be submitted to the Employer**

Representative for each pile. The records shall include the duration of concreting, tremie lengths (individual and cumulative), tremie pipe lengths removed, theoretical sounding, actual sounding ,actual lengths of pile concreted and the volume of concrete placed, cut off level , founding levels etc. For piles with temporary casings records of sequence of casing withdrawal and levels of concrete before and after withdrawal shall also be included in the reports.

Drilling Fluid

- a. Drilling fluid shall comprise bentonite complying with Specification IS:2720 - 1965, IS:2911 Part I Section 2 – 1979 Appendix „A or, DFCP 4 of the Oil Companies Materials Association or otherwise given notice by the Employer s Representative thoroughly mixed with clean fresh water to form a suspension meeting the specification requirements as submitted to and given notice by the Employer s Representative.
- b. The Contractor shall obtain manufacturers' certificates of the bentonite powder consigned to the Site giving properties of each consignment and shall submit them to the Employer s Representative prior to commencing the work and whenever required.
- c. The temperature of the water used in mixing the suspension shall not be lower than 5o C. Where saline or chemically contaminated groundwater occurs, special precautions to the notice of the Employer s Representative shall be taken to modify the bentonite suspension or prehydrate the bentonite in fresh water so as to make it suitable for pile construction.
- d. The frequency of testing drilling fluid and the method and procedure of sampling shall be proposed by the Contractor and given notice by the Employer s Representative prior to commencement of piling work. Such control tests on the bentonite suspension as are required or noticed by the Employer s Representative shall be carried out during the course of the piling work.
- e. Before concreting a pile, the Contractor shall take measures to remove any heavily contaminated bentonite suspension which could impair the free flow of concrete from the tremie pipe. A sample of the bentonite suspension shall be taken from the base of the boring using an noticed slurry sampling device and the specific gravity of the suspension should not exceed 1.20 as per standard practice and also as per IS:2911. Consistency of the 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 with the thicker mud suspension.
- f. All reasonable steps shall be taken to prevent the spillage of bentonite suspension on the Site in areas outside the immediate vicinity of boring. Discarded bentonite shall be removed from the Site without delay and any disposal thereof shall comply with the regulations of all appropriate controlling authorities.

Penalty on mishandling of bentonite

Mishandling of bentonite (like splashing of bentonite outside specified width of barricading or non cleaning of tyres of dumpers and transit mixers before leaving the piling site thereby making the road dirty etc.) is strictly prohibited .

Noncompliance of same shall attract a penalty as follows:

- I. On first observation – Rs One lac
- II. On Second observation – Rs Two lacs
- III. On third and each subsequent observation – Rs Three lacs

Alignment of Piles

Piles shall be installed as accurately as possible according to the drawings either vertically or to the specified batter. All deviations will be measured at the cut off level of the piles. The deviation from the true axis shall not be more than 1.5% for vertical piles and 4% for raker piles. Piles should not deviate in location by more than 75mm when used in groups. For single or two piles used under piers / columns, deviation shall not be more than 50mm.

The Contractor shall maintain a record of actual pile locations in the form of a drawing and submit the information to the Employer s Representative at suitable intervals.

Pile Cap

Pile caps shall be of reinforced concrete. A minimum offset of 200mm shall be provided beyond the outer faces of the outer most piles in the group. The clear cover for main reinforcement in the cap shall not be less than 60 mm. If the pile cap is in contact with earth at the bottom, a levelling course of minimum 75 mm thickness of PCC of grade M15 shall be provided or as shown in the drawings. Soil cover over pile cap shall be 1 m minimum.

The attachment of the pile head to the cap shall be adequate for the transmission of loads and forces. A portion of pile top may be stripped of concrete and the reinforcement anchored into the cap. Manual chipping may be permitted after three days of pile casting while pneumatic tools for chipping shall not be used before seven days after pile casting. The top of pile after stripping shall project at least 50mm into the pile cap. Concreting of the pile cap shall be carried out in dry conditions. Nothing extra will be paid for dewatering, etc. for carrying out pile cap excavation or providing concrete levelling course or building up pile cap and further substructure. Cost of all the operations and tools required for making the pile in dry condition is deemed to be included in the item.

The excavation area for the Piling / Pile cap shall be back filled and compacted and restored immediately but not later than 7 days after casting of the pile cap. Similarly the road surface should be repaired immediately after casting of column or completion of launching of superstructure (as the case may be but not later than 2 weeks). If the area is not back filled and/or road surface is not repaired, within the time frame as above, penalty will be imposed as decided by the Employer s Representative.

Pile testing

General

Load testing of Piles shall be in conformity with IS: 2911 (Part IV) – 1985.

Safety Precautions

1. General

When preparing for conducting a pile test the Contractor shall carry out the requirements of the various acts, orders, regulations and other statutory instruments that are applicable to the work for the provision and maintenance of safe working conditions, and shall in addition make such other provision as may be necessary to safeguard against any hazards that are involved in the testing or preparations for testing.

2. Personnel

All tests shall be carried out only under the direction and in presence of an experienced and competent supervisor conversant with the test equipment and test

procedure. All personnel operating the test equipment shall have been trained in its use.

3. Supervision and recording of results

Since the pile integrity testing involves high skill and use of computerized equipment, the tests shall be performed and interpreted only by trained and experienced personnel.

4. Defective Piles

The Employer's Representative reserves the right to reject any pile which in his opinion has not been constructed in accordance with the specifications.

5. As-Built Drawings

On completion of the work, the Contractor will submit a plan showing the exact location and length of each pile as constructed at site, as well as dates of concreting, cube test results etc. The original tracings of these drawings along with soft copies shall be submitted to the Employer's Representative.

Strands/ Steel for Prestressing

A.10 .a) The pre stressing steel shall confirm to either of the following:

- A) Plain hard drawn steel wire confirming to IS: 1785 (Part I) and IS: 1785(Part II)
- B) Cold drawn indented wire confirming to IS: 6003
- C) High tensile steel bar confirming to IS: 2090
- D) Uncoated stress relieved strands confirming to IS: 6006

A. 10. b) PSC Concrete

PRESTRESSED CONCRETE CONSTRUCTION

PSC Girder and Composite RCC Slab

PSC Girder may be precast or cast-in-situ as mentioned on the drawing or as directed by the Engineer. Girders may be post-tensioned or pre-tensioned. Where precast construction is required to be adopted, selection of casting yard and details of methodology and of equipment for shifting and launching of girders shall be included in the method statement.

In case of cast-in-situ construction, the sequence of construction including side shifting of girders, if applicable, and placing on bearings shall be in accordance with drawings.

The PSC girder constituting the top flange, web and the bottom flange shall be concreted in a single operation without any construction joint.

The portions of deck slab near expansion joints shall be cast along with reinforcements and embedment for expansion joints. For this purpose, the portion of deck slab near expansion joints may be cast in a subsequent stage, if permitted by the Engineer.

The surface finish of the deck slab shall be finished rough by true to lines and levels as shown on the drawings before the concrete has hardened. Care shall be taken for setting of bearings as indicated on the drawings.

Box Girder

Box girders may be simply supported or continuous. Simply supported box girders shall have minimum construction joints as approved by the Engineer. In the case of continuous box girders the sequence of construction and location of construction joints shall strictly follow the drawing.

The box section shall be construction with a maximum of one construction joint located in the

web below the fillet between the deck slab and web. If permitted by the Engineer, one additional construction joint may be permitted and this construction joint shall be located in the web above the fillet between the soffit slab and web.

The portions of deck slab near expansion joints shall be cast along with reinforcements and embedments for expansion joints. For this purpose, the portion of deck slab near expansion joints may be cast in a subsequent stage, if permitted by the Engineer.

The surface finish of the deck slab shall be finished rough but true to lines and levels as shown on the drawings before the concrete has hardened. Care shall be taken for setting of bearings as indicated on the drawings.

Cantilever Construction

Continuity of untensioned reinforcement from one segment to the next must be ensured by providing full lap length as necessary.

The design of the superstructure shall taken into account the following aspects which form an integral part of the construction operations:

- a) Stability against over-turning for each statical condition through which the assembly passes, shall be checked.
- b) Stresses at each preceding segment joint with the addition of every segment or change of statical conditions shall be checked. The load of equipment as well as construction live load shall be taken into account.
- c) Precambering of the superstructure during construction shall be done in such a manner that the finally constructed structure under permanent load attains the final profile intended in the drawings.

TOLERANCES

Precast Concrete Superstructure.

Variation in cross – sectional dimensions:

- | | | | |
|----|---|---|---|
| a) | Upto and including 2 m | : | ± 5 mm |
| | over 2m | : | ± 5 mm |
| b) | Variation in length overall and length between bearings | : | Shall not exceed ± 10mm or ± 0.1 per cent of the span length, whichever is lesser |
| c) | Permissible surface irregularities when measured with a 3 m strait edge or template | : | 5mm |

Cast-in-Situ Superstructure

- | | | | |
|----|--|---|---|
| a) | Variations in thickness of top and bottom slab for box girders, top and bottom flange for T-girders or slabs | : | -5mm to +10mm |
| b) | Variations in web thickness | : | -5mm to +10mm |
| c) | Variations in overall depth or width | : | ± 5mm |
| d) | Variations in length overall and length between bearings | : | Shall not exceed ± 10mm or ± 0.1 per cent of the span length, whichever is lesser |
| e) | Permissible surface irregularities when measured with a 3 m straight edge or template | : | 5mm |

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.

MEASUREMENTS FOR PAYMENT

Concrete in superstructure shall be measured in accordance with Section 1700, based on the quantity ordered or as shown on the drawings.

Steel reinforcement (untensioned) in superstructure shall be measured in accordance with Section 1600, based on the quantity ordered or as shown on the drawings.

High tensile steel (prestressing) in superstructure shall be measured in accordance with Section 1800, based on the quantity ordered or as shown on the drawings.

RATE

The contract unit rates for concrete, steel reinforcement (untensioned) and high tensile steel (prestressing) shall include all works as given in respective sections of these specifications and cover all incidental items for furnishing and providing superstructure as mentioned in this sections.

A.11 Stabilization using RBI Grade 81

Stabilization using RBI Grade 81

Stabilization using RBI Grade 81 (the process of improving the engineering properties of a material by means of the addition of RBI Grade 81) is subject to the quality of materials available and the impact of the environment (traffic, climate, etc.) on the structural design. Stabilization with RBI Grade 81 endeavors to increase the service life of the pavement of a project and reduce construction costs by improving the properties of substandard, locally

available marginal materials to comply with the relevant stabilization specifications.

2.1 Materials

a) Stabilizer agent, RBI Grade 81

Should be kept under cover and protected from moisture from the time of purchase to the time of use. If material has been left exposed to environmental elements, consult a RBI Grade 81 representative.

b) Soil or Gravel

It is preferable to stabilize a soil with a continuously smooth gradation curve from the maximum particle size to the smallest particle size with no excess or lack in certain particles. This will ensure better interlocking capabilities of the soil particles resulting in increased density and strength of the soil. It is recommended that the soil material have sufficient fine material (< 2.00 mm) to effectively stabilize the material with RBI Grade 81. This can be done by blending the appropriate locally available marginal materials e.g. Sand, Aggregate, Moorum etc.

2.2 Water

Water used should be free from harmful substances that may affect the setting and hardening process of the stabilizer. Water that is thought to encourage adverse reactions should be tested for compatibility with RBI Grade 81.

2.3 Construction procedures

The stabilization of soil requires the careful programming of several operations:

1. Pulverization, which may require initial scarifying
2. Spreading designed dosage of RBI Grade-81 stabilizer
3. Uniform mixing of soil, stabilizer and added water
4. Grading, Leveling, laying, compaction
5. Curing of the RBI Grade-81 stabilized layer

Efficient planning of the site operations is necessary to minimize the time between mixing and compaction. The periods of working should also be consistent with the climatic conditions and the capability of the construction equipments, to keep to a minimum, if any changes in moisture content and delays before compaction. Therefore moisture control has to be considered throughout the stabilization process. A good indication of the moisture content is to be found in the wheel tracks on the uncompacted mixture. If too dry for satisfactory compaction, the material in the tracks would crumble and crack; if too wet it would be easily moulded, deforming plastically. Close to the optimum moisture content the wheel tracks would have a dense, stiff surface. It is recommended that 8 – 12 tons vibrating rollers be used for the compaction effort. During shaping of the road initial compaction it is essential to build in a camber to prevent rainwater ponding on the road surface and the construction of side drains by shaping with a motor grader. The road should therefore have adequate cross-falls across the shoulders to the side drains to allow for easy run-off of the surface water into the adjacent side drains. See figures 1(a) and 1(b).

2.3.1 Preliminary investigation of underlying layer prior to start the stabilization work

- i) Stabilized layers should be constructed only where the underlying layer or foundation meets all specified requirements.

- ii) Before construction of any stabilized material or pavement layer as well as before any transported material for stabilization is dumped on the road, the underlying layer should be investigated to establish whether there is any damage, wet spots or other defects. Any defects to the layer should be rectified before the stabilized layer is constructed.
- iii) Where the stabilized layer is constructed on the floor of a pavement excavation or on the top of an existing pavement layer i.e. where the underlying layer has not been reworked or reconstructed, the floor of the excavation or the top of the existing pavement layer should first be watered and the compaction of the layer should be verified.

2.3.2 Preparing the layer

Road

levels shall be implemented to control (1) the shape of the road and (2) the specified stabilized layer height. To minimize surface irregularities it is recommended that the levels be set up at intervals of 10m or 20m apart.

The material to be stabilized should be placed, or in the case of an existing pavement layer, scarified to the full depth specified, broken down, watered if necessary and mixed to achieve a homogenous layer. Any oversize material should be removed. or broken down to -53mm on the road by means of a grid roller or recycler as the occurrence of large stones will influence (1) the quality of the finish and (2) the depth control due to the “pulling out” of the oversize rocks.

2.3.3 Applying the stabilizing agent, RBI Grade 81

- i) Prior to product application, dosage determination and soil testing should be performed under Section 3 Testing of materials and workmanship.
- ii) After the layer of soil or gravel has been prepared the stabilizing agent should be spread uniformly over the full area of the layer by means of an approved type of mechanical spreader or by manually using grid marking over the entire stretch.
- iii) If application is administered by manually, pockets or bags of stabilizing agent should be accurately spaced at equal intervals along the section to be stabilized so that the specified rate of application can be achieved. The stabilizing agent should be spread as evenly as possible and then be uniformly distributed over the entire surface by using wooden float.

2.3.4 Mixing in the stabilizing agent, RBI Grade 81

- i) Immediately after the stabilizing agent has been spread it should be mixed with the material to the full depth of treatment. Special attention should be taken not to disturb the compacted layer underneath and especially not to mix the stabilizing agent in below the desired depth. Mixing should continue for as long as necessary and repeated as often as required to ensure homogeneity and thorough mixing of the soil with RBI Grade 81 over the full area of the application site. Degree of pulverization shall be tested as per table below:

Degree of Soil Pulverization requirements for stabilization with RBI Grade-81

IS Sieve Designation	Minimum percentage passing by wt.
53mm	100
5.6mm	80

- ii) Mixing should be done by grader, disc harrow, rotary mixer (rotovator) or modern advanced stabilizers/recyclers over successive passes of the layer.

2.3.5 Watering

- i) Immediately after RBI Grade 81 has been properly mixed into the layer, the predetermined moisture content should be administered.
- ii) Each application or increment of water should be well mixed with the material so as to avoid concentration of water near the surface or in pockets within the layer.
- iii) Particular care should be taken to ensure satisfactory moisture distribution over the full depth, width and length of the section being stabilized and to prevent any portion of the work from getting excessively wet after the stabilizing agent has been added. The moisture content of the material and stabilizing agent should be the optimum moisture content (OMC) calculated at maximum dry density (Mod AASHTO density).
- iv) If any portion of the work becomes too wet after the stabilizing agent has been added. These portions should be allowed to dry out to the required moisture content and then be scarified, re-stabilized, re-compacted and finished off.
- v) The water supply and watering equipment should be adequate to ensure that all the water required is added and mixed with the material being treated within the prescribed period to enable compaction and finishing to be completed.

2.3.6 Shaping

The compacted layers should be adequately shaped (= 2-3% camber) to prevent standing water from scouring the completed work. The process of shaping should be completed by a competent and experienced motor grader operator and should be facilitated by shaping the road to reflect the required camber without excessive removal from or addition to the thickness of the layer. See fig 1(b) illustrating a 3% camber

2.3.7 Compaction

- i) Compaction should be carried out in a series of continuous operations covering the full width of the layer concerned. The length of any section of a layer being compacted shall, wherever possible, not be more than that can be properly compacted with the available equipment.
- ii) The type of compaction equipment to be used and the amount of rolling to be done should be such as to ensure that specified densities are obtained without damage being done to lower layer structures (see fig 1(c) "vibratory soil compactors.")
- iii) During compaction, the layer should be maintained to the required shape and cross section, and holes, ruts and laminations should be removed.
- iv) During compaction, loss of moisture from evaporation should be corrected by further light applications of water over the surface.
- v) During compaction of the stabilized layer and before final rolling the crust should be lightly scarified in order to prevent the formation of laminations near the surface of the layer.
- vi) The minimum compaction required shall be 100% of Mod AASHTO density for the stabilized layer and 97% of Mod. AASHTO density for the sub-base or immediate underlying layers.

- vii) During final compaction, field density determinations should be carried out to determine accurately the applied compaction effort and to ensure that the minimum compaction requirement is being obtained. Density testing should be carried out within 24-hours of compaction having been completed.
- viii) The use of vibratory rollers have been found to be very efficient for soils stabilized with RBI Grade 81 and the degree of compaction has a decisive influence on the quality as a density increase of $\pm 5\%$ will increase the strength with up to 50%. Vibratory tandem and self-propelled vibratory rollers of 8-12 tons at a roller speed of 3-5 km/hr and variable amplitude requires only 4 vibratory roller passes followed by 2 static roller passes to obtain a degree of compaction of between 95 – 100% for a 150mm layer thickness.
- ix) Vibratory compaction must be limited when stabilized layers are placed directly on top of a wet cohesive material as it may cause water migration to the surface and an increase in plasticity of the material.

2.3.8 Curing the stabilized work .

The main aim of curing the stabilized layer after final compaction by means of lightly watering the layer is to prevent the rapid evaporation of moisture out of the layer vital for the stabilizing effect and therein allowing sufficient strength gain to take place.

- i) After final compaction the stabilized layer should be protected against rapid drying out for a minimum of 3 days. Advanced setting and hardening especially in the upper or top zone of the layer can be reduced through continuously keeping the layer wet or damp by watering at frequent intervals. During this period the application of water should be controlled so that it will not unduly wet the layer but, at the same time, will not allow the layer to dry out. Layers allowed to dry out too quickly may adversely affect the stabilization mechanism.
- ii) During the curing period the stabilized layer should be protected against heavy rain and flooding. While a moderate amount of gentle rain on the stabilized, compacted surface will not harm the layer (and may in fact assist in the reaction), a heavier rainfall or flooding will erode the layer before it has had an opportunity to cure, and may otherwise interfere with the reaction

2.3.9 Construction limitations

- i) RBI Grade 81 should be applied only to a surface the size of which will permit all processing, watering, compacting and finishing to be completed within a single working day.
- ii) No stabilization shall be done during wet weather or windy conditions, which may adversely affect the stabilizing conditions.
- iii) Any rain falling on the working area during the process of stabilization may be sufficient cause to require re-commencement of the process.
- iv) No material for the stabilized layer may be placed if the underlying layer has been softened by excessive moisture.
- v) The minimum and maximum depths that should be stabilized in one section on a stable and compacted sub-base or underlying layer are as follows:

- *minimum: 75 mm*

- *maximum: 150 mm*

Depths in excess of 150 mm can be completed provided that the correct equipment and compactor is utilized that can achieve an effort large enough to compact the lower regions of the layer. Commonly, depths of more than the maximum of 150 mm should be constructed in

two separate layers in order to ensure that the minimum compaction requirement is obtained.

A.12 .Metallising Coat for Steel Girders of bridges

1. Inspection - General

The Inspecting Officer shall have free access to the works of the Contractor at all reasonable times and shall be at liberty to inspect the process of manufacture at any such time and to reject in whole or part, any work or material that does not conform to the provisions of this Specification and may order the same to be removed, replaced or altered at the expense of the Contractor. All gauges and templates necessary to satisfy the Inspecting Officer of the complete interchangeability of parts must be supplied by the Contractor free of cost.

2. Oiling, Painting and Metallising

No part of the work shall be painted or coated, packed or despatched, until it has been finally inspected and approved by the Inspecting Officer. Dry Film Thickness shall be measured by elcometer or any other approved method.

When so specified by the Purchaser, the whole of the work except machined surfaces shall be given protective coating using one of the systems of painting or metallising given in clauses 2.1 to 2.4. Prior to the application of protective coating , the surface of work shall be carefully prepared removing mill-scale, rust, etc. using wire brushes, sand or grit blasting as stipulated and approved by the Purchaser.

For locations where the girders are subjected to salt spray such as in close vicinity of the sea and/or over creeks etc. the protective coating by metallising with sprayed aluminium as given in the **Appendix I** followed by painting as per painting schedule given below may be applied:

- (i) One coat of etch primer to IS:5666.
- (ii) One coat of zinc chrome primer to IS:104 with the additional proviso that zinc chrome to be used in the manufacture of primer shall conform to type 2 of IS:51.
- (iii) Two coats of aluminium paint to IS:2339 brushing or spraying as required. One coat shall be applied before the fabricated steel work leaves the shop. After the steel work is erected at site, the second finishing coat shall be applied after touching up the primer and the finishing coat if damaged in transit.

3. For locations where girders are exposed to corrosive environment i.e. flooring system of open web girders in all cases, girders in industrial, suburban or coastal areas etc., protective coating by metallising followed by painting as mentioned in clause 2 or by painting using epoxy based paints as per the following painting schedule may be applied:

i) Surface Preparation a) Remove oil/grease from the metal surface by using petroleum hydrocarbon solvent to IS:1745. b) Prepare the surface by sand or grit blasting to Sa 2-1/2 to IS:9954 i.e. near white metallic surface. (ii) Painting (a) Primer Coat Apply by brush/airless spray two coats of Epoxy Zinc Phosphate primer to RDSO Specification No. M&C/PCN/102/86 to 60 microns min, dry film thickness (DFT) giving sufficient time gap between two coats to enable the first coat of primer to hard dry.

(b) Intermediate Coat Apply by brush/ airless spray one coat of Epoxy Micaceous Iron Oxide paint to RDSO Specification No. M&C/PCN/ 103/86 to 100 microns minimum DFT of 100 and allow it to hard dry. (c) Finishing Coat Apply by brush/airless spray two coats of polyurethane aluminium finishing to RDSO Specification No. M&C/PCN-110/88 for coastal locations or polyurethane red oxide (red oxide to ISO 446 as per IS:5) to RDSO Specification M&C/PCN-109/88 for other locations to 40 microns minimum DFT giving sufficient time gap between two coats to enable the first coat to hard dry. The finishing coats to be applied in shop and touched after erection if necessary.

4. For other locations, protective coating by painting as per painting schedule given below may be

applied:

a) Primer coat One coat of ready mixed paint zinc chrome priming to IS:104 followed by one coat of ready mixed paint red oxide zinc chrome priming to IS:2074. or Two coats of zinc chromate red oxide primer to IRS:P-31.

b) Finishing coat

Two finishing coats of red oxide paint to IS:123 or of any other approved paint shall be applied over the primer coats. One coat shall be applied before the fabricated steel work leaves the shop. After the steel work is erected at site, the second finishing coat shall be applied after touching up the primer and the finishing coat if damaged in transit

5. Where the life of protective coating is required to be longer to avoid frequent paintings, the problem of accessibility of locations and for other locations where metallising or epoxy based painting is recommended vide Clause 2 but there are no facilities available for the same, protective coating by painting as per following painting schedule may be applied with the approval of the Purchaser:

a) Primer coat One coat of ready mixed zinc chrome priming to IS:104 followed by one coat of zinc chrome red oxide priming to IS:2074.

b) Finishing Coat Two coats of aluminium paint to IS:2339 shall be applied over the primer coats. One coat shall be applied before the fabricated steel work leaves the shop. After the steel work is erected at site, the second coat shall be applied after touching up the primer and the finishing coat if damaged in transit.

6. Surfaces which are inaccessible for cleaning and painting after fabrication shall be applied one heavy coat of zinc chrome red oxide priming to IS:2074 before being assembled for rivetting/welding.

7. All rivets, bolts, nuts, washers etc. are to be thoroughly cleaned and dipped into boiled linseed oil to IS:77

8. All machined surfaces are to be well coated with a mixture of white lead to IS:34 and Mutton tallow to IS:887.

9. For site painting the whole of the steel work shall be given the second finishing coat after finally passing and after touching up the primer and finishing coats if damaged in transit.

10. Name Plate

A neat casting bearing the name of the Contractor, the place and year of manufacture, drawing number, the contract number and the standard of loading to be specified by the Purchaser shall be bolted conspicuously on each span. The drawing of the name plate shall be approved by the Engineer.

11. Erection Mark

Every portion of the work shall be distinctly stenciled with paint with letter size not less than 10 mm for guidance in the erection in the field, and stamped with the letters specified in the drawings. In the case of non-interchangeable work, the system of marking shall be in accordance with the drawings prepared by the tenderer and approved by the Purchaser.

12. Packing

12.1 All projecting plates or bars shall be kept in shape by timber or angle bars spiked or bolted to them, and the ends of the chord lengths, end posts and plate girders at their shipping joints shall be protected and stiffened so as to prevent damage or distortion in transit as the Inspecting Officer may direct.

12.2 All threaded ends and machined surfaces are to be efficiently protected against damage in transit. The parts shall be sent out in lengths convenient for transport.

12.3 All straight bars and plates except small pieces are to be sent out in convenient bundles temporarily rivetted or bolted together or bound with wrought iron or suitable wire as the Inspecting Officer may direct. All rivets, bolts, nuts, washers, plates under 300 mm square and small articles generally are to be packed separately for each span in cases each weighing, when full, not more than 350 kg, or in strong petroleum casks, or in barrels approved by the Inspecting Officer. If not entirely filled by the contents the space left shall be closely packed with wood shaving or other suitable material. Bolts and rivets of different sizes shall be separately packed in bags, each bag having a label indicating its contents. A list of the contents shall be placed in the top of each case or cask.

12.4 In the case of imported material all cases shall be made of 32mm boards with ends nailed with 90mm wire nails strengthened by battens and 38mmx 1.6mm (No. 16 BG) hoop -iron and made thoroughly secure for transit to India. All casks shall be in sound condition, and if not entirely filled by the contents the space left shall be closely packed with wood-wool or other suitable material. The heads shall be firmly secured by means of hoops in the usual way, and in addition each head shall be further secured by a strong wooden batten and not less than two strips of 1.6mm (No.16 BG) hoop-iron passing over the head and nailed to the staves on both sides. The hop-iron shall be long enough to pass over two hoops on each side of the cask and be nailed in such a manner that the hoops cannot slack back. Bolts and rivets of different sizes shall be packed in a separate canvas bags, each bag having a label in dictating its contents. End field holes to be bolted in case of members having split in plate and channels.

13. Despatch or Shipping Marks

13.1 Each package, case or bundle is to have clearly stencilled on it in good oil paint the address as stated in the order of contract, gross and net weight description of contents and such marks as may be required by the Purchaser must be shown against each item in the invoice. The Contractor is to provide necessary stencil plates for marking. Every piece of bundle shall be marked and in the case of material (shipped to India) all cases or casks shall be clearly cut or branded, not merely painted, with their net and gross weights and with such shipping marks and other particulars as the Inspecting Officer may direct and each bundle shall also have a metal label securely attached with wire stamped with similar marks. The marking shall be done with thick oil paint and in such a manner that it cannot be washed off or obliterated.

14. Loading

14.1 All trucks or wagons are to be loaded to as near their full capacity as is consistent with safe transport. While loading the material in wagon, truck or trailer, care should be taken that heavier material is loaded first and lighter material is kept on top so that lighter material is not damaged due to heavy weight. While transporting the material by road, adequate safety precautions shall be taken as per extant instructions.

14.2 The Contractor shall apply all dunnage and lashing required to hold the material securely in position free of charge.

14.3 While handling any girder or girder component it shall be ensured no damage to material takes place in the form of dent/cut mark etc. Wooden blocks, rubber pads shall be used to avoid direct contact 21 between materials to be handled and handling equipment.

15. Weight of Steel Work for Payment

15.1 Any steel work the weight of which differs by more than 2.5% from the calculated weight determined from the nominal weight of the sections shall be liable to rejection.

15.2 Payment shall be made on the tendered weight to be calculated in accordance with the nominal weight of the sections as specified on the contract drawings. An addition in weight for welds and rivet heads should either be specified in the schedule or be made as follows:

a) 3% in case of rivetted or composite (rivetted and welded) work; and b) 1 % in case of purely welded

work.

15.3 Should the actual weight fall short of the calculated weight by more than 2.5%, the material if accepted, will be paid for the actual weight only. Should the actual weight exceed the actual calculated weight, payment will be made for calculated weight only.

15.4 No separate payment shall be made for the items mentioned in clause 24.

15.5 In the event of a dispute arising as to the weight of a portion of steelwork, a weighment shall be made in the presence of the Inspecting Officer.

16. Quantities

16.1 In case where the estimated quantities are given with the schedule, it must be understood that the Purchaser will not be responsible for their accuracy and if the Contractor makes use of them in preparing his/her tender, he/she does so at his/her own risk, as he/she will not be entitled to make any claim or demand nor to raise any question whatsoever, on account of any error or miscalculations in or misunderstanding of the said quantities, as these are given for the convenience of the Purchaser.

17. Tracings and Printings

17.1 Excepting in the case of standard spans fabricated without any modifications to the standard drawings the Contractor shall supply free of charge, one set of neatly executed tracing on linen. They shall be fully dimensioned and contain all erection marks, notifications as to the colour the work has been printed, the name of the Contractor and any alterations from the contract drawings, which may have been made in executing the work. The drawings shall conform to standard sizes as given in IS:962 and shall not exceed AO size. The drawings shall not be folded but rolled outwards on a roller, in addition to three sets of full size copies on strong paper made by an approved process.

18. Rivets and Bolts Lists

18.1 The Contractor shall also supply, without charge, three complete lists of the rivets, bolts, service bolts, washers and drifts required for erecting the work at site, showing the parts of the work to which the various rivets and bolts belong and having each item marked so as to indicate the particular case in which it will be found.

19. Photographs

19.1 If required by the Purchaser the Contractor shall also supply without charge, two sets of large well-executed, unmounted photographs of the first span of each description of plate girder or truss bridge when erected, taken from two points 22 of view and showing the erection marking as clearly as possible Photographs of rolled beam, trough girder or trough plate girder bridges will not be required.

20. Attestation of Tracings etc.

20.1 The tracings, photographs and lists shall be examined and signed by the Inspecting Officer. They shall be supplied with the first instalment of the work delivered.

21. Inclusive Price

21.1 The cost of all painting, temporary erection and tests at the Contractor^s works, marking, packing and delivery F.O.R. or C.I.F. as called for in the schedule is to be included in the price named on the tender. The cost of erection at site, if done by the Contractor, is to be entered separately.

22. Deviations from this Specification

22.1 Should a tenderer desire to depart in any respect from the provisions of this Specifications either on account of manufacturing practice or for any other reasons, he/she must do so in an alternative tender which may not be considered, with a covering letter explaining in detail each and every departure he/she proposes to make from the Specification.

22.2 Manufacturer's standard specification may be submitted but all discrepancies must be carefully drawn attention to, both in covering letter and in appendices to be annexed to the specification.

22.3 The intention is to adopt manufacturer's standard equipment as far as possible but these standards must in all respects comply with the conditions of this Specification regarding safety from break-down, output, capacity, performance etc.

23. Alterations in Work

23.1 The Contractor shall not in any case or in any circumstances have authority to make any alterations in, modifications of, substitution for, addition to, or omission of work or any method or system of construction, unless an alteration order in writing directing such alteration, modification, substitution, addition, omission or change shall have been given by the Purchaser prior to the commencement of the work or part of work nor shall the Contractor be entitled to any payment for or in respect of any such alteration, modification, substitution, addition, omission or change may have been actually made and executed and no course of conduct shall be taken to be a waiver of the obligation and conditions hereby imposed.

23.2 All altered, modified, substituted, additional and changed work, labour and materials and all omitted work shall be valued by the Purchaser on the basis of the rates specified in the schedule.

APPENDIX - I

Specification for Metallising with Sprayed Aluminium for Bridge Girders

1. Surface Preparation The surface shall be thoroughly cleaned and roughened by compressed air blasting or centrifugal blasting with a suitable abrasive material in accordance with Clause 3 of IS:6586. Immediately, before spraying it shall be free from grease, scale, rust, moisture or other foreign matter. It shall be comparable in roughness with a reference surface produced in accordance with appendix A of IS:5905 and shall provide an adequate key for the subsequently sprayed metal coating

2. Metal Spraying The metal spraying shall be carried out as soon as possible after surface preparation but in any case within such period that the surface is still completely clean, dry and without visible oxidation. If deterioration in the surface to be coated is observed by comparison with a freshly prepared metal surface of similar quality which has undergone the same preparation, the preparation treatment should be repeated on the surface to be coated. The wire method shall be used for the purpose of metallising the diameter of the wire being 3mm or 5mm. Specified thickness of coating shall be applied in multiple layers and in no case less than 2 passes of the metal spraying unit shall be made over every part of the surface. At least one layer of the coating must be applied within 4 hours of blasting and the surface must be completely coated to the specified thickness within 8 hours of blasting.

2.1 Purity of Aluminium

The chemical composition of aluminium to be sprayed shall be 99.5% aluminium conforming to IS:2590.

2.2 Appearance Of The Coating

The surface of the sprayed coating shall be of uniform texture and free from lumps, coarse areas and loosely adherent particles.

2.3 Thickness Of The Coating

The nominal thickness of the coating shall be 150 μ(microns).The minimum local thickness, determined in accordance with procedure given in clause 3.1 below, shall be not less than 110 μ(microns).

3. Shop Painting

Any oil, grease or other contamination should be removed by thorough washing with a suitable thinner until no visible traces exist and the surfaces should be allowed to dry thoroughly before application of paint. The coatings may be applied by brush or spray. If sprayed, pressure type spray guns must be used. One coat of wash primer to IS:5666 shall be applied first. After 4 to 6 hours of the application of the wash primer, one coat of Zinc chrome primer to IS:104 with the additional proviso that zinc chrome to be used in the manufacture of primer shall conform to type 2 of IS:51 shall be applied. After hard drying of zinc chrome primer, one coat of Aluminium paint to IS:2339 (brushing or spraying as required) shall be applied. 36

4. Site Painting

After the steel work is erected at site a second cover coat of Aluminium paint to IS:2339 (brushing or spraying as required) shall be applied after touching up the primer and the cover coat given in the shop if damaged in transit

5. Method for the Determination of Local Thickness

5.1 Equipment Any magnetic or electro-magnetic thickness meter that will measure local thickness of a known standard with an accuracy of ± 10 percent.

5.2 Calibration of Instrument Calibrate and check the meter on one of the following standards(as appropriate): (I) (Applicable to magnetic and electro-magnetic meters other than the pull-off type) A soft brass shim ,free from burrs, in contact with the grit-blasted surface of the base metal prior to its being sprayed. The thickness of the shim shall be measured by micro meter and shall be approximately the same as the thickness of the coating. (ii) A sprayed metal coating of uniform known thickness approximately the same as the thickness of the sprayed coating to be tested, applied to a base of similar composition and thickness to the article being sprayed, grit-blasted in accordance with Clause 1.

5.3 Procedure For each measurement of local thickness, make an appropriate number of determinations, according to the type of instrument used. With instrument measuring the average thickness over an area of not less than 0.645 cm², the local thickness shall be the result of the one reading. With instruments having one or more pointed or rounded probes, the local thickness shall be the mean of three readings within a circle of 0.645 cm² area. With meters having two such probes, each reading shall be the average of two determinations with the probes reversed position.

6. Method Of Test For Adhesion Using a straight edge and hardened steel scribe which has been ground to a sharp 30 degree point, scribe two parallel lines at a distance apart equal to approximately 10 times the average coating thickness. In scribing the two lines, apply enough pressure on each occasion to cut through the coating to the base metal in a single stroke.

7. Inspection

7.1 Determination of Local Thickness

The minimum local thickness shall be determined by the method described above.

7.2 Adhesion

The sprayed metal coating shall be subjected to an adhesion test using the method described above. If any part of the coating between the lines breaks away from the base metal, it shall be deemed to have failed the test Articles, which have been rejected shall have the defective sections blasted clean of all sprayed metal prior to respraying. Where the rejection has been solely due to too thin a coating, sprayed metal of the same quality may be added provided that the surface has been kept dry and is free from visible contamination.

A.13 .Methodology for Protective Coatings for Sub Structures and Super Structures of bridges

Scope

This methodology covers the protective coatings for sub structures and super structures of bridges.

General

1. The area where coating needs to be done shall be made free from all other activities that could disrupt the installation of the system.
2. All the products specified in this document shall be installed strictly in accordance with the manufacturer's written instructions and by a specialist applicator approved by the manufacturer.
3. All products in the system shall be manufactured by Sika India Pvt Ltd, an ISO 9001 certified company and shall meet the key performance properties listed below against each. Should the applicator or contractor prefer to use alternative equivalent product(s), the Applicators shall provide proof of compliance to the specified key performance properties.
4. The applicator shall ensure that all products in the system are received in good condition without damage and stored as per manufacturer's instructions.
5. All products in the specified system shall be produced by a single manufacturer. Should the applicator or contractor prefer to use products from different sources they shall submit proof of compatibility between them.

The protective coating system for sub structures of bridges:

Providing and applying an acid resistant epoxy protective coating system using Sikagard 63 or Approved Equivalent at 300 microns thickness approximately (2 coats).

Product Description

Sikagard®-63 or Approved Equivalent is a solvent free, high build thixotropic epoxy resin based protective coating with high chemical resistance.

Priming

The concrete surface has to be primed with one coat of a water based, solvent free, odourless, epoxy resin protective coating Sikagard 67 or Approved Equivalent.

Application of Sikagard 63:

Mixing of Sikagard 63 or Approved Equivalent: Prior to mixing, stir Part A mechanically. When all of Part B has been added to Part A, mix continuously for 2 minutes until a uniform mix has been achieved. To ensure thorough mixing pour the material into another container and mix again to achieve a consistent mix. Over mixing must be avoided to minimise air entrapment. After mixing allow the material to stand for 3 minutes

Application of Sikagard 63:

Sikagard®-63, can be applied with a stiff brush or a short piled, solvent resistant roller over the plastered surface.

Epoxy Coating System

The complete system, therefore would be -

Nature of Application	Product	Coverage (M ²)
Priming	Sikagard 67 or Approved Equivalent	200 gms. per coat
Chem. Res Coating	Sikagard 63 or Approved Equivalent	600 gms. (2 coats)

The protective coating system for super structures of bridges:

Providing and applying a polyurethane resin based UV resistant protective coating system **Sikagard®-PU (UR) or Approved Equivalent** at 300 microns thickness approximately (2 coats).

Product Description

Sikagard®- PU (UR) or Approved Equivalent is a two component polyurethane resin based UV resistant protective coating system.

Priming

The concrete surface has to be primed with one coat of a water based, solvent free, odourless, epoxy resin protective coating **Sikagard 67 or Approved Equivalent**.

Application of Sikagard PU (UR):

Mixing of Sikagard PU (UR) or Approved Equivalent: Prior to mixing, stir Part A mechanically. When all of Part B has been added to Part A, mix continuously for 2 minutes until a uniform mix has been achieved. To ensure thorough mixing pour the material into another container and mix again to achieve a consistent mix. Over mixing must be avoided to minimise air entrapment. After mixing allow the material to stand for 3 minutes

Application of Sikagard PU (UR):

Sikagard®-PU (UR), can be applied with a stiff brush or a short piled, solvent resistant roller over the plastered surface.

Epoxy Coating System

The complete system, therefore would be -

Nature of Application	Product	Coverage (M ²)
Priming	Sikagard 67 or Approved Equivalent	200 gms. per coat

Protective Coating	Sikagard PU (UR) or Approved Equivalent	400 gms.(2 coats)
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TECHNICAL SPEIFICATION
ELECTRICAL HIGHWAY LIGHTING

Technical Specification-Electrical Highway Lighting (Single Arm)

Description

- CMH Road light luminaire with compact and stream lined appearance die cast aluminum housing and tempered curved glass

Specification & features

- Streamline & compact appearance
- Die-casting aluminum housing
- High reflectivity reflector, made with 99.90% purity anodized aluminum
- Tempered glass lens sealed with GE silicon sealing
- Maintenance without tools
- Adjustable bracket of pole arm.
- Passed 2G 3D 100,000 time vibration test
- Charcoal filter as option
- Anti-drop as option
- Lamp : CMH 35w, 70w, 100w,150w

Installation

- Suitable for outer diameter of pole of 42-48mm dia
- Installation angle can be adjusted from 0 degree, 10 degree and 20 degree vertically and horizontally.

Maintenance

- Tool less maintenance

Applications

- Roadway
- Gardern street
- Parking Lot

Compliance

- IP66 optics
- Class 1

Model	TECHNICAL DATA						
	Lamp Type	Nominal Voltage(V)	Mains current (A)	Ballast	Ignitor	Capacitor (Mfd)	PF
GE Lighting SPE07CM6E27WA Or Approved Equivalent	1 x 70W CMH- T	240	0.45	EM,70W CMH 240V- 50Hz	SIP,240V- 50Hz	12	0.85

Technical Specification-Electrical Highway Lighting (Double Arm)

Description

- Industrially designed road lighting luminarie suitable for 400W HPSV and MH tubular lamp

Specification & features

- Pressure die-cast aluminum housing provides long lasting structural reliability
- High purity anodized aluminum reflector provides superior lighting output and outstanding uniformity
- Tempered Glass with Silcon sealing
- Passed 2G 3 dimensional 100,000 times vibration test
- Metallic paint used over anti-corrosion premier for excellent housing finish and quality
- Standard color white aluminum RAL9006
- Optional charcoal filter provision
- Bi-level dimming gear system for energy saving

Installation

- In-built “ pole mounting spigot”
- Suitable for 60mm dia pole

Maintenance

- Easy maintenance and lamp replacement

Applications

- Highways
- Parking Lot & urban areas

Compliance

- IP66 optics
- Class 1

Model	TECHNICAL DATA						
	Lamp Type	Nominal Voltage (V)	Mains current (A)	Ballast	Ignitor	Capacitor (Mfd)	PF
GE Lighting COR40AS6EWA-M Or Approved Equivalent	1 X 400W HPSV/MH (ARC)-T	240	2.20	EM.40 0W HPSV 240V 50HZ	SIP 240V- 50Hz	42	0.85

DETAILS	30 Mtr. (A)
High Mast Shaft Material	As per BS EN10025
Cross sec.of mast in Polygon (No of Sides)	20
No of Sections	3
Material Thickness in mm	5,4,4
Length of individual sections (mm)	10500
Base dia & Top dia	532 / 150
Base plate thickness (mm)	30
Flange thickness (mm)	30
Metal protection treatment of fabricated mast section	Single dip Hot Dip Galvanised
Thickness of galvanization (Avg.)	86 Microns
Size of opening door at base (mm)	300 x 1000
PCD hold (mm) [Pitch Circle Dia.]	730
Baseplate Dia. (mm)	830 x 30
Number of foundation bolts	20
Material / Dia.of foundation bolts	Torr Steel M25
Length of foundation bolts	1200
Max. Wind pressure (Basic wind speed)	180 Km/hr. at max. 3 sec gust speed
Height above ground level at which above two factors are measured	THROUGHOUT THE MAST INCLUDING THE PROJECTED AREAS OF LUMINAIRES
Factor of safety for wind load	1.1
Factor of safety for other loads	1.2
Design safety factor	1.1
Dia.of Lantern carriage ring (mm)	1200
Lantern carriage ring construction	CHANNEL 75 X 40 X 4 mm thk / Sq. Tube 60 x 60 x 3.5 mm
No. of Luminaries (nos.)	12 Symmetrical arrangement
Buffer arrangement between Lantern carriage, ring carriage & mast	Rubber padded guide ring
Method of winch operation (Power Tool)	Manual / Power tool
DETAILS	30 Mtr.(A)
Motor Speed	1410 rpm
Number of speed	Single speed
Reversible / Non reversible	Reversible
Input supply	415 V 3 phase
Remote control switch	Supplied with 5 mtr control cable
Number of drums per winch	2
Capacity	SWL 750 Kg.
Lubrication arrangement	SELF LUBRICATION IN OIL BATH
Material of construction of gears	Phosphorus Bronze / EN 19
Wire rope type	SS
Number of ropes / thickness	3 nos / 6mm
Wire rope construction	6/7 x 19
Wire Rope Breaking load capacity	1800 Kg
Cable Type	PVC COATED MULTI-CORE ROUND / FLAT FLEXIBLE CABLE COPPER CORE
Conduction size	Multi core x 2.5 sq.mm
Timer switch	Optional