V.O.CHIDAMBARANAR PORT AUTHORITY, TUTICORIN

Civil Engineering Department

வ.உ.சி துறைமுக ஆணையம்
वी.ओ.सी पत्तन प्राधिकरण
V.O.C Port Authority
Global Connect

BID DOCUMENT

FOR THE WORK

"Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port"

(Through E-TENDERING CPP Portal only)

TENDER NOTICE NO:06CE/HMD/2024-25/D.3408 Date:09.12.2024.

The Chief Engineer,
Civil Engineering Department
V.O.CHIDAMBARANAR PORT AUTHORITY,
Tuticorin – 628004.
E-mail id: ce@vocport.gov.in

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1. NOTICE INVITING TENDER (NIT)

V.O.CHIDAMBARANAR PORT AUTHORITY

CIVIL ENGINEERING DEPARTMENT

Notice Inviting Tender (NIT)

(Only through E-Tendering Portal)

VOCPA E-Tendering Website: https://etenders.gov.in/eprocure/app

VOCPA Website: https://www.vocport.gov.in

NIT.No:06CE/HMD/2024-25/D.3408 **Date:09.12.2024**

Online tender is invited by V.O.Chidambaranar Port Authority, Tuticorin from registered civil contractors under organizations such as State/Central Government Departments/Public Sector Undertakings/ CPWD/National Highway Authority of India/Railway/Military Engineering Services/Major Ports for the following work.

i	Name of work	**Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port.**
ii	Estimate cost put to tender	**Rs.2,80,94,276/-** (Rupees Two Crore Eighty Lakhs Ninety Four Thousand Two Hundred and Seventy Six only)
iii	Earnest Money Deposit (EMD)	**Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** EMD payment made by the bidders should only pay through online payment gateway mode. Otherwise his/her/their tender will be rejected.
iv	Cost of tender document	Nil
v	Downloading of Tender from VOCPA online e-tendering website.	09.12.2024 to 23.12.2024 upto 15:00Hrs.
vi	Last Date and Time for submission of Tenders online.	23.12.2024 upto 15:00 Hrs.
vii	Online Technical bid opening date and time.	24.12.2024 at 15:30 Hrs.
viii	Period of completion	**Six Months**
ix	Validity of Tender	120 Days from the date of opening of technical bid.

Note: The tenderer shall attach the documentary evidence for the valid registration of Civil Engineering Contractor issued by the organizations as indicated in tender notice.

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2. Minimum qualifying criteria (MQC):

Firm /Company (hereinafter referred to as "The Tenderer") shall meet the Minimum Qualifying Criteria as follows:

A) Work Experience: The Tenderer shall have successfully completed the similar work during the last seven years ending up to **30th of NOVEMBER 2024**, with either the follows;

a) Three completed similar works, each similar work costing not less than – **Rs.1,12,37,710/-**

(Or)

b) Two completed similar works, each similar work costing not less than – **Rs.1,40,47,138/-**

(Or)

c)One completed similar work costing not less than-**Rs.2,24,75,421 /-**

Note:-

i. **Similar Works Means:*Construction of Rigid pavement/Bridge /RCC Culvert/RCC Drain.***

ii. *The work completion certificate should enclose with the document. If the work completion certificate furnished is from other than Government Departments by the bidder/tenderer the same shall be supported with TDS certificate (FORM-16A) issued by the Company/Agency where the work was executed for full executed amount of the work as main contractor otherwise such work experience shall not be considered.*

B) Financial Position: Average Annual Financial Turnover of the Tenderer during last three financial years (i.e) **2021-22, 2022-23** and **2023-24** shall be atleast **– Rs.84,28,283/-.**

3. General Conditions:

1. The tender documents and other relevant documents are required to be submitted only through e-tender mode offered in the website https://etenders.gov.in/eprocure/app.

2. The e-Tender will not be considered who have ongoing litigation against the VOCPA.

3. The EMD payment should made only through online payment gateway mode in CPP Portal, without which the Tender will not be considered. EMD in any other form will not be accepted.

4. The Ports reserves the rights to waive any formality thereof or to reject any or all the tenders without assigning any reason and not bound itself to accept the lowest tender.

5. The tenderer while uploading their document shall also upload the undertaking as ***Annexure-I*** instead of uploading of signed tender documents.

6. This Notice Inviting Tender shall form part of the contract agreement.

7. The tenderer shall furnish the GSTIN, PAN, ESI, EPF registration code document.

8. **Extra/ Additional Security Deposit (E/ASD) & Its Calculation:** Over and above the E.M.D, tenderer quoting rebate more than 15% on the cost of work put to tender shall have to pay an 'Extra / Additional Security Deposit (E/A.S.D) separately. E/ASD wherever applicable will be collected from the successful bidder along with the Initial Security Deposit (ISD) after issuing the Letter of Intent (LOI). Back-out from the offer by the successful bidder after issue/ receipt of LOI or non-deposit of E/ASD by the successful bidder will liable for forfeiture of EMD and debarment of the bidder from participating in any future tender of VOCPA. E/ASD may be accepted in form of RTGS/NEFT/any other e-mode payable V.O.Chidambaranar Port Authority, Tuticorin, Tamilnadu State, India or Bank Guarantee.

$$\text{Extra/Additional Security Deposit (E/A.S.D)} = \frac{A \times \text{cost of work put to tender}}{100}$$

Where A = Percentage rebate quoted on the cost of work put to tender by the tenderer minus 15 (Fifteen).

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Example: If the tenderer desires to quote percentage rebate 25% (Twenty five) percent, then the Extra/Additional Security Deposit (E/A.S.D) shall be worked out as under.

$$\text{E/A.S.D Amount} = \frac{(25 - 15) \times \text{cost of work put to tender}}{100}$$

Note: The RTGS/NEFT or Bank Guarantee shall be valid upto maintenance period of contract. The E.A.S.D will be released on satisfactory completion of the work/after completion of maintenance period.

09.12.2024

CHIEF ENGINEER

Copy to:

1. All Head of Department / VOCPA
2. Chief Vigilance Officer/VOCPA
3. The Superintending Engineer(C)

} Through mail

4. The Executive Engineer / PWD, Sivankoil Street, Tuticorin –2.
5. The Chief Engineer, Tuticorin Thermal Power Station, Tuticorin 4.
6. The IEM, VOCPA - Through Mail
   i) Shri. Trivikram Nath Tiwari, ILS (Retd.), 301-B, Block-3B, HIG DDA Flats, Rani Jhansi Road, DDA Complex, Motia Khan, New Delhi – 110 055.
   ii) Shri. Hermanprit Singh, IPS, (Redt.), 12, Belevedre Road, Alipore, Kolkata – 700 027.
7. Notice Board.

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SECTION – I

2. FORM OF TENDER

(Note: This Memorandum form part of the Tender)

To

The Chief Engineer,

V.O.Chidambaranar Port Authority,

Tuticorin - 628 004.

Tamil Nadu, INDIA.

Sir,

1. Having visited the site and examined the Drawings, conditions of Contract , specifications, Schedules and Bill of Quantities for the above named work, we offer to execute the work of "**Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port**" in conformity with the said drawings, conditions of Contract, Specifications, Schedules and Bill of Quantities for a sum quoted in this tender of the bill of quantities is to be executed.
2. We undertake, if our Tender is accepted, to achieve completion of the various sections of the works within the periods specified in this schedule.
3. If our Tender is accepted we will furnish a performance security in the form of irrevocable Bank Guarantee from a Nationalized Bank / Scheduled Bank having its branch at Tuticorin and payable at Tuticorin to be bound in a sum equivalent to 5% of the accepted Tender value approved by the Employer of the Contract.
4. We agree to abide by this tender for a period of 120 days from the date fixed for receiving the same or for such further period as may be mutually agreed upon and it shall remain binding upon us and may be accepted at any time before the expiration of that period or such further period as may be mutually agreed upon. If we fail to abide by our tenders during the above said period of three calendar months or such extended period as mutually agreed upon, the Port shall be at liberty to forfeit the Earnest Money Deposit paid by us.
5. Unless and until a formal Agreement is prepared and executed, this Tender, together with your written acceptance thereof, shall constitute a binding Contract between us.
6. We understand that you are not bound to accept the lowest or any Tender you may receive.
7. If our Tender is accepted we understand that we are held fully responsible for the due performance of the Contract.

8. We have furnished Earnest Money Deposit for an amount of **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** made by bidder should paid only through online payment gateway in CPP Portal mode, which is not to bear interest. If our tender is not accepted, the Earnest Money Deposit shall be returned to us on our application within 15 days after the date of award of contract. If our Tender is accepted the earnest money shall be adjusted against the Security Deposit at 5% of the Contract value as may be required for the faithful performance and proper fulfillment of the Contract and executed the Contract Agreement as required by the terms of this Tender.

9. We further agree that in addition to the Performance Security, Security Deposit as described in Sub-Clause 4.6.2.2 of the General conditions of Contract with good and faithful performance and proper fulfillment of the Contract, we shall permit the Port at the time of making any payment to us for work done under the Contract to deduct at the rate of 10% of the total value of the interim certificate from each interim certificate towards Security Deposit till 5% of the Contract sum is realized.

10. We agree to execute all the works referred to in the Tender documents upon the terms and conditions contained or referred to therein and to carry out such deviations as may be ordered.

Yours faithfully,

…….. Signature

In the capacity of

2.0 INSTRUCTIONS TO TENDERERS

2.1. E-Tenders are invited by V.O.Chidambaranar Port Authority in two Bid system (i.e,) Bid-I (Technical Bid), Bid-II (Price Bid) from resourceful, experienced and bonafide Contractors/ reputed firms for the work "**Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port".**

2.2. The **e-**tender will be opened on **24.12.2024 at 15.30 Hrs** in the Office of Executive Engineer.

2.3. The Tenderer is advised to acquaint himself with the job involved at the site, examine soil conditions, hydrological conditions, climatic conditions, availability of labour, quarry materials, equipments, means of transport, communication facilities, entry restrictions to the Port, being a custom bound secured area, laws and bye-laws of Government of Tamil Nadu or Government of India and any other statutory bodies and collect all information that may be necessary for preparing and submitting the Tender and entering into the contract.

2.4. The Tenderer shall bear all the costs of visiting the site, collecting the information and for preparing and submitting the Tender.

2.5. The Tenderer and or his workers and agents will be granted permission to visit the site for the purpose of inspection. The Tenderer will be fully responsible for any injury (whether fatal or otherwise) to himself or his workers and agents or for any loss or damage to property or for any other loss, damage, costs and expenses whatsoever caused which but for the granting of such permission would not have arisen. The Tenderer will be liable to indemnify the Employer against any loss or damage to the property of the Employer or neighboring property which may be caused due to any act of the Tenderer or his workers and agents.

2.6. The Tender prepared by the Tenderer, all documents and correspondence in respect of or in connection with the Tender and the work to be executed hereunder shall be in English Language only.

2.7.1. The Tenderer shall examine carefully, all instructions, General Conditions of Contract, Specifications, Bill of quantities, Scope of work, Drawings etc. and all documents issued along with and for the purpose of Tender, any amendments made thereto from time to time, conditions, nature of the ground and substrata, quantity and nature of work, materials necessary for the completion of work, the surface conditions, the hydrological and climatic conditions, means of access to the site, the existing roads and other means of communication, required pollution control measures in the working areas, and in general shall be deemed to have been examined and obtained all necessary information as to risks, contingencies and other circumstances which may

influence or affect his Tender. Failure to comply with the requirements of the Tender documents will be on Tenderer's own risks. Tenders which are not substantially responsive to the requirement of the Tender documents are liable to be rejected. The contract price shall not be subject to any adjustment in respect of raise or fall in the cost of labour, materials, fuels or any other matter affecting the cost of execution of the contract.

2.7.2. All Central and State Governments duties, taxes and levies payable by the Contractor under the contract or for any other cause, shall be included in the rates, prices and amounts submitted by the Tenderer.

2.8. Tenderer shall bear all costs for preparation and submission of his Tender. Employer will not be responsible for or pay for any expenses or losses which might be incurred or suffered by any Tenderer in connection with submission of Tender.

2.9. No Tender shall be considered which is not accompanied by an Earnest Money Deposit of **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** EMD payment made by the bidders should only through online payment gateway in CPP Portal mode. Otherwise his/her/their tender will be rejected. In the event of Tenderer withdrawing his Tender before the expiry of 120 days from the last date of submission of Tender, the Tender shall be cancelled and the amount payable by an Earnest Money Deposit shall become forthwith payable to Employer and decision of the Employer shall be final in that behalf. The Earnest Money Deposit of unsuccessful Tenderer will be released to other than L1 tenderer within 15 days from the date of award of contract. The Earnest Money Deposit in respect of successful Tenderer will be forfeited, if he fails to enter into a contract or furnish necessary performance security within 15 days from the date of award of contract. No interest shall be payable by the Employer on the EMD mentioned above.

2.10 The Tenderer shall furnish his Permanent Account Number (PAN), GST registration number if any along with the Tender. Xerox copies shall be furnished.

2.11. The Tenderer must use metric units in the specifications and on all the drawings.

2.12. The Tenderer shall quote realistic rates in respect of works to be executed by him. The rates shall be firm and final and no increase or decrease in prices will be allowed as mentioned in the General Conditions of Tender document. It must be clearly understood that the rates quoted in the tender are to include everything required to be done in the Notice inviting Tender, Instruction for Tendering, Tender Conditions of Contract, Specification, Bill of Quantities, Schedules and Drawings referred to therein and also for all such work as in necessary for the proper completion of the contract, although specific mention thereof may have been omitted. The rates are for finished

items of Works and should be inclusive of cost of all materials, labour, hire charges of Tools & Plant ladder, scaffolding and incidentals necessary for carrying out the works.

2.13. The Employer reserves the rights to reject all or any Tender or to accept any Tender in part or to annual the tendering process at any stage without assigning any reason & do not bind themselves to accept the lowest or any other Tender. No reasons will be assigned for the rejection of any Tender.

2.14. The Tender documents will not be issued to the Tenderers who have ongoing litigation against the V.O.Chidambaranar Port Authority. If such Tenderers submit the Tender documents downloaded from Port website, the same will not be considered and the amount paid towards cost of EMD will not be refunded.

2.15. The Tender shall remain valid and open for acceptance for a period of **120 days** from the last date fixed for receiving the same. The Employer reserves the rights to extend the period of validity for a specific time. The request and the response thereto shall be made in writing or by telegram or telex. The Tenderers will have an option to refuse the request without forfeiting his EMD. However, in the event of the Tenderer agreeing to the request, he will not be permitted to modify his Tender.

2.16 Documents to be submitted by the bidder:

2.16.1. To be eligible for award of contract, Tenderer shall provide evidences satisfactory to the employer of their eligibility and of their capability and adequacy of resources to carry out the subject contract effectively in addition to documents evidencing fulfillment of all the minimum qualifying criteria as stipulated in the "**Notice Inviting Tender".** The Tenderer shall also submit the following information.

a) Copies of Registration of Firm defining the constitution or legal status, place of registration and principal place of business of the company or firm or partnership.

b) Details of the experience and past performance of the Tenderer on works of a similar nature works during the past seven years ending upto **30th of NOVEMBER 2024**, and other contractual commitments in the format prescribed in **Schedule-C** of the Tender Documents.

c) Qualifications and experience of the key personnel proposed for administration and execution of the contract both on & off site, in the format prescribed in **Schedule-E** of the tender document.

d) List of Equipment of construction plant and equipment in the format prescribed in **Schedule-A.**

e) Reports on the financial standing of the Tenderer including profit and loss statements, balance sheets and auditor's reports for the past three years in **Schedule-F.**

f) Information regarding any current litigation in which the Tenderer is involved.

2.16.2. For determination of eligibility and responsiveness the Tenderer shall, in addition to satisfying the requirement of sub clause 2.16 also satisfy the following criteria.

The Tenderer shall meet all the following minimum qualifying criteria:

A) <u>Work Experience</u>: The Tenderer shall have successfully completed the similar work during the last seven years ending up to **30th of NOVEMBER 2024,** with either the follows;

a) Three completed similar works, each similar work costing not less than – **Rs.1,12,37,710/-**

(Or)

b) Two completed similar works, each similar work costing not less than – **Rs.1,40,47,138/-**

(Or)

c)One completed similar work costing not less than - **Rs.2,24,75,421 /-**

<u>Note:-</u>

(i)Similar Works Means: ***Construction of Rigid pavement/Bridge/RCC Culvert/RCC Drain.***

(ii)The work completion certificate should enclose with the document. If the work completion certificate furnished is from other than Government Departments by the bidder/tenderer the same shall be supported with TDS certificate (FORM-16 A) issued by the Company/Agency where the work was executed for full executed amount of the work as main contractor otherwise such work experience shall not be considered.

B) <u>Financial Position</u>: Average Annual Financial Turnover of the Tenderer during last three financial years (i.e) **2021-22, 2022-23 and 2023-24** shall be atleast **– Rs.84,28,283/-.**

2.17. At any time prior to the last date for submission of tenders, the Employer may for any reason what so ever, change or modify the Tender documents by amendments. The amendments so carried out will be forwarded to all the prospective Tenderers who have obtained the Tender documents. The amendment so carried out will form part of the Tender and shall be binding upon the Tenderers. The Employer may at his discretion extend the last date for submission of the tenders to enable the Tenderers to get reasonable time to submit their Tender after taking into consideration such amendments.

2.18. The Tenderer shall submit the entire content of the Tender and shall be without any alterations, erasures except those to accord with the instructions issued by the Employer or as may be necessary to correct errors made by the Tenderers. All such cancellations, alterations or amendments shall be signed / attested by person or persons signing the Tender.

2.19. The completed Tender shall be submitted only through e-tender mode offered in the website https://etenders.gov.in/eprocure/app.

Bid No. I & II

2.20 **Name of work: "Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port"** Both these BIDS shall be put together through e-tender not later than the prescribed time and date as per NIT. The Tender (Technical Bid) will be opened on the next day of last date of submission of bid on **24.12.2024** @ **15.30** hours. Date of opening of Bid–II of qualified Tenderers will be intimated later. If necessary, additional sheets may be added to the forms. Tenders are liable to be rejected if relevant details are not furnished as per enclosed formats and which do not meet the pre-qualification requirement as specified in the Tender notice.

The Tenderer may furnish along with his e-Tender any additional information which in his opinion will highlight his capability to perform and a covering letter declaring the offer to be unconditional confirming its validity for 120 days and a list of all documents submitted in the Bid I & II.

(A) Bid – I (Technical Bid)

It shall contain the following general information and Technical Proposals:

i. "Earnest Money Deposit" of **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** payment made by the bidders should only through online payment gateway in CPP Portal mode.

ii. Scanned Copies of original document defining the constitution or legal status, place of registration and principal place of business of the company or firm or partnership, duly attested by a Notary.

iii. Details of experience and past performance of the Tenderer of works of similar nature works within the past 7 years and details of current works on hand and other contractual commitments in the prescribed Forms respectively.

iv. The qualifications and experience of key personnel proposed for administration and execution of this contract, both on and off site, in the prescribed forms.

v. Major items of plant and equipment proposed for use in executing the contract is mentioned in the prescribed form.

vi. Reports on the financial standing of the Tenderer including profit and loss statement, balance sheets and auditor's report for the past three years in the prescribed form.

vii. The Tenderer may furnish Scanned copy of latest assessment of Income Tax return filed with IT Department.

viii. Construction schedule/Equipment schedule/Employment schedule: The Tenderer should give construction schedule keeping in view the overall time period, requisite equipments and labour to accomplish the job in the stipulated period.

ix) Information regarding any current litigation in which the Tenderer is involved.

x) The Tenderer has to meet all the minimum qualifying criteria. Relevant information supported by documentary evidence regarding fulfillment of the minimum qualifying criteria as stipulated in Notice Inviting Tender should be submitted along with the e-Tender.

xi) Scanned copy of Power of attorney for the person who is authorized to sign the Tender and carrying out the works when awarded.

xii) **Technical Proposal:**

The Tenderer should give the technical proposal indicating.

1. Detailed method of statement for carrying out the work inter-alia, indicating, the plant and equipment owned by them and plant and equipment they propose to arrange for this work.

i. The Mix temperature should be maintained as per MORT&H Specification by the contractor.

ii. The Hot Mix Plant (HMP) capacity of 100-120TPH shall be installed after award of work by the firm in the Port premises at contractor's own cost. Required area for installation of HMP will be allotted by the Port at free of cost. After completion of the work, the contractor should be removed the HMP within 7days from the date of completion. Failing which, the port will take over the plant and the same will be disposed by any auction method.

iii. Full Lab facilities to be provided adjacent to the Hot mix/Concrete Batching plant sites with lab assistant.

2. Tenderers own quality control management plan & details of testing equipment available with the Tenderer. Details of the field laboratory and back up facilities for testing should be specified.

3. If the Tenderer has carried out any work as specified in the eligibility criteria of NIT with Private Organizations, the tenderer has to produce certificate of deduction of Income Tax at source.

xiii) Covering letter declaring the offer to be unconditional confirming its validity for **120 days** and list of all the documents submitted in the Bid 1 & 2.

(B) Bid –II (Price Bid)

The second bid shall contain the Bill of Quantities as issued by the Port and duly completed indicating the rates for all items of Bill of Quantities (BOQ) and the total cost. It should not contain any conditions, clarifications but only rates and the total cost as specifically sought in the BOQ. Following may also be noted for strict compliance:

i. The Tenderer should quote for the work as per the Technical Specifications and scope of the work as specified in the e-Tender document.

(C) The Tenderer should note the following before submission of offer: Regarding work experience of Tenderer:

i. The work experience as for as a main contractor is acceptable and not as a sub-contractor.

ii. If the contractor has executed the work directly with any Government/Public Sectors, such executed works are considered as main contractor. If the contractor has executed the works in Private Sector, then they have to submit Tax Deduction at Sources (TDS) certificate.

iii. If the tenderer executed the work in private organization TDS deducted the percentage equivalent main contractor. Such cases are considered as main contractor. Work executed as Sub-Contractor will not be considered for evaluation of bids.

iv. The completed works only is considered for qualification. Partly completed works or works in progress shall not be considered for evaluation of bids.

v. Experience of the Tenderer for the completed works including material and workmanship shall be considered with respect to work order and respective work completion certificate issued by the concerned authority.

vi. If the tenderer have successfully completed the work (date of completion of work i.e physically / actually completion irrespective of maintenance period) during last 7 years ending last day of month previous to the one in which applications are invited irrespective of date of commencement / start of work. Such experience of work is also considered for evaluation in work experience.

vii. Once after submission/ uploading of the bid by the tenderer, it will not be permitted to withdraw the same. If any instructions are received from the tenderer to withdraw the submitted bid on or before the scheduled date and time of tender opening, their bid shall be opened and Earnest money submitted shall be forfeited. Subsequently their offer shall be treated as non-responsive and disqualified.

viii. Any instructions received from the tenderer after opening of the bids such as withdrawal of bid / modification of bid etc. Such instructions shall not be considered and their bids shall be evaluated as per tender conditions.

ix. Individual work experience certificate issued by the competent authority against the eligibility criteria shall be submitted along with respective work order, if the tenderer has executed “similar works”.

x. Tenderer has to submit all copies of documents enclosed along with Bid No.1 (Technical Bid) with the attestation of Notary Public.

2.20 Opening of Tender:

On the date and time specified in the Tender notice, following procedure will be adopted for opening of the Tender.

2.20.1 <u>Bid –I (Technical Bid)</u>

Bid-I of all the Tenderers will be opened by the Chief Engineer or his representative, **on 24.12.2024 at 15.30 hours.**

The Tenderer's name, contents of the forwarding letter, the availability of requisite Earnest Money Deposit, and such other details as the Employer at its discretion, may consider appropriate, will be announced at the time of e-Tender Opening for which Tenderer's authorized representative can be present.

2.20.2 <u>Bid No.-II (Price Bid)</u>

The Bid No.-II shall be opened on a date to be fixed later and intimated to all the responsive and eligible Tenderers to enable them to be present at the opening, if they so wish. The Bid No -II shall be opened if the Tenderer's submission in Bid No.-I satisfies / includes all requirements and the same are found acceptable to the Employer, V.O.Chidambaranar Port Authority.

2.20.3. Conditional e-Tender will be rejected outright considering it as non responsive offer and the e-Tender will be liable to be rejected outright if it is found that:

i. The Tenderer proposes any alteration in the work specified in the e-Tender or in time allowed for completing the works or indicate any other condition.

ii. Disclosure / indication of the price in the technical bid shall render the e-Tender disqualified and rejected.

2.21. After the opening of e-Tenders, information relating to the examination, clarification evaluation and comparisons of Tenders and recommendation concerning the award of contract shall not be disclosed to Tenderers or any other(s) any efforts by the Tenderer to influence the Employer, in the process of examination, clarification, evaluation and comparison of tenders and decisions concerning award of contract may result in the rejection of the Tender.

2.22. To assist in the examination, evaluation and comparison of tenders, the Employer may ask Tenderers, individually for clarifications of their tenders. The request for clarification and the response shall be in writing or by cable or by telex, but no change in price or substance of the Tender shall be sought, offered or permitted nor the Tenderer be permitted to withdraw his Tender before the expiry of the Tender validation period.

2.23. The Employer will determine whether the Tender is substantially responsive to the requirements of the Tender documents. For the purpose of this clause a substantially responsive Tender is one which inter-alia confirms to all the terms, general conditions and specifications of the Tender documents and Technically suitable.

2.24. Tenders determined to be responsive will be checked by the Employer for any arithmetical errors in computation and summation as under:

(i) Where there is discrepancy between amounts in figures and words, the amount in words will govern and-

(ii) Where there is a discrepancy between the unit price and total amount derived from the multiplication of the unit price and the quantity, the unit price as quoted will govern.

2.25. Prior to the expiration of the prescribed period of Tender validity or such extended period the Employer will notify the successful Tenderer, by cable or telex, fax confirming in writing by registered letter that his Tender has been accepted. The notification of award will constitute the formation of the contract. Upon the furnishing by the successful Tenderer of a performance security in accordance with the provisions of clause 4.6.2.1 of General conditions of contract, the Employer will promptly notify the unsuccessful Tenderers that their tenders have been unsuccessful.

2.26. All cost, charges and expenses including stamp duty in connection with contract as well as preparations and completion of agreement shall be borne by the Tenderers.

2.27. The Contractor shall, in accordance with the requirement of the Employer, afford all reasonable opportunities for carrying out their work to any other Contractors employed by the Employer and their workmen and to the workmen of the Employer and of any other duly constituted authorities who may be employed in the execution on or near the site of any work not included in the contract or of any contract which the Employer may enter into in connection with or ancillary to the works.

2.28 The Technical Bids of the Tenderers will be evaluated based on the whole work stipulated in Bid -II.

3. APPENDIX TO TENDER

IMPORTANT CLAUSES

Description	Clause No.	Remarks
Earnest Money Deposit	4.6.2	**Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** EMD payment made by the bidders should only through online payment gateway in CPP Portal mode.
Performance Security	4.6.2.1	5 % of accepted Tender Value
Security Deposit	4.6.2.2	A sum @ 10% of the gross amount of the bill shall be deducted from each Running Bill of the Contractor till the sum along with the sum already deposited as EMD will amount to Security Deposit of 5% of the contract price.
Service Tax	4.6.2.6	Standard clause – Deleted
INSURANCE		
	4.6.12	Insurance of works
	4.6.13	Damage to Persons & Property
	4.6.14.1	Third Party Insurance
	4.6.14.2	Minimum amount of Third party Insurance of **Rs.10.00 Lakhs** for any one incident with provision for reinstatement to the above value after every incident.
	4.6.15.1	Accident or Injury to workmen
	4.6.15.2	Insurance against accident etc to workmen
	4.6.16	Remedy on contractor failure to insure
Traffic Regulations	4.6.19.1	To follow the Port Traffic Regulations & Rules
Supply of material	4.6.23	All the materials required for execution of work are to be arranged by the Tenderer.
Labour	4.7	Engagement of Labour.
Cost of samples	4.8.1.2	To be supplied by the Tenderer at his cost
Cost of tests	4.8.1.3	To be borne by the Tenderer

Description	Clause No.	Remarks
Time of completion	4.9.3	**Six Months**
Compensation for delay	4.9.7.1	1% of contract value per week or part thereof subject to maximum of 10% Contract Price.
Period of maintenance	4.10.1.1	The period of maintenance is 12 months.
Variation limit	4.11.1.1	Contract Price Variation limit.
Time within which payment to be made after certification of bill by Engineer	4.14.1	75% of net amount of interim certificate within 10days and balance within 30days.
Entry of labour & vehicles into Green Gate /Red Gate /Zone-B	4.24	Tokens for entry for labour and vehicles on payment by the Tenderer
Escalation / increase or Decrease of cost	4.28	
Power supply	5.4.1	
Water supply	5.4.2	
Facilities for housing labour	5.4.3	
Indicative lead statement	5.17	
Law governing the contract	4.18.2	
E.S.I.	27	
E.P.F.	28	

4. GENERAL CONDITIONS

4.1.0. DEFINITIONS AND INTERPRETATION

4.1.1. Definitions

In the Contract (as hereinafter defined) the following words and expressions shall have the meanings hereby assigned to them, except where the context otherwise requires:

a) **"Employer"** means the Board of Trustees of V.O.Chidambaranar Port Authority or their successors and assigns, acting through its Chairman or any other Officer so nominated by the Board.

b) **"Contractor"** means the person or persons, firm or company whose Tender has been accepted by the Employer and the legal Successors in title to such person, but not (except with the consent of the Employer) includes the contractor's personal representatives, Successors and any assignee of such persons.

c) **"Engineer"** means the Chief Engineer / Civil of the VOCPT or his Successor in office.

d) **"Engineer's Representative"** means any Representative of the Engineer to perform such duties as mentioned in Clauses 4.2.1 and 4.2.2 hereof whose authority shall be notified in writing to the Contractor by the Engineer.

e) **"Works" means** the works to be executed in accordance with the Contract.

f) **"Contract"** means the Notice Inviting the Tender, the Tender and acceptance thereof and the formal Agreement, if any, executed between the Employer and the Contractor together with the documents referred to therein including these Conditions with appendices and any Special Conditions, the Specifications, Designs, Drawings, Priced Schedule / Bill of Quantities and Schedule of Rates. All these documents taken together shall be deemed to form one Contract and shall be complementary to one another.

g) **"Contract Price"** means the sum named in Tender subject to such additions thereto, or deductions there from as may be made under provisions hereinafter contained.

h) **"Constructional Plant"** means all appliances or things of whatsoever nature required in or about the execution, completion or maintenance of the works or Temporary Works (and hereinafter defined) but does not include materials or other things intended to form or forming part of the permanent work.

i) **"Permanent Work" means** the permanent works to be executed and maintained in accordance with the Contract.

j) **"Temporary Work"** means all temporary works of every kind required in or about the execution, completion or maintenance of the works for which no payment will be made by the Port.

k) **"Drawings"** means the drawings referred to in the specification and any modification of such drawings approved in writing by the Engineer and such other drawings as may from time to time be furnished or approved in writing by the Engineer.

l) **"Site"** means the lands and other places on under in or through which the works are to be executed or carried out and any other lands or places provided by the Employer for the purpose of the Contract together with such other places as may be specifically designated in the Contract as forming part of the site.

m) **"Approved"** means approval in writing including subsequent written confirmation of previous verbal approval and "Approval" means approval in writing including as aforesaid.

n) **"Market Rate"** means the rate as decided by the Engineer on the basis of the cost of materials and labour to the Contractor at the site where the Works are to be executed plus the percentage mentioned in Schedule to cover all overheads and profit.

o) **"Specifications"** means the specification referred to in the Tender and any modification thereof or addition thereto as may from time to time be furnished or approval in writing by the Engineer.

p) **"Schedule (s)"** referred to in these conditions shall means the relevant schedule(s) annexed to the Tender papers issued by the Employer.

q) **"A Week"** means, seven days without regard to the number of hours worked in any day in the week.

r) **"A Day"** means a day of 24 hours from midnight to the next midnight irrespective of the number of hours worked in that day.

s) **"A Month"** means month according to Gregorian Calendar.

t) **"A Year"** means Contract year commencing from 15th day after the date of the written order to commence the work.

4.1.2. Singular and Plural

Words importing the singular only also include the plural and vice versa where the context requires.

4.1.3. Marginal Headings or Notes

The marginal headings or notes in these general Conditions shall not be deemed to be part thereof or be taken into consideration in the interpretation or laying / construction thereof or of the Contract.

4.2.0. ENGINEER AND ENGINEER'S REPRESENTATIVE

4.2.1. Duties and Powers of Engineers Representative.

The Engineer shall carry out such duties in issuing decision, certificates and orders as are specified in the contract. The Engineer's representative shall be responsible to the Engineer

4.2.2. The duties of the Engineer's representatives are to watch and supervise the works and to test and examine any materials to be used or workmanship employed in connection with the works. He shall have no authority to relieve the contractor or any of his duties or obligations under the contract nor except as expressly provided here under or elsewhere in the contract to order any work involving delay or any extra payment by the employer nor to make any variation of or in the works.

4.2.3. The Engineer may from time to time in writing delegates to the Engineer's Representative any of the powers and authorities vested in the Engineer and shall furnish to the contractor a copy of all such written delegation of powers and authorities. Any written instructions or approval given by the Engineer's Representative to the contractor within the terms of such delegation (but not otherwise) shall bind the contractor and the employer as though it had been given by the Engineer provided always as follows:

a) Failure of the Engineer's Representative to disapprove any work or materials shall not prejudice the power of the Engineer thereafter to disapprove such work or materials and to order the pulling down, removal or breaking up thereof.

b) If the Contractor shall be dissatisfied by reason of any decision of the Engineer's Representative, he shall be entitled to refer the matter to the Engineer who shall thereupon confirm, reverse or vary such decision.

4.3.0. ASSIGNMENT AND SUB LETTING

4.3.1. Assignment

The Contractor shall not, assign the contract or any part thereof or any benefit or interest therein or there under without the prior written consent of the Engineer.

4.3.2. Sub-letting

The Contractor shall not sub-let the whole of the works. Except otherwise provided by the Contract, the Contractor shall not sub-let any part of the Works without the prior written consent of the Engineer (which shall not be unreasonably withheld) and such consent if given shall not relieve the Contractor from any liability or obligation under the Contract and he shall be responsible for the facts, defaults and neglects of any sub Contractor, his agents, servants or workmen. Provided always that the provision

of labour on a piece work basis shall not be deemed to be a sub-letting under this Sub-Clause.

4.4.0. EXTENT OF CONTRACT

The Contract comprises the construction, completion and maintenance of works and except in so far as the Contract otherwise provides, the provision of all labour, materials, constructional plant, temporary works and everything whether of a Temporary or permanent nature required in and for such construction, completion including removal of temporary works, clearance of site and maintenance so far as the necessity for providing the same is specified in or reasonable to be inferred from the Contract. The period for completion of the work stipulated in the Tender is the essence of the Contract.

4.5.0. CONTRACT DOCUMENTS

4.5.1.1. Language

The language in which the Contract documents shall be drawn up shall be English.

4.5.1.2. **Documents mutually explanatory**

Except if and to the extent otherwise provided by the Contract, the provisions of the General conditions and conditions of particular application shall prevail over these of any other document forming part of the Contract. subject to the foregoing the several documents forming the Contract are to be taken as mutually explanatory of one another but in case of ambiguities or discrepancies the same shall be explained and adjusted by the Engineer who shall thereupon issue to the Contractor instructions directing in what manner the work is to be carried out.

4.5.1.3.1. If there are varying or conflicting provisions made in any one document forming part of the Contract, the Engineer shall be the deciding authority with regard to the intention of the documents.

4.5.1.3.2. Any error in description, quantity or rate in Schedule of works / items or bill of quantities or any omission there from shall not vitiate the Contract or release the Contractor from the execution of the whole or any part of the works comprised therein according to Drawings and specifications or from any of his obligations under the Contract. No extra claim of whatsoever nature will be entertained for any omission in the description of work in the schedule.

4.5.1.3.3. It must be clearly understood that the rates quoted in the tender are to include everything required to be done in the Notice inviting Tender, Instruction for Tendering. Tender Conditions of Contract, Specification, Bill of Quantities, Schedules and Drawings referred to therein and also for all such work as in necessary for the proper completion of the contract, although specific mention thereof may have been omitted. The rates are for finished items of Works and should be inclusive of cost of all

materials, labour, hire charges of Tools & Plant ladder, scaffolding and incidentals necessary for carrying out the works.

4.5.2.1. Custody of Drawings

The Drawings shall remain in the sole custody of the Engineer, but two copies thereof shall be furnished to the Contractor free of cost. The Contractor shall provide and make at his own expense any further copies required by him. At the completion of the contract the Contractor shall return to the Engineer all drawings provided under the Contract, if so desired by the Engineer.

The Contractor shall give adequate notice in writing to the Engineer or the Engineer's Representative of any further drawing or specification that may be required for the execution of the works or otherwise under the Contract.

4.5.2.2. One copy of Drawings to be kept at site

One copy of the drawings furnished to the Contractor shall be kept by the Contractor at the Site and the same shall at all reasonable times be available for inspection and use by the Engineer and the Engineer's Representative and by any other person authorized by the Engineer in writing.

4.5.3. Further Drawings and Instructions

The Engineer shall have full power and authority to supply to the Contractor by the Employer, from time to time during the progress of the works such further Drawings and instructions as shall be necessary for the purpose of the proper and adequate execution and maintenance of the Works and the Contractor shall carryout and be bound by the same.

4.6.0. GENERAL CONDITIONS

4.6.1. Contract Agreement

The Contractor shall when called so to do enter into and execute a formal Agreement with the Employer incorporating the conditions of Contract in the form prescribed by the Engineer with such modifications as may be necessary at the cost of the Contractor. All costs, charges and expenses including stamp duty incurred in connection with the Contract as well as preparations of Agreement shall be borne by the Contractor. Until such Contract Agreement is executed the acceptance of the Tender in terms of the Contract as defined in Sub-Clause 4.1.1(f) shall be binding upon the parties and shall be Contract. The Contractor shall be supplied with a copy of the Agreement free of cost.

4.6.2. Earnest Money

The amount of Earnest Money shall be **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** made by bidder should paid only

through online payment gateway in CPP Portal mode. Without EMD the Tender will not be considered. E.M.D in any other form will not be accepted.

4.6.2.1. Performance Security

The Contractor shall deposit an amount equal to **5% of the accepted tender value** as performance security through RTGS/NEFT or Insurance Surety Bonds or irrevocable bank guarantee, obtained from the Nationalized Bank/Schedule Bank in the form as per specimen in the schedule having its Branch at Tuticorin and payable at Tuticorin in favour of the V.O.Chidambaranar Port Authority. The Bank Guarantee should be sent to the Port directly by the Issuing Bank through Registered Post with Acknowledgment due. A letter from the bank shall also be sent along with the bank guarantee to Employer by the employer within 15 days of placement of work order or before the commencement of work whichever is earlier. However the Chief Engineer may relax the time limit of 15 days and extend it by further period of 10 days in extraordinary circumstances for the reasons recorded by him. If the Performance security is not deposited in time as prescribed above, the work order shall stand cancelled automatically and the earnest money deposit will be forfeited. The Performance security will remain in force throughout the period of the contract, including the maintenance period of 12 month after the date of handing over of the work by the contractor to the Chief Engineer and will be refunded after successful completion of maintenance period.

4.6.2.2. Security Deposit

Security Deposit at 10% will be deducted from each running bill after adjusting the amount already deposited by the contractor as EMD subjected to a maximum accumulation of 5% of the contract price. Half of the above sum will be refunded to the Contractor, if he so desires, on substantial completion and / or handing over of the work to the satisfaction of the Engineer. The balance being held in deposit as security for satisfactorily maintaining the works free from defects for a period of 12 months after the date of completion of works. If during this period of 12 months any defects are notified which in the opinion of the Engineer are due to bad materials used and /or defective workmanship, the contractor shall be required to carry out at the contractor's cost, such repairs as the Engineer considers necessary or in the event of contractor failing to do this within a notified time, the Engineer may arrange for such repairs to be carried out and deduct the cost of such rectification of the defects from the amount retained without prejudice to the recovery of any amount that may have been spent in excess of the deposit. For purpose of this clause, the period of 12 months shall count from the date of handing over of the works by the contractor to the Chief Engineer. The amounts as stated above will not bear any interest.

4.6.2.3 Payment of Income Tax

Payment of Income Tax: Income Tax will be deducted at the rates as applicable from time to time. It is open to the contractor to make an application to the Income Tax officer concerned and obtain a certificate authorizing the department to deduct the Income Tax at such lower rates or deduct no Tax as may be appropriate to his case. Such certificate will be valid for a period specified therein unless it is cancelled by the Income Tax officer earlier.

4.6.2.4 Payment of VAT- VOIDS

4.6.2.5 Payment of Service Tax - VOIDS

4.6.2.6 Service Tax-- VOIDS

4.6.3. Inspection of Site

The Tender shall be deemed to have been based on such data regarding hydrological, climate and physical conditions, nature of ground and underlying strata as shall have been supplied by the Employer in the documents furnished to the Contractor by the Employer for the purpose of tendering. The Contractor shall nevertheless inspect and examine the site and its surroundings and shall satisfy himself before submitting his Tender as to the form and nature of the site, the quantities and nature of the work and materials necessary for the completion of the works and the means of access to the site the accommodation he may require and in general shall himself obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect his Tender.

4.6.4. Sufficiency of Tender

The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of the Tender for the works and of the rates and prices stated in the period, bill of quantities and the schedule of rates and prices (if any) which rates & prices shall except in the Contract cover all his obligations under Contract and shall cover matters and things necessary for the proper completion and maintenance of the works.

4.6.5. Work to be done to the satisfaction of the Engineer

The Contractor shall execute, complete and maintain the works strict in accordance with the Contract to the satisfaction of the Engineer and shall comply with and adhere strictly to the Engineer's instructions and directions on any matter (whether mentioned in the Contract or not) touching or concerning the works. The Contractor shall take instructions and directions only from the Engineer or (subject to the limitations referred to in Clause 4.2 hereof) from the Engineer's representative.

4.6.6.1.Programme to be furnished

The execution of the works shall be so planned as to cause as little impediment as practicable to the working of the Port in General.

4.6.6.2. The Contractor shall submit to the Engineer within one month or further period as may be permitted by the Engineer after receipt of the acceptance letter for the Tender, a detailed PERT / CPM network based programme for completion of the work in the form of a detailed network and bar charts both in triplicate. The network shall include the various activities involved in the execution of the work and their inter-dependencies and the time required for completion of the different activities. The progress of the work shall be periodically reviewed and the network will be updated by the Contractor every three months and three copies of this shall be supplied expeditiously to the Engineer. The Contractor shall submit to the Engineer during the first week of every calendar month the up-to-date progress and the progress made during the previous month on important sections or portions of the work in relation to the network programme.

4.6.6.3. Progress Photographs

The Contractor shall arrange to take Progress Photographs on various activities every month till the completion of the project at his cost; the positions from which the photographs are to be taken shall be directed by the Engineer. The Contractor shall submit on monthly basis minimum 2 sets colour photographs (size 15 cm x 10 cm) each set containing 12 photographs in albums. Beside this, two sets of each A.4 size enlargement of 24 selected photographs from the entire work shall also be submitted to the Engineer. Prints may not be reproduced without the approval of the Engineer.

4.6.6.4 Completion Photographs, Video Film, Slides, Etc.

The Contractor shall also arrange to produce the above selected 24 photographs in slides as directed by the Engineer, a video programme of about 10 minutes duration shall be arranged to be taken covering the main features of the project from time to time and two copies of the film with commentary shall be submitted to the Engineer at the end of Contract.

4.6.6.5 The Contractor shall submit to the Engineer within one month or further period as may be permitted by the Engineer after the receipt of the acceptance letter for the Tender, a statement indicating his estimates, based on the detailed and approved network, of the gross and the net amounts that would become payable to him at the end of each month during the progress of the works, to enable the Employer to arrange for the required funds. In case a revision of such an estimate is considered necessary by the Contractor he will be allowed to furnish a revised estimate based

again on approved network, provided it is received sufficiently in advance of the actual date of payment of a monthly certificate.

4.6.6.6 The Contractor shall submit to the Engineer for his approval full details and drawings for the design of any temporary works which he proposes to construct sufficiently in advance as directed by the Engineer depending on the nature of the work on the erection of any such Temporary Works commences on the site.

4.6.6.7 The submission to and approval by the Engineer or Engineer's Representative of such programme or the furnishing of such particulars shall not relieve the Contractor of any of the duties or responsibilities under the Contract in connection with the Works or Temporary Works.

4.6.7. Contractor's Superintendence

The Contractor shall give or provide all necessary superintendence during the execution of the Works and as long thereafter as the Engineer may consider necessary for the proper fulfilling of the Contractor's obligations under the Contract. The Contractor, or his competent and authorized agent or representative approved of in writing by the Engineer (which approval may at any time be withdrawn) is to be constantly on the works and shall give his whole time to the superintendence of the same. If such approval shall be withdrawn by the Engineer the Contractor shall as soon as is practicable after receiving written notice of such withdrawal remove the agent from the Site and shall not thereafter employ him again on the Site in any capacity and shall replace him by another agent approved by the Engineer. Such authorized agent or representative shall receive on behalf of the Contractor directions and instruction from the Engineer or (subject to the limitations of Clause 4.2 hereof) the Engineer's Representative.

4.6.8.1. Contractor's Employees

The Contractor shall provide and employ on the site in connection with the execution and maintenance of the works.

(a) Only such technical assistants as are skilled and experienced in their respective callings and such sub-agents, foremen and leading hands as are competent to give proper supervision to the work they are required to supervise and

(b) Such skilled, semi-skilled and unskilled labour as is necessary for the proper and timely execution and maintenance of the works.

4.6.8.2. Removal of Workmen

The Engineer shall be at liberty to object to and require to Contractor to remove forthwith from the works any person employed by the Contractor in or about the execution or maintenance of the works who in the option of the Engineer misconducts himself or is incompetent or negligent in the proper performance of his duties or

whose employment is otherwise considered by the Engineer to be undesirable and such person shall not be again employed upon the works without the written permission of the Engineer any person so removed from the work shall be replaced as soon as possible by a competent substitute approved by the Engineer.

4.6.8.3.Regarding Employment of Government Retired Persons

The Employer shall be at liberty to terminate the Contract if the successful Tenderer himself or any of his partners / employees or any of his directors who having held Class I post in the Port Authority prior to his retirement has failed to obtain the Port Authority Chairman's specific permission to undertake any outside employment before the expiry of two years from the date of his retirement, in accordance with the provisions of the Regulation 4 (a) under Tuticorin Port Authority Class I employees (Acceptance of employment after retirement) Regulations, 1979.

4.6.8.4. Employment of Technical Staff

The Contractor shall employ the following minimum technical staff during the execution of this work. The technical personnel should have sufficient experience in such nature of works.

1. Two Graduate Engineer with not less than 10 years experience in this nature of work. They shall be suitably supported by adequate Technical staff at all work spots.

The technical staff should be available at sites (i.e.,) Hot Mix plant, construction site, etc., at all times during the course of execution of work. They will take instructions from the Engineer in charge as and when required by them.

In Case the Contractor fails to employ the Technical staff as aforesaid, he/they shall be liable to pay a sum of **Rs.1276.80** per day of default in the case of Graduate Engineer and **Rs.1150.80** per day of default in the case of Diploma Holder (Overseer).

4.6.9. Setting Out

The Contractor shall be responsible for the true and proper setting- out of the works in relation to original points, lines and levels of reference given by the Engineer in writing and for the correctness (subject as above mentioned) of the position, levels, dimensions and alignment of all parts of the Works and for the provision of the necessary instruments, appliances and labour in connection there with.

If, at any time during the progress of the Works, any error shall appear in the position, levels, dimensions or alignment of any part of the Works the Contractor on being required so to do by the Engineer or Engineer's Representative shall at his own expense, rectify such error to the satisfaction of the Engineer or Engineer's Representative. The checking of any setting out or of any line or level by the Engineer or Engineer's Representative shall not in any way relieve the Contractor of his

responsibility for the correctness thereof and the Contractor shall carefully protect and preserve all bench marks sight-rails, pegs and other things used in setting out the works.

4.6.10.1. Watching and Lighting

The Contractor at his own cost shall make such provisions for the lighting the works, material and plant and shall provide all such works and lights as may be required by the Engineer or the Employer or any other authority having jurisdiction in connection with the Site together with all labour, stores and services required for their efficient working and use at any time of day and night. He shall also provide at his own cost every description of watching and maintenance required in connection with the foregoing and all other services and for protecting and securing all places dangerous whether to the Contractor's workmen or to other persons until the work shall have been handed over to the Employer unless the Engineer shall decide that such services are no longer required.

4.6.10.2. All lights provided by the Contractor shall be placed or screened so as not to interfere with any signal lights on the Employer's railways or with any traffic lights of any local or other authority.

4.6.11.1. Care of Works

From the Commencement to the completion of works the Contractor shall take full responsibility for the care thereof and of all Temporary works and in case any damage, loss or injury shall happen to the works or to any part thereof or to any Temporary works from any cause whatsoever (save and except the Excepted Risks as defined in clauses 4.6.11.2) shall at his own cost repair and make good the same so that at completion the works shall be in good order and condition and in conformity in every respect with the requirements of the Contract and the Engineer's instructions. In the event of any such damage, loss, injury happening from any of the Expected Risks the Contractor shall if and to the extent required by the Engineer and subject always to the provisions of Clause 4.17 hereof repair and make good the same as aforesaid at the cost of the Employer. The Contractor shall also be liable for any damage to the works occasioned by him in the course of any operations carried out by him for the purpose of complying with his obligations under Sub-Clauses 4.10.1.1 to 4.10.1.4 thereof.

4.6.11.2. Excepted Risks

The "Excepted Risks" are war hostilities (whether war be declared or not) invasion act of foreign enemies, rebellion, revolution, insurrection or military or usurped power civil war or (otherwise than among the Contractor's own employee's) riot, commotion or disorder or use or occupation by the Employer of any portion of the works in respect

of which a certificate of completion has been issued or a cause solely due to the Engineer's design of the Works or any such operation of the forces of nature as reasonable foresight and ability on the part of the Contractor could not foresee or responsibility provide against (all of which are herein collectively referred to as "The Excepted Risks").

4.6.12.Insurance of Works Etc.

Without limiting his obligations and responsibilities under clauses 4.6.11.1. and 4.6.11.2. hereof the Contractor shall insure at his cost in the joint names of the Employer and the Contractor against all loss or damage from whatever cause arising (other than the Excepted Risks) for which he is responsible under the terms of the Contract and in such manner that the Employer and Contractor are covered during the period of construction of the works and are also covered during the period of maintenance for loss or damage arising from a cause occurring prior to the commencement of the period of Maintenance and for any loss or damage occasioned by the Contractor in the course of any operation carried out by him for the purpose of complying with his obligations under Clauses 4.10.1.1 to 4.10.1.4 hereof

a) The works and the Temporary works to the full value of such works executed from time to time.

(b) The materials, constructional plant and other things brought on to the site by the Contractor to the full value of such materials, constructional plant and other things.

(c) As in case of sinking of constructional plant and equipment for the cost of salvage of the same as assessed by the Port.

4.6.13. Damage to Persons & Property

The Contractor shall (except if and so far as the specification provided otherwise) indemnify and keep indemnified the Employer against all losses and claims for injuries or damages to any person, or any property whatsoever (other than surface or other damage to land being or crops being on the site suffered by tenants or occupiers) which may arise out of or in consequence of the construction and maintenance of the works and against all claims, demands, proceedings damages costs, charges and expenses whatsoever in respect of or in relation thereto.

Provided further that for the purposes of this Sub-Clause the expression "the Site" shall be deemed to be limited to the area defined in the specification or shown on the drawing in which land and crops will be disturbed or damaged as an inevitable consequence of carrying out of the works.

4.6.14.1. Third Party Insurance

Before commencing the execution of the works the Contractor (but without limiting his obligations and responsibilities under Sub-Clause 4.6.13 hereof) shall insure at his cost against any damage, loss or injury which may occur to any property (including that of the Employer) or to any person (including any employee of the Employer) by or arising out of the execution of the works or Temporary works or in the carrying out of the Contract.

4.6.14.2. Minimum Amount of Third Party Insurance

Such insurance shall be effected with an insurer and in terms approved by the employer and for at least the amount stated in the tender and the contractor shall whenever required produce to the Engineer's representative the policy or policies of insurance and the receipts for payment of the current premiums.

4.6.15.1. Accident or Injury to Workmen

The Employer shall not be liable for or in respect for any damage or compensation payable at Law in respect of or in consequence of any accident or injury to any workman or other person in the employment of the Contractor or any sub-Contractor and the Contractor shall indemnify and keep indemnified the Employer against all such damages and compensation and against all claims, demands, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

4.6.15.2.Insurance against Accident etc., to Workmen

The Contractor shall insurance against such liability with an insurer approved by the Employer and shall continue such insurance during the whole of the time that any persons employed by him on the Works and shall when required produce to the Engineer or the Engineer's Representative such policy of insurance and the receipt for payment of the current premium. Provided always that in respect of any persons employed by any sub-Contractor the Contractor's obligation to insure as aforesaid under this Sub-Clause shall be satisfied if the Sub-Contractor shall have insured against the liability in respect of such persons in such manner that the Employer is indemnified under the policy but the Contractor shall require such Sub-Contractor to produce to the Engineer or the Engineer's Representative when required such policy of insurance and the receipt for payment of the current premium.

4.6.16.Remedy on Contractor Failure to Insure

If the Contractor shall fail to effect and keep in force the insurance referred to in clauses 4.6.12, 4.6.14.1 and 5.16.15.1 hereof or any other insurance which he may be required to effect under the terms of Contract then and in any such case the Employer may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the

amount so paid by Employer with interest (Rate of interest as applicable is 3% above the prevailing 'Bank Rate', as announced by the Reserve Bank of India from time to time under Section 6.17.49. of R.B.I. Act,1934) as aforesaid from any money due or which may become due to the Contractor or recover the same as a debt due from the Contractor.

4.6.17.1 Giving of Notice and Payment of Fees

The Contractor shall give all notices and pay all fees required to be given or paid by any National or State Statute ordinance or other law or any Regulation or Bye-Law of any local or other duly constituted authority in relation to the execution of the works or of any Temporary Works and by the Rules and Regulations of all Public Bodies and Companies whose property or rights are affected or may be affected in any way by the works or any Temporary Works.

4.6.17.2. Compliance with Statutes, Regulations, Etc.

The Contractor shall conform in all respects with the provisions of any such statute Ordinance of Law as aforesaid and the Regulations or Bye-Laws of any local or other duly constituted authority which may be applicable to the works or to any Temporary Works and with such Rules and Regulations of Public Bodies and companies as aforesaid and shall keep the Employer indemnified against as penalties and liability of every kind for breach of any such Statue, Ordinance or Law, Regulation or Bye-Law.

4.6.18.Patents Rights and Royalties

The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any patent rights, design trademark or name or other protected rights in respect of any constructional plant, machine, work or material used for or in connection with the works or Temporary works or any of them and from and against all claims, demands, proceedings, damages, costs charges and expenses whatsoever in respect thereof or in relation thereto Except where otherwise specified the Contractor shall pay all tonnage and other royalties, rent and other payments or compensation (if any) for getting stone, sand, gravel, clay or other materials required for the works or Temporary works or any of them.

4.6.19.1.Traffic Regulations

Contractor shall have to make all necessary arrangements at his cost for regulating traffic day and night during the period of the contract to the entire satisfaction of the Employer, Contractor shall have to provide necessary caution boards, barricades, flags, lights, watchmen etc., and the same shall be elegant looking / sturdy type. Contractor will have to comply with the latest Motor Vehicles Rules and Regulations for Traffic safety and shall be responsible for all claims for the accidents which may

arise due to his negligence whether in regulating the traffic or in stacking materials on the road or by any other reasons. During the execution of the works of this contract the Contractor shall take care that the port traffic is not hindered by his working. All operations necessary for the execution of the works shall, so far as compliance with the requirements of the contract permits, be carried out so as not to interfere unnecessarily or access to use and occupation of public and private roads or and foot paths to or of properties whether in the possession of the Employer or of any other person. The contractor shall indemnify the employer in respect of all claims, proceedings, damages, costs, charges and expenses whatsoever arising out of or in relation to any such matters in so far as the contractor is responsible for.

4.6.20.1. Extra-ordinary Traffic

The Contractor shall use every reasonable means to prevent any of the highways or bridges communicating with or on the routes to the Site from being damaged or injured by any traffic of the Contractor or any of his Sub-Contractor and, in particular, shall select routes, choose and use vehicles, restrict and distribute loads so that any such extraordinary traffic as will inevitably arise from the moving of Plant and materials from and to the site shall be limited, as far as reasonable possible, and so that no unnecessary damage or injury may be occasioned to such road and bridges.

4.6.20.2.Special Loads

Should it be found necessary for the Contractor to move one or more loads of constructional plant machinery or pre-constructed units or parts of units of work over part of a highway or bridge falling within the jurisdiction of the Employer the moving whereof is likely to damage any highway or bridge unless special protection or strengthening is carried out then the Contractor shall before moving the load on to such highway or bridge give notice to the Engineer or Engineer's Representative of the weight and other particulars of the weight and other particulars of the load to be moved and his proposals for protecting or strengthening the said highway or bridge. Unless within fourteen days of the receipt of such notice the Engineer shall by counter-notice direct that such protection or strengthening is unnecessary then the Contractor will carry out such proposal or any modification thereof that the Engineer shall require, at his own cost.

4.6.21.Opportunities for other Contractors

The Contractor shall in accordance with the requirements of the Engineer afford all reasonable opportunities for carrying out their work to any other contractors employed by the Employer and their workmen and to workmen of the Employer and of any other duly constituted authorities who may be employed in the execution on or near the site of any work not included in the Contract or of any contract which the Employer may enter into in connection with or ancillary to the works. If however, the Contractor shall on the written

request of the Engineer or the Engineer's Representative make available to any such other Contractor or to the Employer or any such authority any roads or ways for the maintenance of which the Contractor is responsible, or permit the use by any such of the Contractor's scaffolding or other plant on the site provide any other service of whatsoever nature for any such the Employer shall pay to the Contractor in respect of such case or services such sum or sums as shall in the opinion of the Engineer be reasonable. Provided also that if the Contractor avails of similar services from such other or the Employee the Employer shall be entitled to recover from the Contractor in respect of such service such sum or sums as shall in the opinion of the Engineer be reasonable. The decision of the Engineer shall be final.

4.6.22. Supply of Plant, Materials and Labour

Except where otherwise specified the Contractor shall at his own expense supply and provide all the

a) Constructional Plant, temporary works, materials both for Temporary and for the Permanent works, labour (including the supervision thereof) transport to or from the site and in and about the works and other things of every kind required for the construction, completion and maintenance of the works.

b) The Contractor shall not hire out any item of plant or equipment brought by him in connection with the execution of the work under the contract to any other party in connection with any work of the latter in the Port without the written permission of the Engineer and such permission may or may not be granted by the Engineer.

c) The Contractor shall at his own cost make due arrangements for the proper watch and safety of all materials and plant supplied to him by the Employer/ or brought by him for use on this work. The Contractor shall arrange to operate the machinery in proper care with all safety precaution. He shall not remove such constructional plant or materials from the site without the permission of the Engineer.

d) If any of the materials supplied or constructional plants hired out by the department are lost or damaged in any way due to negligence or carelessness on the part of the Contractor or any of his employees, the cost thereof as determined by the Engineer shall be recovered from the Contractor from any money due to him or to become due to him.

4.6.23. Materials to be supplied by the Employer

The procurement of all the necessary materials for the completion of the works shall be sole responsibility of the Contractor which shall conform to I.S. Specifications. For any delay in procurement / non-availability etc., the Contractor is solely responsible.

4.6.24. Clearance of Site on Completion

On completion of the works the Contractor shall clear away and remove from the site all construction plant, surplus materials, rubbish and temporary works of every kind and leave the whole of the site and works clean and in a workman like condition to the satisfaction of the Engineer. If not done the cost of clearing etc., will be recovered from any money due to the Contractor.

4.6.24.1. Ownership of Debris and Excavated Materials Etc.

All excavated materials, debris, etc., arising from the demolition or removal of properties, buildings or structures of the work site and all other materials or things of whatsoever nature found or being upon or excavated from the site shall remain the property of the Employer and shall not be removed by the Contractor from the site or used in the works until permission for such removal or use has been given by the Engineer in writing.

4.6.24.2. Except as specifically authorized in writing by the Engineer no photographs shall be taken nor shall any photograph, articles or description of the work or the site or any part thereof be published nor shall any details of the drawings furnished to him or part thereof be disclosed by the Contractor, his employees, sub-contractors, agents and representatives.

4.6.25. Life Saving appliances and First Aid Equipments

The Contractor shall provide and maintain upon the work sufficient proper and efficient life saving appliances and first aid equipment to the approval of the Engineer and in accordance with the requirements of I.L.O. Convention No.62**.** The appliances and equipment shall be available for use at all times. For work carried out within the dock area or in the vicinity of any wharf or quay, the Contractor shall abide by all the provisions of the Dock Workers (Safety, Health and Welfare) Scheme, 1961. The contractor's particular attention is drawn to Clause 43 of the said Regulation in respect of erection and maintenance of staging. Contractor shall indemnify the Port from the cases booked by the LEO for his negligence.

4.6.26. Bribes, Commission and Corrupt Gifts

Any bribe, commission, gift or advantage given, promised or offered by or on behalf of the Contractor or his partner, agent or servant or anyone on his or their behalf to any officer, servant, representative or agent of the Engineer or to any person on his behalf in relation to the obtaining or to the execution of this or any other Contract with the Employer shall in addition to any criminal liability which he may incur subject to the Contractor to the cancellation of this and all other contract with Employer and also to the payment of any loss, or damage resulting from any such cancellation. The Employer shall be entitled to deduct the amounts so payable from any money otherwise due to the Contractor during this or any other Contract. Any question or dispute as to the

commission of any offense under the present Clause shall be settled by the Engineer, in such manner and on such evidence or information as he shall think fit and consider sufficient and his decision shall be final and binding on the Contractor.

4.6.27.1 Precautions against Water-Borne Deceases

Every precaution to prevent the breeding of mosquitoes on the site and all receptacles used for the storage of water must be suitably protected for this purpose and must be applied at the close of work every day.

4.6.27.2. Precautions against Air & Water Pollution

Every precaution shall be taken by the Contractor to prevent air and water pollution resulting from his operations as per requirements of the appropriate authorities.

The hazardous wastes shall be disposed off only to the genuine processors having requisite in accordance with the Implementation of Hazardous Waste Rule, 1989, notified under Environment Act, 1986 and the Rules and Regulations made there under from time to time.

4.6.28 Reservation or Right to work

The Employer reserves to himself the right anytime or times to carry out any works he thinks necessary or proper in the vicinity of the site or elsewhere.

4.6.29 Use of Port Authority Lands

The Contractor shall be permitted to use the Port land for the purpose of laying out his work yard, setting up of Hot Mix Plant, offices, stores, etc. to the extent required to be decided by the Engineer free of any rental charges. The Contractor, however, shall fix all electrical, water supply and drawings installation, as per existing local Regulations and pay charges for consumption of electrical energy and water as levied by the Port from time to time. On execution of the works the site shall be handed over to the Engineer in good state within such a date as may be intimated to him by the Engineer. The location, area and the plan of such structures must be got approved by the Engineer. But these buildings are not to be used for residential purposes.

4.6.30 Levels and Charts

The Contractor shall provide all assistance, instruments, machines, labour and materials as are normally required for taking levels for the preparation of charts and cross sections before commencement of work and after execution of works. The Contractor shall provide at his own expense experienced attendants for the Engineer or the Engineer's Representatives to assist him in taking levels and checking of alignments.

4.6.31 Inflammable Stores

The Contractor shall comply with all central and local Regulations in respect of safe storage of all inflammable stores, or other materials involving risk to third parties and shall take all special precautions required in the transport and use of such materials. The

Contractor shall submit to the Engineer for approval all drawings and documents required for the construction of storage sheds or other accommodation and shall build all such storage sheds to the proper requirements.

4.6.32. Apprentices

The Contractor shall during the term of this Contract comply with the provisions of the Apprentices Act, 1981 and maintain as part of his organization a system of apprenticeship for training craftsmen. Failure on the part of the Contractor to observe the conditions and stipulations of this Clause shall be deemed to be a failure to employ a sufficient number of proper and efficient workmen within the meaning of Sub-Clause 4.6.8.1 above and all the rights and remedies of Employer therein provided including the power to determine the Contract shall be applicable in such case.

4.7.0. LABOUR

4.7.1.1. Engagement of Labour

The Contractor shall make his own arrangements for the engagement of all labour local or otherwise, and save in so far as the Contract otherwise provides for the transport, housing, feeding and payment thereof.

4.7.1.2 Supply of Water

The Contractor shall, so far as is reasonably practicable, having regard to local conditions provide on the Site, to the satisfaction of the Engineer's Representative, an adequate supply of drinking and other water for the use of the Contractor's staff and work people.

4.7.1.3. Alcoholic Liquor or Drugs.

The Contractor shall not, otherwise than in accordance with the Statues, Ordinances and Government Regulations or Orders for the time being in force, import, sell, give, barter or otherwise dispose of any alcoholic liquor, or drugs, or permit or suffer any such importation, sale, gift, barter or disposal by his Sub-Contractors, agents or employees.

4.7.1.4. Arms and Ammunition

The Contractor shall not give barter or otherwise dispose of to any person or persons, any arms or ammunition of any kind or permit or suffer the same as aforesaid.

4.7.1.5. Festival and Religious Customs

The Contractor shall allow his labour the Government notified National and local festival holiday and also such closed holidays for the Port declared by the Employer and also have due regard to local religious and social custom in respect of labour employed by him.

4.7.1.6. Epidemics

In the event of any outbreak of illness of an epidemic nature, the Contractor shall comply with and carryout such Regulations, orders and requirements as may be made by the Government, or the local medical or sanitary authorities for the purpose of dealing with and overcoming the same.

4.7.1.7. Disorderly Conduct Etc.

The Contractor shall at all time take all reasonable precautions to prevent any unlawful, riotous or disorderly conduct by or amongst his employees and for the preservation of peace and protection of persons and property in the neighborhood of the Works against the same.

4.7.1.8. Observation by Sub-Contractors

The Contractor shall be responsible for observance by his Sub-Contractors of the foregoing provisions.

4.7.1.9. Compliance with Regulations etc.

The Contractor shall at all times during the continuance of the Contract so far it may be necessary comply with all existing enactment's including central and state Legislation as well as an applicable Bye-Laws of any local authority regarding labour particularly the Minimum Wages Act, Factories Act, Workmen's Compensation Act, Employees Provident Fund and Family Pension Fund Act, Employees State Insurance Act, Contract Labour (Regulation and Abolition) Act, Payment of Wages Act, Maternity Benefit Act, National Festival Holiday Act, Shop and Establishment Act and shall keep the Employer indemnified against any action that may be taken against him for the contravention of provisions of the above said enactment's by the Contractor. The rates quoted by the Contractor in Bill of Quantities and Rates shall be deemed to include all expenses whatsoever the Contractor may be required to incur for the compliance with the provisions of the above said legislation. The Contractor shall make necessary arrangements for the Employer to witness the payments made by the Contractor to his staff and labour and get the certificate from the Employer as required in terms of the CPWD Contract labour Regulations. The Tenderer shall also produce copies of certificates of registration with Employees Provident Fund authorities and Employees State Insurance authorities.

4.7.1.10. Foreign Personnel

Should the Contractor find that suitable qualified and experienced personnel required for the works are not available in India in sufficient numbers and should Contractor wish to employ personnel of nationalities other than Indian the Contractor must obtain the necessary permits from the Central Government to

permit foreign personnel to enter India and to work in India for this work. The Contractor shall keep the Employer fully informed of application made by him for the work permits for foreign staff and/or approvals by the Indian authorities.

4.7.1.11 Fair Wages

The Contractor shall pay the labour engaged by him on the work not less than fair wages which Expression shall mean whether for the time or piece work the labour rates or wages as fixed by the Central Public Works Departments as fair wages of the state payable to the different categories of labourers or those as notified under the Minimum Wages Act for the District for Corresponding employees of the Employer whichever may be higher.

The Contractor shall pay the labour engaged by him on the work not less than the minimum wages notified under any Central or State law as applicable to the Port and he shall not engage persons below the minimum age fixed under any such law applicable.

4.7.1.12. Wage Records

The Contractor shall maintain records of wages and other remuneration paid to his employees in such forms as may be convenient and to the requirements of the Engineer and conciliation officer, Central Ministry of Labour Government of India or such other authorized persons appointed by the State Government. The Contractor shall also exhibit the different notices as required under the Minimum Wages Act, 1949; payment of Wages Act 1936 and other Acts, Rules and Regulations made there under from time to time.

4.7.1.13.1. Inspection of Wage Records

The Engineer incharge or any other person authorized by them on their behalf shall have power to make enquiries with a view to ascertain a proper observance of the fair Wage Clause. He shall also have the power to investigate into any compliance regarding any default made by the Contractor or Sub-Contractor in regard to such provisions and also the provisions made in the Contract Labour Act.

4.7.1.13.2 The Engineer shall have the right to deduct from the Moneys due to the Contractor any sum required or estimated to be required by making good the loss suffered by a worker or workers by reason of non-fulfillment of the conditions of the Contract for the benefit of the workers, non-payment of wages or of deductions made from his or their wages which are not justified by their terms of the Contract or non-observance of the Regulations.

4.7.1.14. Accidents

The Contractor shall within 24 hours of the occurrence of any accident at or about the site or in connection with the execution of the work report such accidents to the Engineer / Engineer's Representative. The Contractor shall also report such accidents to the competent authorities to whom such report is required by law.

4.7.1.15. Wage Book & Wage Slip

The Contractor shall maintain:

1. A wage book of each in such forms as may be convenient but the same shall include the following particulars:
    - i) Rate of daily or monthly wages.
    - ii) Nature of work on which employed.
    - iii) Total number of days worked during each wage period.
    - iv) Total amount payable for the work during each wage period.
    - v) All deductions made from the wages with an indication in each case of the grounds for which the deduction is made.
    - vi) Wage actually paid for each wage period.
2. A wage slip for each worker employed on the work provided that the Engineer may grant exemption for the maintenance of wage slip, if in his opinion not more than 19 persons are likely to be employed directly on the work, but in any case he will have to maintain wage books as specified in 4.7.1.16.

4.7.1.16. Preservation of Books & Slips

The Wage books and wage slips shall be preserved for a period of not less than 12 months after the date of the last entry made in it.

4.7.2. Return of Labour Etc.

The Contractor shall, if required by the Engineer, deliver to the Engineer's Representative or at his office a return in detail in such form and at such intervals as the Engineer may prescribe showing the supervisory staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such information respecting Constructional plant as the Engineer's Representative may require.

4.8.0. MATERIALS AND WORKMANSHIP

Quality of Materials and Workmanship & Tests

All materials and workmanship shall be of the respective kinds described in the Contract and in accordance with Engineer's instructions and shall be subjected from time to time to such tests as the Engineer may direct at the place of manufacture or fabrication or on the Site or at all or any of such places or any of

the approved test houses. The Contractor shall provide such assistance, instruments, machines, labour and materials as are normally required for examining measuring and testing any work and the quality weight or quantity of any materials used and shall supply samples of materials before incorporation in the works for testing as may be selected and required by the Engineer.

4.8.1.2. Cost of Samples

All samples required for testing and comparison shall be supplied by the Contractor at his own cost at the places indicated by the Engineer if the supply thereof is clearly intended by or provided for in the specification or Bill of Quantities.

4.8.1.3. Cost of Tests

The cost of making any test shall be borne by the Contractor if such test is clearly intended by or provided for in the specification or Bill of Quantities and (in the cases only of a test under load or of a test to ascertain whether the design of any finished or partially finished work in appropriate for the purposes which it was intended to fulfill) is particularized in the specification or Bill of Quantities in sufficient detail to enable the Contractor to price or allow for the same in his Tender. In case specifications for a particular item are not in the Tender documents, relevant I.S. Specification will apply.

4.8.1.4. Cost of Tests Not Provided for, Etc.

If any test is ordered by the Engineer which is either

a) not so intended by or provided for or

b) (in the case above mentioned) is not so particularized (or)

c) though so intended or provided for is ordered by the Engineer to be carried out by an independent person at any place other than the site or the place of manufacture of fabrication of the material tested then the cost of such test shall be borne by the Contractor if the test shows the workmanship or material not to be in accordance with the provisions of the Contract or the Engineer's instructions but otherwise by the Employer.

4.8.2.1. General

Materials required for the Works, whether brought by the Contractor or supplied by the Employer shall be stored by the Contractor only at places approved by the Engineer. Storage and safe custody of materials shall be the responsibility of the Contractor.

4.8.2.2. Materials Brought to Site

All Materials brought to the site shall become and remain property of the Employer and shall not be removed off the site without the prior written approval

of the Engineer. But whenever the works are finally completed and advance if any in respect of any such materials is fully recovered the Contractor shall at his own expenses forthwith remove from the site all surplus materials originally supplied by him and upon such removal, the same shall revert in and become the property of the Contractor.

4.8.3. Access to Site

The Engineer and any person authorized by him shall at all times have access to the works and to the Site and to all workshops and places where work is being prepared or hence materials, manufactured articles or machinery are being obtained for the works and Contractor shall afford every facility for and every assistance in or in obtaining the right to such access.

4.8.4.1. Examination of Work before Covering Up

No work shall be covered up or put out of view without the approval of the Engineer or the Engineer's Representative and the Contractor shall afford full opportunity for the Engineer or the Engineer's Representative to examine and measure any work which is about to be covered up, painted or put out of view and to examine foundations, etc., before permanent work is placed thereon. The Contractor shall give due notice to the Engineer's Representative whenever any such work or foundations is or are ready or about to be ready for examination and the Engineer's Representative shall without unreasonable delay unless he considers it necessary and advises the Contractor accordingly attend for the purpose of examining and measuring such work or of examining such foundations.

4.8.4.2. Uncovering and Making Openings

The Contractor shall uncover any part or parts of the Works or make openings in or through the same as the Engineer may from time to time direct and shall reinstate and make good such part or parts to the satisfaction of the Engineer. If any such part or parts have been covered up or put out of view after compliance with the requirements of Sub-Clause 4.8.4.1 and are found to be executed in accordance with the Contract the expenses of uncovering, making openings in or through reinstating and making good the same shall be borne by the Employer but in any other case all such expenses shall be borne by the Contractor and shall be recoverable from him by the Employer or may be deducted by the Employer from any money due or which may become due to the Contractor.

4.8.5.1. Removal of Improper Works and Materials

The Engineer shall during the progress of the Works have power to order in writing from time to time

a. The removal from the Site within such time or times as may be specified in the order of any materials which in the opinion of the Engineer are not in accordance with the Contract

b. The Substitution of proper and suitable materials and

c. The removal and proper re-execution (not withstanding any previous test thereof or interim payment therefore) for any work which in respect of materials or workmanship is not in the opinion of the Engineer in accordance with the Contract

4.8.5.2. Default of Contractor in Compliance

In case of default on the part of the Contractor in carrying out such order the Employer shall be entitles to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Employer or may be deducted by the Employer from any money due or which may be come due to the Contractor.

4.8.6.1.1 Suspension of Work

The Contractor shall on the written order of the Engineer suspend the progress of the works or any part thereof for such time or times and in such manner as the Engineer may consider necessary and shall during such suspension property protect and secure the work so far as is necessary in the opinion of the Engineer. The extra cost including all running wages to be paid on the Site salaries, depreciation and maintenance of plant, site on-costs and general overhead costs of the Contract incurred by the Contractor is giving effect to the Engineer's instructions under this Sub-Clause shall be borne and paid by the Employer unless such suspension is

a) Otherwise provided for in the Contract or

b) Necessary for the proper execution of the work or by reason of weather conditions effecting the safety or quality of the works or by some default on the part of the Contractor or

c) Necessary for the safety of the works or any part thereof.

4.8.6.1.2 Provided that the Contractor shall not be entitled to recover any such extra cost unless he gives notice in writing of his intention to claim to the Engineer within 28 days of the Engineer's order. The Engineer shall settle and determine such extra

payment to be made to the Contractor in respect of such claim as shall in the opinion of the Engineer be fair and reasonable.

4.9.0. COMMENCEMENT TIME AND DELAYS

4.9.1. Commencement of Works

The Contractor shall commence the works on site from the date of work order to commence the work from the Engineer and shall proceed with the same with due expedition and without delay except as may be expressly sanctioned or ordered by the Engineer or be wholly beyond the Contractor's control. Failure on the part of the Contractor to commence the work, without reasonable grounds which will be decided by the Engineer will entail forfeiture of the EMD to the Employer. No further correspondence on this account will be entered into with the Contractor.

4.9.2.1 Possession of Site

Save in so far as the Contract may prescribe the extent of portions of the site of which the Contractor is to be given possession from time to time and the order in which such portions shall be made available to him and subject to any requirement in the Contract as to the order in which the works shall be executed. The Employer will with the Engineer's written order to commence the works give to the Contractor possession of so much of the site as may be required to enable the Contractor to commence and proceed with the construction of the works in accordance with the programme refer to in Sub-Clauses 4.6.6.1. to 4.6.6.5. hereof (if any) and otherwise in accordance with such reasonable proposals of the Contractor as he shall by notice in writing to the Engineer make and will from time to time as the works proceed give to the Contractor possession of such further portions of the site as may be required to enable the Contractor to proceed with the construction of the works with due despatch in accordance with the said programme or proposals (as the case may be). If the Contractor suffers delay from failure on the part of the Employer to give possession in accordance with the terms of this Sub-Clause the Engineer shall grant an extension of time for the completion of the works.

4.9.2.2 Way Leaves Etc.

The Contractor shall bear all expenses and charges for special or temporary way-leaves required by him in connection with access to the site. The Contractor shall also provide at his own cost any additional accommodation out-side the Site required by him for the purposes of the works.

4.9.3 Time of Completion

Subject to any requirement in the specification as to completion of any portion of the works before completion, the whole of the works shall be completed within the time stated in the Tender (i.e.) **Six Months**. The time completion of the work shall be extended in the proportion that the altered additional or substituted work bears to the original Contract work and the Certificate of the Engineers shall be conclusive as to such proportion.

4.9.4 Extension of Time for Completion

The Contractor shall commence the works on site with the period named in the Tender after the receipt by him of an order in writing to this effect from the Engineer and shall proceed with the same with due expedition and without delay except as may, be expressly sanctioned or ordered by the Engineer or be wholly beyond the Contractor's control.

The Contractor shall maintain the rate of progress required as per schedule if the progress of work is held up owing to circumstances which, in the opinion Engineer are beyond the control of the Contractor such as war, stormy weather and for other reasonable causes the Engineer may, at his discretion, grant to the Contractor such extension of time as he considers reasonable for the completion of the work. In such circumstances, the Contractor shall apply for extension of time within 15 days of the hindrance on account of which he desires such extension as aforesaid.

The execution of the work during the extended period also shall be only under the conditions and at the rate specified in the contract.

No claim shall be made by the contractor on the grounds of executing the work beyond the completion period stipulated in the contract.

4.9.5 Night or Sunday Work

Subject to any provision to the contrary contained in the Contract none of the permanent work shall save as hereinafter provided be carried on during the night or on Sundays (if locally recognized as days of rest) or their locally recognized equivalent without the permission in writing of the Engineer's Representative save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the works in which case the Contractor shall immediately advise the Engineer's Representative. Provided always that the provisions of this Sub-Clause shall not be applicable in the case of any work which it is customary to carry out by rotation or double shifts.

4.9.6 Rate of Progress

The whole of the materials, plant and labour to be provided by the Contractor hereof and the mode manner and speed of execution and maintenance of the work are to be of a kind and conducted in a manner to the satisfaction of the Engineer. Should the rate of progress of the works or any part thereof be at any time in the opinion of the Engineer too slow to ensure the completion of the works by the prescribed time or extended time for completion, the Engineer shall so notify the Contractor in writing and the Contractor shall there-upon take such steps as the Contractor may think necessary and the Engineer may approve to expedite progress so as to complete the works by the prescribed time or extended time for completion. If the work is not being carried on by day and night and Contractor shall request permission to work by night as well as by day the Engineer shall consider grant of such permission to the Contractor, will not be entitled for any additional payment for so doing. If, however, the Engineer refuses such permission, the Contractor shall not be entitled for any extension of time on the Contract on account of such refusal. All work at night shall be carried out without unreasonable noise and disturbance. The Contractor shall indemnify the Employer from and against any liability for damages on account of noise or other disturbance created while or in carrying out the work and from and against all claims demands, proceedings, costs, charges and expenses whatsoever in regard or in relation to such liability.

4.9.7.1 Compensation for Delay/ Liquidated Damages: For slow performance or delay in the completion of work, compensation at the rate of 1% per week or part thereof of the **contract price** subject to a maximum of 10% of the total value of contract / purchase as Liquidated and ascertained damages and not by way of penalty , for every week or part thereof beyond the said period or extended period as the case may be during which the work shall remain unfinished as per Clause.4.9.4 under contract document. The total value of contract/ purchase is governed by the “Contract Price” definition under clause 4.1.1 (g) of contract document which mean the sum named in the tender subject to such additions thereto and deductions there from as may be made under the provisions of the contract.

4.9.7.2 Reduction of Compensation

If before the completion of the whole of the works any part of the works has been certified by the Engineer as completed pursuant to Sub-Clause 4.9.8 hereof and occupied or used by the Employer the liquidated damages for delay shall for any

period of delay after such certificate be reduced in the proportion which the value of the part so certified bears to the value of the whole of the works.

4.9.8 Certificate of Completion of Work

As soon as in the opinion of the Engineer the works shall have been substantially completed and shall have satisfactorily passed and final test that may be prescribed by the Contract the Engineer shall on receiving a written undertaking by the Contractor to finish any outstanding work during the period of maintenance, issue a Certificate of Completion in respect of the works and the period of Maintenance of the works shall commence from the date of such certificate. Provided that the Engineer may give such a certificate with respect to any part of the works before the completion of the whole of the works and shall upon the written application of the Contractor give such certificate with respect to any substantial part of the Works which has been both completed to the satisfaction of the Engineer and occupied or used by the Employer and when any such certificate is given in respect of a part of the works such part shall be considered as completed and the period of maintenance of such part shall commence from the date of such certificate. Provided also that a certificate of completion given in accordance with the foregoing provisions of any part of the works occupied and used as aforesaid shall not be deemed to certify completion of any ground or surface requiring reinstatement unless such certificate shall expressly so state.

4.10.0 MAINTENANCE AND DEFECTS

4.10.1.1 Definition of Period of Maintenance

In these conditions the expression 'period of Maintenance' shall mean the period of maintenance **Twelve Months** calculated from the date of completion of the works certified by the Engineer in accordance with Sub-Clause 4.9.8 hereof or in the event of more than one certificate having been issued by the Engineer under the said Sub-Clause from the respective dates so certified and in relation to the period of maintenance the expression 'the works' shall be construed accordingly.

4.10.1.2 Execution of Works of Repair Etc.

To the intent that the works shall at or as soon as practicable after the expiration of the period of Maintenance be delivered unto the Employer is as good and perfect a condition (fair wear and tear excepted) to the satisfaction of the Engineer as that in which they were at the commencement of the Period of Maintenance the Contractor shall execute all such work of repair, amendment, reconstruction, rectification and making good of defects imperfections shrinkages or other faults as may be required of the Contractor in writing by the Engineer

during the period of maintenance or within fourteen days after its expiration as a result of an inspection made by or on behalf of the Engineer prior to its expiration.

4.10.1.3 Cost of Execution of Work of Repair Etc.

All such work shall be carried out by the Contractor at his own expense if necessity thereof shall in the opinion of the Engineer be due to the use of materials or workmanship not in accordance with the Contract or to neglect or failure on the part of the Contractor to comply with any obligation expressed or implied on the Contractor's part under the Contract. If in the opinion of the Engineer such necessity shall be due to any other cause the value of such work shall be ascertained and paid for as if it were additional work.

4.10.1.4 Remedy on Contractor's Failure to Carry out Work Required

If the Contractor fails to do any such work as aforesaid required by the Engineer, the Employer shall be entitled to carry out such work by his own workmen or by other contractors and if such work is a work which the Contractor should have carried out at the Contractor's own cost shall be entitled to recover from the Contractor the cost thereon or may deduct the same from any money due or that may become due to the Contractor.

4.10.2 Contractor to Search

The Contractor shall if required by the Engineer in writing search for the cause of any defect, imperfection or fault under the directions of the Engineer. Unless such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract, the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by the Employer. But if such defect, imperfection or fault shall be one for which the Contractor is liable under the Contract, the cost of the work carried out by the Contractor in searching as aforesaid shall be borne by the Employer. But if such defect, imperfection or fault shall be one for which the Contractor is liable as aforesaid the cost of the work carried out in searching as aforesaid shall be borne by the Contractor and he shall in such case repair, rectify and make good such defect, imperfection or fault at; his own expense in accordance with the provision of Clauses 4.10.1.1. to 4.10.1.4. hereof.

4.11.0 ALTERATIONS, ADDITIONS AND OMISSIONS

4.11.1.1 Variations

The Engineer shall make any variation of the form, quality or quantity of the works or any part hereof that may in his opinion be necessary and for that purpose or if for any other reasons it shall in his opinion be desirable he shall

have power to order the Contractor to do and the contractor shall do any of the following;-

a) Increase or decrease of the work up to **15% of Contract Price**

b) Omit any part of the work (partially or fully)

c) Change the character or quality or kind of any such work

d) Change the level lines, position and dimensions of any part of the works, and

e) Execute additional work of any kind within the port limits and no such variation shall in any way vitiate or invalidate the Contract but the value of all such variations shall be taken into account in ascertaining the amount of the Contract price.

4.11.1.2 Orders for Variations to be in Writing

No such variation shall be made by the Contractor without an order in writing of the Engineer. Provided that no order in writing shall be required for increase or decrease in; the quantity of any work where such increase or decrease is not the result of an order given under this Sub-Clause but is the result of the quantities exceeding or being less those stated in the Bill of Quantities. Provided also that if for any reason the Engineer shall comply with such order and any confirmation in writing of such verbal order given by the Engineer whether before or after carrying out of the order shall be deemed to be an order; in writing within the meaning of this Sub-Clause. Provided further that if the Contractor shall confirm in writing to the Engineer any verbal order of the Engineer and such confirmation shall not be contradicted in writing by the Engineer it shall be deemed to be an order in writing by the Engineer.

4.11.2.1 Valuations of Variations

The Engineer shall determine the amount (if any) which in his opinion should be added to or deducted from the sum named in the Tender in respect of any extra or additional work done or work omitted by his order. All such work shall be valued at the rates set out in the Contract if in the opinion of the Engineer the same shall be applicable. If the Contract does not contain any rates applicable to the extra or additional work then suitable prices shall be agreed upon between the Engineer and the Contractor given below (i) if the altered additional or substituted works include any class of work shall be carried out at the rates entered in the schedule of rates of the Port Authority which was in force at the time of the acceptance of this Contract minus/plus the percentage which the total tendered amount bears to the estimated cost of the entire work put to Tender (ii) if the rates for additional, altered or substituted work are not specifically provided

in the Contract for the work, the rates will be derived from the rate for the similar class of work as are specified in the Contract for the work (iii) if the altered additional or substituted work is not entered in the said schedule of rates, then the Contractor shall within seven days, of the date of his receipt of the order to carry out the work inform the Engineer of the rates, which is his intention to charge for such class of work, and if the Engineer does not agree to this rate he shall, by notice in writing be at liberty to cancel his order to carry it out in such manner as he may consider advisable provided always that, if the Contractor shall commence work or incur any expenditure in regard there to before the rates shall have been determined as lastly herein before mentioned, then and in such case he shall only be entitled to be paid in respect of the work carried out or expenditure as assessed by the Engineer prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer.

In the event of a dispute, the decision of the Chief Engineer shall be final.

4.11.2.2.1 Powers of Engineer to Fix Rates

Provided that if the nature or amount of any omission or addition relative to the nature or amount of the whole of the Contract Work to any part thereof shall be such that in the opinion of the Engineer the rate or price contained in the Contract for any item of the Works is by reason of such omission or addition rendered unreasonable or inapplicable then a suitable rate or price shall be agreed upon between the Engineer and Contractor. In the event of disagreement the Engineer shall fix such other rate or price as shall in his opinion be reasonable and proper having regard to the circumstances.

4.11.2.2.2 Provided also that no increase of the Contract Price under Sub-Clause 4.11.2.1 or variation of rate or price under Sub-Clause 4.11.2.2.1 shall be made unless as soon after the date of the order as is practicable and in the case of extra or additional work before the commencement of the work or as soon thereafter as is practicable notice shall have been given in writing:-

(a) by the Contractor to the Engineer of his intention to claim extra payment or a varied rate or

b) by the Engineer to the Contractor of his intention to vary a rate or price as the case may be.

4.11.2.3 Increase or Decrease of Costs

If the net effect of all variations (other than those arising by reason of any Clause relating to variations in price of materials and/or labour and or fuel) shall be found on completion of the whole of the works to result in a reduction or an addition

greater the amount of the Contract Price; shall be amended by such sum as shall be agreed upon between the Engineer shall fix such sum as shall in his opinion be reasonable and proper regard being had to all material and relevant factors including the Contractor's own costs and overheads.

4.11.2.4.1 Day Work

The Engineer may if in his opinion it is necessary or desirable order in writing that any additional or substituted work shall be executed on a day work basis. The Contractor shall then be paid for such work under the conditions set out in the Day work Schedule included in the Bill of Quantities and at the rates and prices affixed thereto by him in his Tender.

4.11.2.4.2 The Contractor shall furnish to the Engineer such receipts or other vouchers as may be necessary to prove the amounts paid and before ordering materials shall submit to the Engineer quotations for the same for his approval.

4.11.2.4.3 In respect of all work executed on a day work basis the Contractor shall during the continuance of such work deliver each day to the Engineer's Representative an exact list in duplicate of the names, occupation and time of all workmen employed on such work and a statement also in duplicate showing the description and quantity of all materials and plant used thereon or therefore (other than plant which is included in the percentage addition in accordance with the Schedule herein before referred to). One copy of each list and statement will if correct or when agreed be signed by the Engineer's Rep and returned to the Contractor. At the end of each month the Contractor shall deliver to the Engineer's Representative a priced statement of the labour, material and plant (except as aforesaid) used and the Contractor shall not be entitled to any payment unless such lists and statements have been fully and punctually rendered. Provided always that if the Engineer shall consider that for any reason the ending of such list or statement by the Contractor in accordance with the foregoing provision was impracticable he shall nevertheless be entitled to authorize payment for such work either as day work. (on being satisfied as to the time employed and plant and materials used on such work) or at such value therefore as shall in his opinion be fair and reasonable.

4.11.2.5 Claims

The Contractor shall send to the Engineer once in every month an account giving particulars (as detailed as possible) of all claims for any additional expense to which the Contractor himself entitled and of all extra or additional work ordered by the Engineer which he has executed during the preceding month and no claim

for payment for any such work will be considered which has not been included in such particulars.

4.12.0 PLANT TEMPORARY WORKS AND MATERIALS

4.12.1.1 Plant Etc. Exclusive Use for the Works:

All Constructional Plant, Temporary Works and materials provided by Contractor shall when brought on to the site be deemed to be exclusively intended for the construction and completion of the works and the Contractor shall not remove the same or any part thereof (save for the purpose of moving it from one part of Site to another) without the consent in writing of the Engineer which shall not be unreasonably withheld provided; that nothing contained in these conditions shall prevent the Employer from retaining on the Site for the due completion of the Works, and any item of Constructional Plant, Temporary Works and materials after the happening of any event which gives to the Engineer the right to exclude the Contractor from Site and proceed with the Completion of the works.

4.12.1.2.1 Removal of Plant Etc.

Upon completion of the works, the Contractor shall remove from the site all the said Construction Plant and Temporary Works remaining thereon and any unused materials provided by the Contractor.

4.12.1.2.2 If the Contractor fails to remove any such Constructional Plant, Temporary works, or unused materials within such reasonable time, after the completion of works, as may be allowed by the Engineer, then the Employer may sell the same and shall after deducting from the proceeds costs, charges and expenses of an in connection with such sale, pay the balance if any, to the Contractor.

4.12.1.2.3. During the course of execution /completion of work, gate passes for the materials will be issued by the Engineer's Representatives on the written requisition by the Contractor. In case of any movement of unauthorized materials hidden/non hidden and brought along the authorized materials the Contractor is alone fully responsible for all consequence and in no way Engineer's Representatives are responsible for the same.

4.12.1.3 Employer not Liable for Damage to Plant Etc.

The Employer shall not at any time be liable for the loss of or injury to any of the said Construction Plant, Temporary Works or materials save as mentioned in Clauses 4.6.11.1, 4.6.11.2. and 4.17 hereof.

4.12.1.4 Conditions of Hire of Construction Plant

With a view to securing in the event of a forfeiture under Sub-Clause 4.16.1.1. hereof the continued availability for the purpose of executing the works of any essential Hired Plant the Contractor shall not bring on to the Site any Essential

Hired Plant unless the Agreement for hire thereof contains a provision that the owner thereof will, on request in writing made by the Employer within seven days after the date on which any such forfeiture has become effective and on the Employer undertaking to pay all hire charges in respect thereof from such date, hire Essential Hired plant to the Employer on the same terms in all respects as the same was hired to the Contractor save that the Employer shall be entitled to permit the use thereof by any other Contractor employed by him for the purpose of completing the works under the terms of the Sub-Clause 4.16.1.1.

4.12.1.5 Hire Purchase Payments by the Employer

The Employer shall in order to avoid seizure by the owner of any hire-purchase plant be entitled to pay to such owner the amount of any overdue installment or other sum payable under any agreement for hire purchase and in the event of its doing so any amount so paid by him shall be debt due from the Contractor to the Employer and may be deducted by the Employer from any moneys due or that may become due to the Contractor under the contract or may be recovered by the Employer from the Contractor at law. This will be accomplished in the following manner :-

The payment of overdue installment to the owner of hire purchase plant will be done by the department after deducting from the bills/money due as on date to the Contractor.

In case if happened to be paid before hand from the money that become due to the Contractor at a later date then the amount so paid is recoverable with interest at 3% above the prevailing SBI base rate following the departmental procedure.

4.12.1.6 Costs for Purposes of Sub-Clause 4.16.1.1.

In the event the Employer entering into any Agreement for hire of Essential Hired Plant pursuant to the provision of Sub-Clause 4.12.1.5. all sums properly paid by the Employer under the provision of any such agreement and all expenses incurred by him (including stamp duties) in entering into such Agreement shall be deemed for the purpose of Sub-Clause 4.16.1.1. hereof to be part of the cost of completing the work.

4.12.1.7 Contractor's Certificate as to Hiring Provisions

The Contractor shall upon request made by the Engineer at any time in relation to any item of Essential Hired Plant forthwith notify to the Engineer in writing the name and address of the owner thereof and shall certify that the Agreement for the hire thereof contains provisions in accordance with requirements; of Clauses 4.12.1.4 and 4.12.1.5. The Contractor shall also upon request as aforesaid give a like notification (but without certificate) in regard to any Hire Purchase Plant.

4.13.0 MEASUREMENT

4.13.1 Quantities

The quantities set out in the Schedule of Quantities are the estimated quantities of the work but they are not to be taken as the actual and correct quantities of the Works to be executed by the Contractor in fulfillment of his obligations under the Contract.

4.13.2 Method of Measurement

Except where any general or detailed description of the work in bills of quantities or schedule of works / items / quantities expressly shows to the contrary, bills of quantities or schedule of works / items / quantities shall be deemed to have been prepared and measurements shall be taken in accordance with the procedure set forth in the schedule of rates/specification notwithstanding any provision in the relevant standard method of measurement or any general or local custom. In the case of items which are not covered by the Schedule of Rates/specification, measurements shall be taken in accordance with the relevant standard method of measurements issued by the Bureau of Indian Standards.

4.13.3 Records & Measurements

The Engineer's Representative shall except as otherwise stated ascertain and determine; by measurement the value in accordance with the Contract of work done in accordance therewith.

All items having a financial value shall be entered in measurement book, level book, etc., prescribed by the employer so that a complete record is obtained of all work performed under the Contract.

Measurements shall be taken jointly by the Engineer's Representative or his authorized representative and by the Contractor or the representative. Before taking measurement of any work the Engineer's Representative or the person deputed by him for the purpose shall give a reasonable notice to the Contractor. If the Contractor fails to attend or send an authorized representative for measurement after such a notice or fails to countersign or to record the objection within a week from the date of measurement, then in any such event measurements taken by the Engineer's Representative or by the person deputed by him shall be taken to the correct measurement of the work.

The Contractor shall, without extra charge, provide assistance with every appliance and other things necessary for measurement. Measurements shall be signed and dated by both parties each day on the site on completion of measurement. If the Contractor objects to any of the measurement recorded on behalf of the Employer, a note to that effect shall be made in the measurement

book against the item objected to and such note shall be signed and dated by both parties engaged in taking the measurements.

If as a result of such objection, it become necessary to remeasure the work wholly or in part, the expense of such measurement shall be borne by the party requiring the measurements to be retaken provided that net errors are found by this measurement to amount to less than 5% of the value as recorded by the first measurement, where however the net errors amount to 5% or over the said value, The cost of re-measurement shall be borne by the other party. In any case if the net value of errors exceeds Rs.500/- the expense of re-measurement shall be borne by the other party.

4.14 CERTIFICATES AND PAYMENTS

4.14.1 Payment of Bills Monthly Payment

The Contractor shall submit to the Engineer each month on or before the 10th of the month, a statement on the standard printed form to be had on application showing the quantity of each item of Contract Value of the permanent work executed upto the end of the month (if such value shall justify the issue of an interim certificate) and the Contractor will be paid monthly on the certificate of the Engineer. The amount due to him on account of estimated Contract Value of the Permanent Work executed upto the end of the previous month together with such amount (if any) as the Engineer may consider proper on account of material for permanent Works or Constructional Plants for which separate amounts are provided in Bills of Quantities subject to deduction of 10% from each running bill after adjusting the EMD already deposited towards security Deposit to a maximum of 5% of contract price. All Amounts due to the Board by the Contractor if outstanding on account of the supply of any materials, electricity, water services rendered in connection with the Contract, repairs or rectification to work etc., shall be adjusted from the bills or any amount due to the Contractor by the Board by way of outstanding, deposits etc. In addition to the above all statutory levies such as Income Tax, Sales Tax etc will be deducted at the rates applicable from time to time.

The contractor should furnish proof of having paid all payments due to employees Provident Fund and Employees State Insurance organizations along with monthly bills. 75% of the net amount of interim certificate shall be paid by the Employer within 10 days from the date of interim certificate and the balance within 30 days from the date of interim certificate. The date on which a Cheque of payment is handed over to the contractor by the Employer will be considered as the date of payment for all purposes. Delay in making such payments by the

Employer due to exceptional circumstances shall not nullify or vitiate in any way or other conditions of the contract and the contractor shall have no claim on this account.

E- PAYMENT - Payments of contractor's bills through Banks :-

Payments due to the contractor may, if so desired by him by made to the bank instead of direct to him, provided that the contractor furnishes to the Engineer– in –Charge (1) **an authorization in the form** of a legally valid document such as a **power of attorney** conferring authority on the bank to receive payments and (2) his own acceptance of the correctness of the account made out as being due to him by employer or his signature on the bill or other claim preferred against employer before settlement by the Engineer – in – Charge of the account or claim by payment to the Bank. While the receipt given by such banks shall constitute a full and sufficient discharge for the payment the contractor should, wherever possible present his bills duly receipted and discharged through his bankers. Nothing here in contained shall operate to create in favor of the bank any rights or equities vis-à-vis the Board.

The date on which e-payment to the contractor by the employer will be considered as the date of payment for all purposes. Delay in making such payments by the employer due to exceptional circumstances shall not nullify or vitiate in any way or other the conditions of the contract and the contractor shall have no claim on this account

. The Engineers may by any certificate make any correction or modification in any previous certificate which shall have been issued by him and shall have power to with hold any certificate if the work or any part thereof is not being carried out to his satisfaction. Balance payment will be released on completion of work to the satisfaction of Engineer's Representatives. No claim will be entertained by the Port in this account For the e-payment, Port has made working arrangements with the following Bankers:

a) State Bank of India, Main Branch, Tuticorin.

b) Indian Overseas Bank, Harbour Branch

c) Syndicate Bank, New Port, Tuticorin-628 004

The arrangements designed to work are as follows:

i The amount due to the payee will be intimated to the port Bankers in the form of Electronic messages

ii The Bank will arrange to credit the amount to the parties account through electronic transfer failing which by other modes as detailed further.

iii If the payee's account is with any of the computerized & net work0ed branches of the above named Banks, the amount due to the payee will be credited to the payee instantly without payment of Bank charges.

iv In all other cases, payment will be arranged through Banker's Cheque/ DDs by the State Bank of India through "speed post" or "courier service" for this the bank charges at the appropriate rates will be payable by the payee.

SPECIMEN FORM OF E- PAYMENT

To
The Financial Advisor & Chief Accounts Officer,
V.O.Chidambaranar Port Authority

Tuticorin-628004.

Sir,

We hereby give particulars for payment of the Works bill / Advance etc

Sl No	Particulars	
1	Name of the Contractor / Supplier	
2	Address of the Contractor / Supplier	
3	Name of the work for which payment is made	
4	Estimate No. Agreement No. Work order No.	
5	Name of the bank in which Contractor/ Supplier operating account. Either with IOB or SBI or Any other bank (If it is other than IOB or SBI, bank commission plus postage will be deducted)	
6	Address of the Bank	
7	Branch Code No	
8	Type of Account (whether SB A/c. or Current A/c.)	
9	Account No.	
10	PAN No.	
11	GST Registration No.	
12	I.F.S.C Code (Bank Code)	

Yours Sincerely,

(Signature of Contractor)

4.14.2. Correction and Withholding of Certificates

The Engineer's Representative may by any certificate make any correction or modification in any previous certificate which shall have been issued by him and shall have power to withhold any certificate make part payment if the Works or any part thereof are not being carried out to his satisfaction. Balance payment will be released on completion of work to the satisfaction of Engineer's Representative. No claim will be entertained by the Port on this account.

4.14.3 Indian Currency

All payments made to the Contractor under the Contract shall, unless otherwise agreed to be made to the Contract in Indian Currency.

4.14.4 Approval only by Maintenance Certificate

No Certificate other than the Maintenance Certificate referred to in Clauses 4.14.5 to 4.14.7 hereof shall be deemed to constitute approval of any work or other matter in respect of which it is issued or shall be taken as an admission of the due performance of the Contract of any part thereof or of the accuracy of any claim or demand made by the Contractor or additional or varied work having been ordered by the Engineer nor shall any other certificate conclude or prejudice any of the powers of the Engineer.

4.14.5 Maintenance Certificate

The Contract shall not be considered as completed until a Maintenance Certificate shall have been signed by the Engineer and delivered to the Employer stating that the works have been completed and maintained to his satisfaction. The Maintenance Certificate shall be given by the Engineer within twenty eight days after the expiration of the Period of maintenance (or if different periods of Maintenance shall become applicable to different parts of the Works the expiration of the latest such period) or as soon thereafter as any works ordered during such period pursuant to Sub-Clause 4.10.1.1 and 4.10.2 hereof shall have been completed to the satisfaction of the Engineer and full effect shall be given to this Clause notwithstanding any previous entry on the works or the taking possession working or using thereof or any part thereof by the Employer.

4.14.6 Cessation of Employer's Liability

The Employer shall not be liable to the Contractor for any matter or thing arising out of or in connection with the Contract or the execution of the Works unless the Contractor shall have made a claim in writing in respect thereof before the giving of the Maintenance Certificate under this Sub-Clause.

4.14.7 Unfulfilled Obligations

Notwithstanding the issue of the Maintenance Certificate the Contractor and (subject to Sub-Clause 4.14.6) the Employer shall remain liable for the fulfillment of any obligation incurred under the provisions of the Contract prior to the issue of the Maintenance Certificate which remains unperformed at the time such certificate is issued and for the purposes of determining the nature and extent of any such obligation the Contract shall be deemed to remain in force between the parties hereto.

4.14.8 Time limit for Payment of Final Bill

The Contractor's Final bill shall be passed for payment within Three Months after the issue of certificate by the Engineer provided the Contractor has fully complied with the requirements under the Contract. If the amount payable under any certificate is not sufficient to cover deduction to be made for the sums loaned and other sums deductible under the Contract the balance outstanding shall be paid by the Contractor in cash within 15 working days from the date of receipt; of the written notice issued in this regard by the Engineer.

The date on which a Cheque of payment is handed over to Contractor by the employer will be considered as the date of payment for all purpose.

4.14.9 After the payment of the amount of final bill, payable as aforesaid has been made the Contractor may, if he so desires, reconsider his position in respect of the disputed portion of the final bill and if he fails to do so within 90 days, his disputed claim shall be dealt with as provided in the Contract.

4.15.0 Void

4.16.0 Remedies and Powers

4.16.1.1 Forfeiture

If the Contractor shall become bankrupt or have a receiving order made against him or shall present his petition in bankruptcy or shall make an arrangement with or assignment in favour of his creditors or shall agree to carry out the Contract under a committee of inspection of his creditors or (being a corporation) shall go into liquidation (other than a voluntary liquidation for the purposes of amalgamation or reconstruction) or if the Contractor shall assign the Contract without the consent in writing of the Employer first obtained or shall have an execution levied on his goods or if the Engineer shall certify in writing to the Employer that in his opinion the Contractor :

(a) has abandoned the Contractor

(b) Without reasonable excuse has failed to commence the Works or has suspended the progress of the Works for 28 days after receiving from the Engineer written notice to proceed or

(c) has failed to remove materials from the Site or to pull down and replace Work for 28 days after receiving from the Engineer written notice that the said materials or Work had been condemned and rejected by the Engineer under these conditions or

(d) is not executing the works in accordance with the contact or is persistently or flagrantly neglecting to carry out his obligations under the Contract or

(e) has to the detriment of good workmanship or in define of the Engineer's instructions to the contrary sub-let any part of the Contract then the Employer may after giving 14 days notice in writing to the Contractor enter upon the site and the Works and expel the Contractor there from without thereby avoiding the Contract or releasing the Contractor from any of his obligations or liabilities under the Contract or affecting the rights and powers conferred on the Employer or the Engineer by the Contract and may himself complete the works or may employ any other Contractor to complete the works and the Employer or such other Contractor may use for such completion so much of the Constructional Plant, temporary Works and materials which have been deemed to be reserved exclusively for the construction and completion of the works under the provisions of the Contract as he or they may think proper and the Employer may at any time sell any of the said Constructional Plant, temporary works and unused materials and apply the proceeds of sale in or towards the satisfaction of any sums due or which may become due to him from the Contractor under the Contract.

4.16.1.2 Valuation of Forfeiture

The Engineer shall as soon as may practicable after any such entry and expulsion by the Employer fix and determine exparte or by after reference to the parties or after such investigation or enquiries as he may think fit to make or institute and shall certify what amount (if any) had at the time of such entry and expulsion been reasonably earned by or would reasonably accrue to the Contractor in respect of Work then actually done by him under the Contract and what was the value of any of the said unused or partially used materials any Constructional Plant and any Temporary Works.

4.16.1.3 Payment after Forfeiture

If the Employer shall enter and expel the Contractor under this Sub-Clause he shall not be liable to pay to the Contractor any money on account of the Contract until the expiration of the Period of maintenance and thereafter until the costs of completion and maintenance damages for delay in completion (if any) and all other expenses incurred by the Employer have been ascertained and the amount thereof certified by the Engineer. The Contractor shall then be entitled to receive only such sum or sums (if any) as the Engineer may certify would have been due to him upon due completion by him after deducting the said amount. But if such amount shall exceed the sum which would have been payable to the Contractor on due completion by him then the Contractor shall upon demand pay to the Employer the amount of such excess and it shall be deemed a debt due by the Contractor to the Employer and shall be recoverable accordingly.

4.16.1.4 Assignment of Benefit of Agreement

If so required by the Employer or the Engineer the Contractor shall before the expiration of the notice referred to in Sub-Clause 4.16.1.1. assign to the Employer without payment the benefit of any Agreement which the Contractor has entered into for the supply for materials and /or for the execution of any works for the purpose of the Contract but on the terms that a supplier or Sub-Contractor shall be entitled to make any reasonable objection to any further assignment thereof by the Employer and the Employer may pay the supplier or Sub-Contractor for any such material supplied and delivered to the site or works executed under such Agreement (whether the same be assigned as aforesaid or not) before or after the giving of the notice the amount due by such Agreement in so far as the supplier or the Sub-Contractor or by the Employer to the Contractor.

4.16.2 Urgent Repairs

If by reason of any accident or failure or other event occurring to in or in connection with the works or any part thereof either during the execution of the works or during the Period of Maintenance any remedial or other work or repairs shall in the opinion of the Engineer or the Engineer's Representative

be urgently necessary for security and the Contractor is unable or unwilling at once to do such work or repair the Employer may by his own or other workman do such work or repair as the Engineer or the Engineer's Representative may consider necessary. If the work or repair so done by the Employer is work which in the opinion of the Engineer the Contractor was liable to do at his own expense under the Contract all cost and charges properly incurred by the Employer in so doing shall on demand be paid by the Contractor to the Employer or may be

deducted by the Employer from any money due or which may be come due to the Contractor. Provided always that the Engineer or the Engineer's Representative (as the case may be) shall as soon after the occurrence of any such emergency as may be reasonably practicable notify the Contractor thereof in writing.

4.17.0 SPECIAL RISKS

4.17.1.1 No liability for War, Etc., Risks

The Contractor shall be under no liability whatsoever whether by way of indemnity or otherwise for or in respect of destruction of or damage to the Works (save to work condemned under the provisions of Clauses 4.8.5.1. and 4.8.5.2. hereof prior to the occurrence of any special risk hereinafter mentioned) or temporary Works or to property whether of the Employer or third parties or for or in respect of injury or loss of life which is the consequence whether direct or indirect of war hostilities (whether war be declared or not), invasion act of foreign enemies, rebellion, revolution, insurrection or military or uninterrupted power, civil war or (otherwise than among the Contractor's own employees) riot, commotion or disorder (here in after comprehensively referred to as "the said Special Risks").

4.17.2 Projectile Missile, Etc.

Destruction, damage, injury or loss of life caused by the explosion or impact whenever and wherever occurring of any mine bomb, shell grenade or other projectile missile, munition or explosive of war shall be deemed to be a consequence of the said Special Risks.

4.17.3 Increased Costs Arising from Special Risks

The Employer shall repay to the Contractor any increased cost of or incidental to the execution of the works, (other than such as may be attributable to the cost of reconstructing work condemned under the provisions of Clauses 4.8.5.1.and 4.8.5.2. hereof prior to the occurrence of any Special Risks) which is howsoever attributable to or consequent on or the result of or in any way whatsoever connected with the said special risks (subject however to the provisions in this Sub-Clause hereinafter contained in regard to outbreak of war) but the Contractor shall as soon as any such increase of cost shall come to his knowledge forthwith notify the Engineer thereof in writing.

4.17.4 Outbreak of War

If during the currency of the Contract there shall be an outbreak of war (whether war is declared or not) in any part of the world which whether financially or otherwise materially affects the execution of the Works the Contractor shall

unless and until the Contract is terminated under the provisions in the Sub-Clause contained use his best endeavors to complete the execution of the works provided always that the Employer shall be entitled at any time after such outbreak of war to terminate this Contract by giving notice in writing to the Contractor and upon such notice being given this Contract shall save as to the rights of the parties under this Sub-Clause without prejudice to the rights of either party in respect of any antecedent breach thereof.

4.17.5 Removal of Plant on Termination

If the Contract shall be terminated under the provisions of the last preceding Sub-Clause the Contractor shall with all reasonable despatch remove from the Site all Constructional Plant and shall give similar facilities to his Sub-Contractors to do so.

4.17.6 Payment if Contract Terminated

If the Contract shall be terminated as aforesaid the Contractor shall be paid by the Employer (in so far such amounts or items shall not have already been covered by payments on account made to the Contractor) for all work executed prior to the date of termination at the rates and prices provided in the Contract and in addition:-

(a) The amounts payable in respect of any preliminary items so far as the work or service comprised therein has been carried out or performed and a proper proportion as certified by the Engineer of any such items the work or service comprised in; which has been partially carried out or performed.

(b) The cost of materials or goods reasonably ordered for the works or Temporary works shall have been delivered to the Contractor or of which the Contractor is legally liable to accept delivery (such materials or goods becoming the property of the Employer upon such payment being made by him.)

(c) A sum to be certified by the Engineer being the amount of any expenditure reasonably incurred by the Contractor in the expectation of completing the whole of the works in so far as such expenditure shall not have been covered by the payments in this Sub-Clause before mentioned.

(d) Any additional sum payable under the provisions of Sub-clause 4.17.1.

(e) The reasonable cost of removal under Sub-Clause 4.17.6 and (if required by the Contractor) return thereof to the Contractor's main plant yard in his country of registration or to any other destination at no greater cost.

(f) The reasonable cost of repatriation of all the Contractor's staff and workmen employed on or in connection with the works at the time of such termination.

Provided always that against any payments due from the Employer under this Sub-clause the Employer shall be; entitled to be credited with any outstanding balance due from the Contractor for advance in respect of plant and materials and any sum previously paid by the Employer to the Contractor in respect of the execution of the work.

4.18.0 FRUSTRATION

4.18.1 Payment in the Event of Frustration

In the event of the Contract being frustrated whether by war or otherwise howsoever the sum payable by the Employer to the Contractor in respect of the work executed shall be the same; as that which would have been payable under Clause 4.17 hereof if the Contract had been terminated under the provisions of Clause 4.17 hereof .

4.18.2 Law Governing the Contract

This contract shall be governed by the India Laws for the time being in force and any proceedings relating to this contract shall be filed or taken by the contractor in a court of Law only in Tuticorin.

4.19.0 NOTICES

4.19.1 Notice to Contractor

All certificates, notices or instructions to be given to the Contractor by the Employer of the Engineer under the terms of the Contract shall be sent by post, cable, telex or facsimile transmission to or left at the Contractor's principal place of business or such other address as the Contractor shall nominate for that purpose.

4.19.2 Notice to Employer and Engineer

Any notice to be given to the Employer or to the Engineer under the terms of the Contract shall be sent by post, telex, or facsimile transmission to or left at the following address:-

Chief Engineer,
Administrative Building,
V.O.Chidambaranar Port Authority,
Tuticorin – 628 004, Tamil Nadu, INDIA.
Fax No. 0461 – 2354270

4.20 SITE DRAINAGE

All water which may accumulate on the site during the progress of work or in trenches and excavations from other than the Excepted Risks shall be removed from the site to the satisfaction of the Engineer and at the Contractor's expenses.

4.21 PROTECTIONS OF TREES

Trees designated by the Engineer shall be protected from damage during the course of the works and earth level within one meter of each such tree shall not changed. Where necessary such trees shall be protected with temporary fencing.

4.22 CHANGES IN CONSTITUTION

Where the Contractor' is a partnership firm, prior approval in writing of the Engineer shall be obtained before any change is made in the constitution of the firm. If the Contractor is an individual or a Hindu undivided family business concern such approval as aforesaid shall likewise be obtained before the Contractor enters into any partnership Agreement where under the partnership firm would have the right to carry out the work hereby undertaken by the Contractor.

4.23 VOID

4.24 REGARDING ENTRY OF LABOUR & VEHICLES IN HARBOUR PREMISES

Admission into the Harbour is regulated by passes and the Contractor shall get passes required on payment of necessary fees as levied by the port from time to time for labour / Staff for entry into the Harbour of his work. Failure to the returns all the passes will entail a penalty as may be levied by the Board from time to time.

The passes for entry into Green Gate / Red Gate / Zone-"B" for Labour and Vehicles of the Contractor in connection with the execution of this contract work shall be obtained at his cost as per tariff in force from time to time in this Port.

No License fee will be collected for the entry of construction equipments to be stationed in the work spot such as concrete mixer, batching plant, excavator, paver, road roller, tractor, tippers and any other necessary equipment depending on the type of work to be certified by the Engineer in charge.

4.25 SET OFF CLAUSE

Any sum of money due and payable to the Contractor (including the security deposit returnable to him) under this Contract may be appropriated by the Port and set off against any claim of this Port for the Payment of a sum of money arising out of or under other Contract made by the Contractor with the Port.

4.26 TERMINATION OF CONTRACT IN THE EVENT OF DEATH, INSANE ETC.

In the event of death, insanity or insolvency of the Contractor or in the case of the Contractor being a partnership on dissolution of the firm of contractors or in case of the Contractor being a company governed by Companies Act, 1956, the winding up of the company, the Contract shall be terminated on the happening of and all of and all accepted and acceptable work shall be measured up and paid for to the person or persons legally entitled to receive payment for the work done, and on his or their executing a bond indemnifying the Board against any claims that may be made in respect of payments made by board by persons claiming from the Contractor or other. In respect of work done by the Contractor prior to the termination of the Contract.

4.27 CUSTOMS AND SECURITY ARRANGEMENTS

The Contractor shall comply with all the regulations imposed by the customs and Port security Authorities in respect of the passage of plant, vehicles, materials and personnel through custom barriers.

No photographs of the works or any part thereof or plant deployed thereon shall be taken or permitted by the Contractor to be taken by any of his or sub Contractor's employees without the approval of the Engineer and no such photographs shall be published or otherwise circulated without the approval of the Engineer, except for what is stated in Sub-Clause No.4.6.6.3. & 4.6.6.4.

4.28 ESCALATION / INCREASE OR DECREASE OF COST

Adjustments to the contract price shall not be allowed in respect of rise or fall in the costs of labour and / or materials and / or fuel or any other matters affecting the cost of the execution of the works.

5. GENERAL INFORMATION

5.1 SITE

Tuticorin Town is at latitude 08º–48'– N and longitude 78º– 09' E and about 530 Km SSW Madras. The town is connected by good roads to all important places to Nagercoil, Trivandrum, Quilon and Cochin via. Tirunelveli, Kanyakumari (Cape Comorin) via. Tiruchendur and to Madurai, Tiruchirapalli and Madras. A Broad gauge track connects Tuticorin with the net work of lines of Southern Railway. The track from Tuticorin leads to Maniyachi Junction. From Maniyachi one line leads to Tirunelveli and Trivandrum. The other line from Maniyachi leads to Madurai, Madras and other parts of India. The Harbour site is connected by Broad Gauge siding to Milavittan, a station on the Tuticorin – Maniyachi line, just before Tuticorin. Tuticorin is served with electric power by grid of the TamilNadu

Electricity Board, supply Voltage is 22 KV which is stepped down to 220V and 440V. Newly laid feeder lines supply upto 230 KVA of electric energy at the Harbour site at 0.8 power factor. The frequency is 50 cycles per second. The Harbour site is connected to the water supply system and good water is available in sufficient quantities which can also be used for drinking purposes.

This Port consists of two Zones (Zone 'A' and Zone 'B'). The Port is Zone 'A' is an artificial Harbour with rubble mound type parallel Break waters, North and South each of length 4103 metres and 3888 metres respectively. The main wharf is 877 m long and it can be accommodated four ships. Two numbers of Additional berth are constructed in the year 1984 to a length of 463 m. All the six berths are under operation now. In addition to this one Oil Jetty and 2 Nos. Coal Jetties are constructed at North Break Water. Seventh Berth, completed in May 1998 in additional Berth Site has been leased to Port of Singapore Authority for operation on Built, Operate and Transfer (B.O.T) basis. Berth No.8 has been completed during 2/2002. The connection between the Wharves and the shore is by means of Roads, and Railway lines laid over the reclaimed approach arm.

Facilities available at V.O.Chidambaranar Port

Zone 'A' (Major Port)

a) Berths at South Breakwater

i) Along side berths - 4 Nos.

ii) Additional berth in Finger pier - 6Nos.

b) At North Breakwater

i) Oil Jetty - 1 No.

ii) Coal Jetty - 2 Nos.

iii) NCB-I -1No

5.2 DATA

5.2.1 Meteorological Data

5.2.1.1 Atmospheric Pressure

Mean pressure reduced to MSD is 1010.7 millibars.

5.2.1.2 Air Temperature

The mean of daily maxima and minima are about 32º C and 25º C respectively. Extreme values recorded during 1955-1960 are about 41º C and 18º C respectively.

5.2.1.3 Rainfall

Total rain fall per annum is 640 mm. Rainy months are October, November and December. Totally there about 34 rainy days in a year.

5.2.1.4 Wind

Mean wind speeds of about 15 knots are quite probable from W and ENE and about 10 knots from SSE. Wind speeds of about 27 knots lasting for one or two days have also been observed. But on a very few occasions like the year 1961 these speeds have been exceeded.

5.2.1.5 Cyclones

The months of November and December are the worst as far as cyclones in this area are concerned. The winds associated with the cyclones, especially these emanating from the Bay of Bengal may generate significant disturbances. Recently a cyclone passed directly over Tuticorin during November 1992. Recently Tsunami waves triggered Tuticorin Port during December 2004. However, VOC Port can work ordinarily throughout the year except during severe storms.

5.2.2 Geological Data

5.2.2.1 Shore Area

The shore area is of very fine sand to a considerable depth except for a skin of lime-stone occurring between levels (-) 6 metre and for a thickness of maximum 2 metre. The area generally is low lying, the levels varying from (+) 4.00 feet (1.22 m) to (+) 5.5 feet (1.68 m) and except for growth of grass and small thorny bushed, no other growth of trees are at present existing. However, after the commencement of works in this area, plantations have been taken up.

The ground water level varies between 2' to 4' (0.61 m. To 1.22 m.) below existing ground level, and the water is saline in most parts.

5.2.2.2 The sea bed just beyond the coast line is shallow, and the depth of (-)1 m. is found at about 480 metres beyond the coastline. Thereafter the sea bed dips at a rate of one in 100 m. Approximately and a depth of (-)10 mtrs. is noticed at about 3000 metres away from the coast line.

5.3 DATUM

The Datum to which levels and soundings have been reduced for the purpose of Drawings in Contract is the chart datum which is 2.36 metre below the G.T.S. Benchmark situated beside the path leading to the main entrance of the Holy Trinity Church of England at Tuticorin. The Contractor will be given, by the Engineer, the value of a Benchmark relative to the chart Datum located near the Green Gate of the Port which shall be used for all setting out, soundings etc.

5.4 SERVICES AND FACILITIES

The following services and facilities are available for use of the contractors for construction.

5.4.1 Electricity

a) Electric power supply will be made available from the existing outdoor pillar box for tapping for general lighting, welding and other such works under this Contract nearer to the work site to the extent possible.

b) The Contractor is to make his own arrangements at his cost to install tested meters at the respective points of supply at the Harbour area and to draw only U.G.cable, put up fittings required and take electrical energy for lighting and power required for use.

c) The entire electrical installation shall conform to Indian Electricity Rules and as per general layout approved by the Chief Mechanical Engineer. But the Contractor shall be responsible for the details.

d) No claim will be entertained by the Port for stoppage or failure of electric supply. In case of failure of electricity the Contractor shall make arrangement for generator at his cost for uninterrupted power supply.

e) Current consumption charges consumed by the Contractor including meter rent if any will be recovered as usual rates. The prevailing Tariff is applicable and subject to revision by TNEB.

The above is subject to revision from time to time whenever TNEB revises the tariff.

5.4.2 Water Supply

Water supply will be made available nearer to the work site. The Contractor(s) shall make his / their own arrangements to draw water required for the work including cost of all materials and conveyance to the site of work and nothing extra will be paid for the same.

The cost will be recovered from the Contractor at **Rs.70/- (Rupees Seventy only)** per thousand liters of water supplied. The above water charge is subject to revision from time to time. The Contractor should fix the water meter at his cost at places required for him. Water shall be drawn through the meter only. If the Contractor fails to fix the water meter or if the water meter goes out of order water charges shall be recovered at 1% of the value of the work done during the period under consideration.

It should be clearly understood that the department does not guarantee to maintain uninterrupted supply of water and it will be incumbent on the part of the Contractor(s) to make alternative arrangements for water at his / their own cost,

in the event of any temporary breakdown in the departmental water mains and whenever the department is unable to supply water due to scarcity, so that progress on his / their work is not held up for want of water. No claim of damage or refund of water charge will be entertained on account of such breakdown, non supply etc. And any delay in completing the work for want of water will not be considered as hindrance to the work.

5.4.3 Facilities for Housing Labour

For housing the Contractor's labours temporarily during construction period, plots can be allotted in the Port's labour colony based on the specific application from the Contractor for erecting temporary huts. Normal ground rent will be charged as per rules at the rate fixed by the Port from time to time. The Contractor should furnish the layout of the land required for approval of the Engineer. The allotment of plots will be at the discretion of the Engineer.

A water supply point will be given. The Contractor has to make their own arrangements at their cost for erecting sheds, extension of water supply and sanitary arrangements. Charges for water will be recovered from the Contractor at **Rs.70/- (Rupees Seventy only) per Thousand Litres of water supplied**. The above water charges is subject to revision from time to time. Water should be drawn through water meter only to be fixed by the Contractor. If the water meter goes out of order the cost as assessed by the Port will be recovered.

5.4.4 Availability of Materials

Diesel and petrol filling stations are available at Harbour Area and Tuticorin Town.

5.5 CONTRACTOR TO WORK TO OTHER CONTRACTOR'S DRAWINGS

The Contractor shall where so directed by the Engineer incharge be required to work to other Drawing wheresoever's that the Drawings for works not included in this Contract are related to particular details of work.

5.6 ATTENDANCE ON OTHER CONTRACTORS

The Contractor shall from time to time as the Engineer directs provide attendance on other contractors and carryout minor works in connection with such Contract.

5.7 CONTRACTORS WORKING AREA

The area for erection of Hot Mix Plant and batching plant will be allotted suitably by Port. For the allotted working areas no ground rent will be charged. The buildings for site offices are not to be used for residential purpose.

5.8 TELEPHONE FACILITIES

The Contractor shall make his arrangements for the provision of telephone facilities to the site as a contingency of the Contract. However public call office with STD & ISD facilities are available at VOC Wharf, Additional Berth, Green Gate Area, Quarters Area.

5.9 SURVEYS AND LEVELS TO BE AGREED

Before the works or any part thereof are begun, the Contractor's agent and the Engineer or his representative shall together survey and take levels of the site of the works and agreed to all particulars on which the survey is to be made and on which the measurements of the works are to be based. Failing such surveys and agreements being prepared and or signed by the Contractor's agent the surveys of the Engineer shall be final and binding of the contractors.

5.10 NOTICE OF OPERATIONS

No important operation shall be commenced nor shall the work outside the working hours by carried out without the consent of the Engineer or his Representative or without full and complete notice also in writing being given to him sufficiently in advance of the time of the operation so as to enable him to make such arrangements as he may deem necessary for his inspection.

5.11 ADVERTISING

No advertisement may be placed on any building fencing or scaffolding etc., erected in connection with this Contract without the written permission of the Engineer.

5.12 EXISTING SERVICES

Drains, pipes, cables, overhead wires and similar services encountered in the course of the works shall be guarded from damages by the Contractor at his own expense so that they may continue in full and uninterrupted use to the satisfaction of the owners thereof and the Contractor shall not store materials or otherwise occupy and part of the site in a manner likely to hinder the operation of such services.

5.13 FILLING IN HOLES AND TRENCHES

The Tenderer immediately upon completion of any work under the Contract shall at his own expenses fill up all holes or trenches which have been made or dug, level or remove mounds of earth that may have been made and clear away all rubbish obtained in the execution of the work or temporary works.

5.14 KEEPING THE SITE CLEAN

The Tenderer shall at all times keep the site free from all surplus excavated materials, rubbish offensive matter which shall be disposed off in a manner to be approved by the Engineer.

5.15 MATERIALS

The Employer will not supply any construction materials of whatsoever nature and kind for the execution of the contract. The Contractor shall at his own costs and expenses make his own arrangement for obtaining all materials required, for the execution of the work and ensure that the requisite materials are procured in time. A list showing the names of the firms or company or authorities from whom the contractor proposes to obtain or purchase various materials must be submitted by the contractor and approved by the Engineer in writing before placing orders for purchasing the material

5.16 QUARRY MATERIAL & ROYALTY PAYMENTS

The contractor shall at his own costs and expenses obtain fill material / aggregate, as also find source for obtaining fill material / aggregates required for execution of works. The contractor shall also bear all costs and expenses incurred by him for identification of sources, transport of material to the site of work, royalty and other expenses in connection with obtaining fill material / aggregates.

5.17 LEAD FOR MATERIALS

The lead statement furnished for the various materials is only indicative. No increase in rates shall become payable to the Contractor if the actual lead for any of the materials is found to be more than specified in the lead statement.

6. SCOPE OF WORK

a) Short description of the works

The work of "**Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port**" is detailed below:

The overall cost of the proposed road work is **Rs.2,80,94,276/- (Rupees Two Crore Eighty Lakhs Ninety Four Thousand Two Hundred and Seventy Six only)**

Major components:

The main part of the contract involved for "**Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port**"

The main works consists of following items.

1. Dismantling and removal of Reinforcement Cement Concrete (RCC) and brick work masonry.
2. Earthwork in bulk excavation in dense (or) hard soil.
3. Filling basement with available excavated earth in trenches, plinth, sides of foundation.
4. Providing and laying of Granular Sub base (GSB) for 250mm thick
5. Providing Form work including centering, shuttering for foundation footings.
6. Fabricating and placing in position of M.S/Tor steel grills for R.C.C works.
7. Supplying and laying impregnated bitumen pad of 20 mm thickness for expansion joint.
8. Supplying and laying bitumen sealing compound of grade 'A' for expansion joint, longitudinal joint and contraction joints.
9. Supplying and laying in trenches 110 mm dia. PVC for cable in the cable trench.
10. Painting the Floor surfaces with Two Coats of Synthetic Enamel Paint for median and side Kerb walls.
11. Preparation of sub grade by excavating earth work to 15cm average depth, dressing to camber.
12. Providing and fixing Reflective Road Studs and installing of Delineators (road way indicators, hazard markers and object markers).
13. Construction of dry lean cement concrete sub-base over a prepared sub-grade with coarse and fine aggregate.
14. Construction of un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base.
15. Providing and fabricating 38mm dia MS bars and placing in position as dowel bars for expansion joints
16. Providing and laying of debonding layer of 125micron PVC sheet for road
17. Providing and laying and jointing reinforced concrete heavy duty non pressure pipe.

b) General

i. The works are to be carried out as per approved programme.

ii. The total period of completion of this work is **Six Months.**

iii. The work has to be carried out in the operational areas of the Port. The Tenderer has to work out a scheme in such a way that which cause least hindrance to Port operations.

7. EMBANKMENT CONSTRUCTION/SUB GRADE - VOIDS

7.1 General

7.1.1 Description

These Specifications shall apply to the construction of embankments including sub-grades, earthen shoulders and miscellaneous backfills with approved material obtained from approved source, including material from roadway and drain excavation, borrow pits or other sources. All embankments sub-grades, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these Specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer.

7.2 Materials and General Requirements

7.2.1 Physical Requirements

7.2.1.1 The materials used in embankments, subgrades, earthen shoulders and miscellaneous backfills shall be soil, moorum, gravel, reclaimed material from pavement, fly ash, pond ash, a mixture of these or any other material as approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment.

The following types of material shall be considered unsuitable for embankment:

a) Materials from swamps, marshes and bogs;

b) Peat, log, stump and perishable material; any soil that classifies as OL, 01, OH or Pt in accordance with IS:1498;

c) Materials susceptible to spontaneous combustion;

d) Materials in a frozen condition;

e) Clay having liquid limit exceeding 50 and plasticity index exceeding 25; and

f) Materials with salts resulting in leaching in the embankment.

7.2.1.2 Expansive clay exhibiting marked swell and shrinkage properties ("free swelling index" exceeding 50 percent when tested as per IS:2720 — Part 40) shall not be used as a fill material. Where an expansive clay having "free swelling index" value less than 50 percent is used as a fill material, subgrade and top 500 mm portion of the embankment just below sub-grade shall be non-expansive in nature.

7.2.1.3 Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO_3) per litre when tested in accordance with BS:1377, Part 3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm distance(or any other distance described in the Contract), of permanent works constructed out of concrete, cement bound materials or other cementitious material.

Materials with a total sulphate content (expressed as SO_3) exceeding 0.5 percent by mass, when tested in accordance with BS:1377, Part 3 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Vorks.

7.2.1.4 The size of the coarse material in the mixture of earth shall ordinarily not exceed 75 mm when placed in the embankment and 50 mm when placed in the sub-grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these Specifications. The maximum particle size in such cases, however, shall not be more than two-thirds of the compacted layer thickness.

7.2.1.5 Ordinarily, only the materials satisfying the density requirements given in Table 300-1 shall be employed for the construction of the embankment and the sub-grade.

Table 300-1 : Density Requirements of Embankment and Sub-grade Materials

S. No.	Type of Work	Maximum laboratory dry unit weight when tested as per IS:2720 (Part 8)
	Embankments up to 3 m height, not subjected to extensive flooding	Not less than 15.2 kN/cu.m
	Embankments exceeding 3 m height or embankments of any height subject to long periods of inundation	Not less than 16 kN/ cu.m
	Sub grade and earthen shoulders/verges/ backfill	Not less than 17.5 kN/cu.m

Notes• 1) This Table is not applicable for lightweight fill material, e.g., cinder, fly ash, etc.

2) The material to be used in subgrade shall be non-expansive and shall satisfy design CBR at the specified dry density and moisture content. In case the available materials fail to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer shall be followed.

7.2.1.6 The material to be used in subgrade shall conform to the design CBR value at the specified dry density and moisture content of the test specimen. In case the available materials fails to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer or by the IRC Accreditation Committee shall be followed.

7.2.1.7 The material to be used in high embankment construction shall satisfy the specified requirements of strength parameters.

7.2.2 General Requirements

7.2.2.1 The materials for embankment shall be obtained from approved sources with preference given to acceptable materials becoming available from nearby roadway excavation under the same Contract.

The work shall be so planned and executed that the best available materials are saved for the sub grade and the embankment portion just below the sub grade.

7.2.2.2 Borrow Materials

The arrangement for the source of supply of the material for embankment and sub-grade and compliance with the guidelines, and environmental requirements, in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable shall be the sole responsibility of the Contractor.

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width of a minimum of 10 m.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or siting of temporary buildings or structures.

7.2.2.3 Fly-Ash

Use of fly-ash shall conform to the Ministry of Environment and Forest guidelines. Where fly-ash is used the embankment construction shall conform to the physical and chemical properties and requirements of IRC:SP:38-2001, "Guidelines for Use of Flyash in Road Construction", The term fly-ash shall cover all types of coal ash such as pond ash, bottom ash or mound ash.

Embankment constructed out of fly ash shall be properly designed to ensure stability and protection against erosion in accordance with IRC guidelines. A suitable thick cover may preferably be provided at intervening layers of pond ash for this purpose. A thick soil cover

shall bind the edge of the embankment to protect it against erosion. Minimum thickness of such soil cover shall be 500 mm.

7.2.2.4 Compaction Requirements

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the subgrade material when compacted to the density requirements as in Table 300-2 shall yield the specified design CBR value of the sub-grade.

Table 300-2 : Compaction Requirements for Embankment and Sub-grade

S. No.	Type of work/material	Relative compaction as percentage of max. laboratory dry density as per 1S:2720 (Part 8)
1)	Subgrade and earthen shoulders	Not less than 97%
2)	Embankment,	Not less than 95%
3)	Expansive Clays	
	a) Subgrade and 500 mm portion just below the subgrade	Not allowed
	b) Remaining portion of embankment	90-95%

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval:

i) The values of maximum dry density and optimum moisture content obtained in accordance with IS:2720 (Part 8), appropriate for each of the fill materials he intends to use.

ii) A graph of dry density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.

iii) The maximum dry density and optimum moisture content approved by the Engineer shall form the basis for compaction.

7.3 Construction Operations

7.3.1 Setting Out

After the site has been cleared to Clause 201, the work shall be set out to Clause 301.3.1 The limits of embankment/sub-grade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment/sub-grade shall be built sufficiently wider than the design dimension so that surplus material may be trimmed,

ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.

7.3.2 Dewatering

If the foundation of the embankment is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore it to original condition or compensate for the damage at his own cost.
If the embankment is to be constructed under water, Clause 305.4.6 shall apply.

7.3.3 Stripping and Storing Topsoil

When so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily subjected to traffic either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

7.3.4 Compacting Ground Supporting Embankment/Sub-Grade

Where necessary, the original ground shall be levelled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling in accordance with Clauses 305.3.5 and 305.3.6 so as to achieve minimum dry density as given in Table 300-2.

In case where the difference between the sub-grade level (top of the sub-grade on which pavement rests) and ground level is less than 0.5 m and the ground does not have 97 percent relative compaction with respect to the dry density (as given in Table 300-2), the ground shall be loosened upto a level 0.5 m below the sub-grade level, watered and compacted in layers in accordance with Clauses 305.3.5 and 305.3.6 to achieve dry density not less than 97 percent relative compaction as given in Table 300-2.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation (500 mm portion just below the sub-grade) shall be removed, suitably disposed and replaced by approved materials laid in layers to the required degree of compaction.

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed by borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which an embankment is to be built has any of such material types (a) to (f) in Clause 305.2.1.1 at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

7.3.5 Spreading Material in Layers and Bringing to Appropriate Moisture Content

7.3.5.1 The embankment and sub-grade material shall be spread in layers of uniform thickness in the entire width with a motor grader. The compacted thickness of each layer shall not be more than 250 mm when vibratory roller/vibratory soil compactor is used and not more than 200 mm when 80-100 kN static roller is used. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

7.3.5.2 Moisture content of the material shall be checked, at the site of placement prior to commencement of compaction: if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by blading, using disc harrow until a uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acieptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS:2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 percent above to 2 percent below the optimum moisture content determined in accordance with IS:2720 (Part 8) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the sub-grade.

7.3.5.3 Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other construction vehicles. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength of the material before it was damaged.

Embankments and unsupported fills shall not be constructed with steeper side slopes or to greater widths than those shown in the drawings, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material,

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cuttings, other fills and excavations steeper than 1 vertical to 4 horizontal, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

All permanent faces of side slopes of embankments and other areas of fill shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

7.3.6 Compaction

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Static three-wheeled roller, self propelled single drum vibratory roller, tandem vibratory roller, pneumatic tyre roller, pad foot roller, etc., of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of self-propelled single drum vibratory roller or pad foot vibratory roller of 80 to 100 kN static weight or heavy pneumatic tyre roller of adequate capacity capable of achieving the required compaction. The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for the site trials shall be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density gauge used in accordance with agreed procedure and provided the gauge is calibrated to give results identical to that obtained from tests in accordance with IS:2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurements reveal any soft areas in the embankment/sub-grade/earthen shoulders, further compaction shall be carried out as directed by the Engineer. If inspite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted using appropriate mechanical means such as light weight vibratory roller, double drum walk behind roller, vibratory plate compactor, trench compactor or vibratory tamper to the density requirements and satisfaction of the Engineer.

7.3.7 Drainage

The surface of the embankment/sub-grade at all times during construction shall be maintained at such a crossfall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

7.3.8 Repairing of Damages Caused by Rain/Spillage of Water

The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density in accordance with Clause 305.3.6. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery/equipment for the purpose.

7.3.9 Finishing Operations

Finishing operations shall include the work of shaping and dressing the shoulders/verge/ roadbed and side slopes to conform to the alignment, levels, cross-sections and dimensions shown on the drawings or as directed by the Engineer subject to the surface tolerance described in Clause 902. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil, removed and conserved earlier (Clauses 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moistened slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

Where directed, the slopes shall be turfed with sods in accordance with Clause 307.1f seeding and mulching of slopes is prescribed, this shall be done to the requirements of Clause 308.

When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

7.4 Construction of Embankment and Sub-grade under Special Conditions

7.4.1 Earthwork for Widening Existing Road Embankment

When an existing embankment and/or sub-grade is to be widened and its slopes are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment/sub-grade material to be added. The material obtained from cutting of benches could be utilized in the

widening of the embankment/subgrade. However, when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

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 light weight vibratory roller, double drum walk behind roller, vibratory plate compactor or vibratory tamper or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

7.4.2 Earthwork for Embankment and Sub-Grade to be Placed Against Sloping Ground

Where an embankment/subgrade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed/scarified as required in Clause 305.4.1 before placing the embankment/sub-grade material. Extra earthwork involved in benching or due to ploughing/ scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall and subsoil drains at the lowest point shall be provided as per the drawings, before the fill is placed against sloping ground.

Where the Contract requires construction of transverse subsurface drain at the cut-fill interface, work on the same shall be carried out to Clause 309 in proper sequence with the embankment and sub-grade work as approved by the Engineer.

7.4.3 Earthwork over Existing Road Surface

Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below:

i) If the existing road surface is of granular type and lies within 1 m of the new formation levels, it shall be scarified to a depth of 50 mm or as directed so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new sub-grade level is compacted to the desired density;

ii) If the existing road surface is of bituminous type or cement concrete and lies within 1 m of the new formation level, the bituminous or cement concrete layer shall be removed completely;

iii) If the level difference between the existing road surface and the new formation level is more than 1 m, the existing surface shall be roughened after ensuring that the minimum thickness of 500 mm of subgrade is available.

7.4.4 Embankment and Sub-Grade Around Structures

To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points, to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The till material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and sub-grade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS:2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC:78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract.

Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

7.4.5 Construction of Embankment over Ground Incapable of Supporting Construction Equipment

Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any

area of the Contract will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the embankment shall be constructed as specified in Clause 305.3.

7.4.6 Embankment Construction under Water and Waterlogged Areas

7.4.6.1 Embankment Construction under Water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per IS:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having un iformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

7.4.6.2 Embankment Construction in Waterlogged and Marshy Areas

The work shall be done as per IRC:34.

7.4.7 Earthwork for High Embankment

The material for high embankment construction shall conform to Clause 305.2.1.7. In the case of high embankments (more than 6 m), the Contractor shall normally use fly ash in conformity with Clause 305.2.1.1 or the material from the approved borrow area.

Where provided, stage construction of embankment and controlled rates of filling shall be carried out in accordance with the Contract including installation of instruments and its monitoring.

Where required, the Contractor shall surcharge embankments or other areas of fill with approved material for the periods specified in the Contract. If settlement of surcharged fill results the Contractor shall bring the resultant level up to formation level with acceptable material for use in fill.

7.4.8 Settlement Period

Where settlement period is specified in the Contract, the embankment shall remain in place for the required settlement period before excavating for abutment, wing wall, retaining wall, footings, etc., or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the Contract or as directed by the Engineer.

7.5 Plying of Traffic

Construction and other vehicular traffic shall not use the prepared surface of the embankment and/or sub-grade without the prior permission of the Engineer. Any damage arising out of such use shall, however, be made good by the Contractor at his own cost as directed by the Engineer.

7.6 Surface Finish and Quality Control of Work

The surface finish of construction of sub-grade shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised in accordance with Clause 903.

7.7 Sub-grade Strength

7.7.1 It shall be ensured prior to actual execution that the material to be used in the sub-grade satisfies the requirements of design CBR.

7.7.2 Sub-grade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed sub-grade shall be determined on remoulded samples, compacted to the field density at the field moisture content and tested for soaked/unsoaked conditioh as specified in the Contract.

7.8 Measurements for Payment

7.8.1 Earth embankment/sub-grade construction shall be measured separately by taking cross sections at intervals given in Sub-Section 113.3 after completion of clearing and grubbing and after completion of embankment/sub-grade. The volume of earthwork shall be computed in cubic metres by the method of average end areas.

7.8.2 The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cu.m of suitable material brought to site from road and drainage excavation forms one cu.m of compacted fill and all bulking or shrinkage shall be ignored.

7.8.3 The embankment constructed with fly ash will be measured in cu.m, separately for the fly ash portions and for the soil cover and intervening layers of soil, unless otherwise specified in the Contract.

7,8.4 Construction of embankment under water shall be measured in cu.m.

7.8.5 Construction of high embankment with specified material and in specified manner shall be measured in cu.m.

7.8.6 Stripping including storing and r6application of top soil shall be measured in cu.m.

7.8.7 Work involving loosening and recompacting of ground supporting embankment/sub-grade shall be measured in cu.m.

7.8.8 Removal of unsuitable material at embankment/sub-grade foundation and replacement with suitable material shall be measured in cu.m.

7.8.9 Scarifying existing granular/bituminous road surface shall be measured in square metres.

7.8.10 Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

7.8.11 Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cu.m.

7.9 Rates

7.9.1 The Contract unit rates for the items of embankment and sub-grade construction shall be payment in full for carrying out the required operations including full compensation for:

i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;

ii) Setting out;

iii) Compacting ground supporting embankment/sub-grade except where removal and replacement of suitable material or loosening and recompacting is involved;

iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and sub-grade as applicable;

v) Cost of watering or drying of material in borrow areas and/or embankment and sub-grade during construction as required;

vi) Spreading in layers, bringing to appropriate moisture and compacting to Specification requirements;

vii) Shaping and dressing top and slopes of the embankment and sub-grade including rounding of corners;

viii) Restricted working at sites of structures;

ix) Working on narrow width of embankment and sub-grade;

x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and sub-grade site with all leads and lifts unless otherwise provided for in the Contract;

xi) All labour, materials, tools, equipment and incidentals necessary to complete the work to the Specifications;Dewatering; and

xii) Keeping the embankment/completed formation free of water as per Clause 311.

xiii) Transporting unsuitable excavated material for disposal with all leads and lifts.

7.9.2 Clause.301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil including reapplication of topsoil.

7.9.3 Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment/sub-grade foundation.

7.9.4 Clauses 309.1.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material, respectively.

7.9.5 The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals, necessary to complete the work. This will also

comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

7.9.6 Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

7.9.7 The Contract unit rate for providing and laying filter material shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

7.9.8 The Contract unit rate for providing and compacting backfill material behind abutments and retaining walls shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

7.9.9 Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.

7.9.10 Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.

8. GRANULAR SUB BASE

8.1 Scope : The provisions of clause No.401.1 MoRTH specification shall apply. This work shall consist of laying and compacting well-graded material on prepared sub-grade in accordance with the requirements of these specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

8.2 Materials

8.2.1 The provisions of clause No.401.2.1 MoRTH specification shall apply. The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of Materials like brick metal, kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV shall preferably be used in lower sub-base. Gradings V and VI shall be used as a Sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150mm.

8.2.2 The provisions of clause No.401.2.2 MoRTH specification shall apply. If the water absorption of the aggregates determined as per IS:2386 (part 3) is greater than 2 percent, the

aggregates shall be tested for Wet Aggregate impact value (AIV) (IS:5650). Soft aggregates like Kankar, Brick ballast and laterite shall also be tested for Wet AIV (IS:5640).

TABLE 400-1. GRADING FOR GRANULAR SUB-BASE MATERIALS

IS Sieve Designation	Percent by weight passing the IS sieve					
	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	100	-
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25-55	40-65	10-30	15-35	25-50	30-55
2.36 mm	20-40	30-50	-	-	10-20	10-25
0.85 mm	-	-	-	-	2-10	-
0.425 mm	10-15	10-15	-	-	0-5	0-8
0.075 mm	<5	<5	<5	<5	-	0-3

8.3 Construction Operations

8.3.1 Preparation of sub-grade: The provisions of clause No.401.3.1 MoRTH specification shall apply. Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80 -100 kN smooth wheeled roller.

8.3.2 Spreading and compacting: The provisions of clause No.401.3.2 MoRTH specification shall apply. The sub-base material of the grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing, So as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS:2720 (Part 8). The mix shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer.

Moisture content of the mix shall be checked in accordance with IS: 2720 (Pan 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 percent below the optimum moisture content.

Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layers does not exceed 100mm, a smooth wheeled roller of 80 to100 kN weight may be used. For a compacted single layer upto 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper

edge longitudinally for portions having unidirectional crossfall or on super-elevation. For carriageway having crossfall on both sides, rolling shall commence at the edges and progress towards the crown.

Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. During rolling, the grade and crossfall (camber) shall be checked and any high spots or depressions which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 KM per hour.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS: 2720 (Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

8.4 Surface Finish and Quality Control of Work

The provisions of clause No.401.4 of MoRTH specification shall apply. The surface finish of construction shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

8.5 Arrangements for Traffic

The provisions of clause No.401.5 of MoRTH specification shall apply. During the period of construction, arrangements for the traffic shall be maintained in accordance with Clause 112.

8.6 Measurements for Payment

The provisions of clause No.401.6 of MoRTH specification shall apply. Granular sub-base shall be measured as finished work in position in cubic metres.

The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

8.7 Rate

The provisions of clause No.401.7 of MoRTH specification shall apply. The contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

Making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;

Supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts;

All labour, tools, equipment and incidentals to complete the work to the specifications;

Carrying out the work in part widths of road where directed; and Carrying out the required tests for quality control.

9. DRY LEAN CEMENT CONCRETE SUB-BASE

9.1Scope

9.1.1 The work shall consist of construction of (zero slump) dry lean concrete sub-base for cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross-sections shown on the drawings or as directed by the Engineer. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations, in connection with the work, as approved by the Engineer.

9.1.2 The design parameters of dry lean concrete sub-base, viz., width, thickness, grade of concrete, details of joints, if any, etc. shall be as stipulated in the drawings.

9.2 Materials

9.2.1 Sources of Materials

The Contractor shall indicate to the Engineer the source of all materials with relevant test data to be used in the dry lean concrete work sufficiently in advance and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work in trial length. If the Contractor later proposes to obtain the materials from a different source during the execution of main work, he shall notify the Engineer with relevant test data for his approval at least 45 days before such materials are to be used.

9.2.2 Cement

Any of the following types of cement may be used with prior approval of the Engineer:

S. No.	Type	Conforming to
i)	Ordinary Portland Cement 43 Grade	IS:8112
ii)	Portland Slag Cement	IS:455
iii)	Portland Pozzolana Cement	IS:1489-Part I

If the subgrade soil contains soluble sulphates in a concentration more than 0.5 percent, sulphate resistant cement conforming to IS:6909 shall be used.

Cement to be used may preferably be obtained in bulk form. It shall be stored in accordance with stipulations contained in Clause 1014 and shall be subjected to acceptance test prior to its immediate use.

9.2.3 Fly-ash

Fly-ash upto 20 percent by weight of cementitious material (cement+flyash) may be used along with 43/53 grade cement may be used to replace OPC cement grade 43 upto 30 percent by weight of cement. Fly-ash shall conform to IS:3812 (Part 1) and its use shall ba permitted only after ensuring that facilities exist for uniform blending through a proper mechanical facility with automated process control like batch mix plant conforming to IS:4925 and IS:4926.

9.2.4 Aggregates

9.2.4.1 Aggregates for lean concrete shall be natural material complying with IS:383. The aggregates shall not be alkali reactive. The limits of deleterious materials shall not exceed the requirements set forth in Table 600-2. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hours before belching, or as directed by the Engineer.

9.2.4.2 Coarse Aggregates

Coarse aggregates shall comply with Clause 10.2.6.2, except that the maximum size of the coarse aggregate shall be 26.5 mm, and aggregate gradation shall comply with Table 600-1.

9.2.4.3 Fine Aggregates

The fine aggregate shall comply with Clause 10.2.6.3.

9.2.4 A The material after blending shall conform to the grading as indicated in Table 600-1.

Table 600-1 : Aggregate Gradation for Dry Lean Concrete

Sieve Designation	Percentage by Weight passing the sieve
26.50mm	100
19.0 mm	75-95
9.50 mm	50-70
4.75 mm	30-55
2.36 mm	17-42
600 micron	8-22
300 micron	7-17
150 micron	2-12
75 micron	0-10

9.2.5 Water

Water used for mixing and curing of concrete shall comply with Clause 10.2.7.

9.2.6 Storage of Materials

All materials shall be stored in accordance with the provisions of Clauses 10.2.12 of these Specifications and other relevant IS Specifications.

9.3 Proportioning of Materials for the Mix

9.3.1 The mix shall be proportioned with a maximum aggregate cementitious material ratio of 15:1. The water content shall be adjusted to the optimum as per Clause 9.3.2 for facilitating compaction by rolling. The strength and density requirements of concrete shall be determined in accordance with Clauses 9.7 and 9.8 by making trial mixes. Care should be taken to prevent one size of aggregate falling into the other size of the hopper of the feeding bin while loading the individual size of aggregates into the bins.

9.3.2 Moisture Content

The optimum water content shall be determined and demonstrated by rolling during trial length construction and the optimum moisture content and degree of compaction shall be got approved from Engineer. While laying in the main work, the lean concrete shall have a moisture content between the optimum and optimum +2 percent, keeping in view the effectiveness of compaction achieved and to compensate for evaporation losses.

9.3.3 Cement Content

The cement content in the dry lean concrete shall be such that the strength specified in Clause 9.3.4 is achieved. The minimum cement content shall be 150 kg/cu.m of concrete. In case flyash is blended at site as part replacement of cement, the quantity of flyash shall not be more than 20 percent by weight of cementitious material and the content of OPC shall not be less than 120 kg/cu.m. If this minimum is not sufficient to produce dry lean concrete of the specified strength, it shall be increased as necessary by the Contractor at his own cost.

9.3.4 Concrete Strength

The average compressive strength of each consecutive group of 5 cubes made in accordance with Clause 903.5.1.1 shall not be less than 10 MPa at 7 days. In addition, the minimum compressive strength of any individual cube shall not be less than 7.5 MPa at 7 days. The design mix complying with the above Clauses shall be got approved from the Engineer and demonstrated in the trial length construction.

9.4 Sub-grade

The sub-grade shall conform to the grades and cross-sections shown on the drawings and shall be laid and compacted in accordance with Clause 305. The subgrade strength shall correspond to the design strength specified in the Contract. As far as possible, the construction traffic shall be avoided on the prepared sub-grade.

9.6 Construction

9.6.1 General The Dry Lean Concrete shall be laid on the prepared granular drainage layer. The pace and programme of the Dry Lean Concrete sub-base construction shall be matching suitably with the programme of construction of the cement concrete pavement over it. The Dry Lean Concrete sub-base shall be overlaid with concrete pavement only after 7 days of sub-base construction.

9.6.2 Batching and Mixing

The batching plant shall be capable of proportioning the materials by weight, each type of material being weighed separately in accordance with Clauses 10.9.2, 10.9.3.1 and 10.9.3.2.

The design features of Batching Plant should be such that the plant can be shifted quickly.

9.6.3 Transporting

Plant mix lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering the tipping trucks with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner. The lead of the batching plant to paving site shall be such that the travel time available from mixing to paving as specified in Clause 9.6.5.2 will be adhered to. Tipping truck shall not have old concrete sticking to it. Each tipping truck shall be washed with water jet before next loading as and when required after inspection.

9.6.4 Placing

Lean concrete shall be placed by a paver with electronic sensor on the drainage layer or as specified in the Contract. The equipment shall be capable of laying the material in one layer

in an even manner without segregation, so that after compaction the total thickness is as specified. The paving machine shall have high amplitude tamping bars to give good initial compaction to the sub-base. One day before placing of the dry lean cement concrete subbase, the surface of the granular sub-base/drainage layer shall be given a fine spray of water and rolled with a smooth wheeled roller.

Preferably the lean concrete shall be placed and compacted across the full width of the two lane carriageway, by constructing it in one go. In roads with carriageway more than 2 lanes a longitudinal joint shall be provided. Transverse butt type joint shall be provided at the end of the construction in a day. Transverse joints in the concrete pavement shall not be coterminous with the transverse construction joint of the Dry Lean Concrete.

The Dry Lean Concrete shall be laid in such a way that it is atleast 750 mm wider on each side than the proposed width including paved shoulders of the concrete pavement. The actual widening shall be decided based on the specifications of the paver, such that the crawler moves on the Dry Lean Concrete, and the cost of extra width shall be borne by the Contractor.

9.6.5 Compaction

9.6.5.1 The compaction shall be carried out immediately after the material is laid and levelled. In order to ensure thorough compaction, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is well closed. The minimum dry density obtained shall not be less than 98 percent of that achieved during the trial length construction in accordance with Clause 9.7. The densities achieved at the edges i.e. 0.5 m from the edge shall not be less than 96 percent of that achieved during the trial construction.

9.6.5.2 The spreading, compacting and finishing of the lean concrete shall be carried out as rapidly as possible and the operation shall be so arranged as to ensure that the time between the mixing of the first batch of concrete in any transverse section of the layer and the final finishing of the same shall not exceed 90 minutes when the temperature of concrete is between 25°C and 30°C, and 120 minutes if less than 25°C. This period may be reviewed by the Engineer in the light of the results of the trial run but in no case shall it exceed 120 minutes. Work shall not proceed when the temperature of the concrete exceeds 30°C. If necessary, chilled water or addition of ice may be resorted to for bringing down the temperature. It is desirable to stop concreting when the ambient temperature is above 35°C. After compaction has been completed, roller shall not stand on the compacted surface for the duration of the curing period except during commencement of next day's work near the location where work was terminated the previous day.

9.6.5.3 Double drum smooth-wheeled vibratory rollers of minimum 80 to 100 kN static weight are suitable for rolling dry lean concrete. In case any other roller is proposed, thesame shall be got approved from the Engineer, after demonstrating its performance. The number of passes required to obtain maximum compaction depends on the thickness of the drylean concrete, the compactibility of the mix and the weight and type of the roller and the sane as well as the total requirement of rollers for the jobs shall be determined during trial runby measuring in-situ density and the scale of the work to be undertaken.

Except on super elevated portions where rolling shall proceed from the inner edge to the outer, rolling shall begin from the edges gradually progressing towards the centre. First, the edge/edges shall be compacted with a roller running forward and backward. The roller shat then move inward parallel to the centerline of the road, in successive passes uniformly lapping preceding tracks by at least one half width.

9.6.5.4 A preliminary pass without vibration to bed the Dry Lean Concrete down shall be given followed by the required number of passes to achieve the desired density and, a final pass without vibration to remove roller with vibration marks and to smoothen the surface.

Special care and attention shall be exercised during compaction near joints, kerbs, channels, side forms and around gullies and manholes. In case adequate compaction is not achieved by the roller at these locations, use of plate vibrators shall be made, if so directed by the Engineer.

9.6.5.5 The final lean concrete surface on completion of compaction shall be well closed, free from movement under roller and free from ridges, low spots, cracks, loose material, pot holes, ruts or other defects. The final surface shall be inspected immediately on completion and all loose, segregated or defective areas shall be corrected by using fresh lean concrete material, laid and compacted. For repairing honeycombed/hungry surface, concrete with aggregates of size 10 mm and below shall be spread and compacted as per Specifications. It is necessary to check the level of the rolled surface for compliance. Any level/thickness deficiency shall be corrected after applying concrete with aggregates of size 10 mm and below after roughening the surface. Surface regularity also shall be checked with 3 m straight edge. Strength tests shall be carried out, and if deficiency in strength is noticed, at least three (evenly spread) cores of minimum 100 mm dia per km shall be cut to check deficiency in strength. The holes resulting

from cores shall be restored by filling with concrete of the specified strength and compacted by adequate rodding.

9.6.5.6 Segregation of concrete in the tipping trucks shall be controlled by moving the dumper back and forth while discharging the mix into the same or by any appropriate means. Paving operation shall be such that the mix does not segregate.

9.6.6 Joints

Construction and longitudinal joints shall be provided as per the drawings.

Transverse butt type joint shall be provided at the end of the construction in a day. Longitudinal construction joint shall be provided only when full width paving is not possible. Transverse joints in Dry Lean concrete shall be staggered from the construction butt type joint in Concrete pavement by 800-1000 mm.

Longitudinal joint in Dry Lean Concrete shall be staggered by 300-400 mm from the longitudinal joint of concrete pavement.

At longitudinal or transverse construction joints, unless vertical forms are used, the edge of compacted material shall be cut back to a vertical plane where the correct thickness of the properly compacted material has been obtained.

9.6.7 Curing

As soon as the lean concrete surface is compacted, curing shall commence. One of the following methods shall be adopted:

a) Curing may be done by covering the surface by gunny bags/hessian, which shall be kept wet continuously for 7 days by sprinkling water.

b) The curing shall be done by spraying with approved resin based aluminized reflective curing compound conforming to ASTM-C 309-81 in accordance with Clause 10.9.12. As soon as the curing compound has lost its tackiness, the surface shall be covered with wet hessian for three days. The rate of application shall be as recommended by the supplier.

c) Wax-based white pigmented curing compound with water retention index of not less than 90 percent shall be used to cure the dry lean concrete. The curing compound shall conform to BS:7542. The compound shall be applied uniformly with a mechanical sprayer and with a hood to protect the spray from the wind. The curing compound shall be applied over the entire exposed surface of the Dry Lean Concrete, including sides and edges, at the rate of 0.2 litres/sq.m, or as recommended by the supplier.

   The first application, referred to as curing application shall be applied immediately after the final rolling of Dry Lean Concrete is completed. As soon as the curing compound loses tackiness, the surface shall be covered with wet hessian for three days. The second application of curing compound also referred to as the debonding application, shall be applied 24 to 48 hours prior to the placement of the concrete pavement. Any damaged Dry Lean Concrete shall be corrected prior to the second application. Normally, the manufacturer's instructions shall be followed for its application.

9.9 Tolerances for Surface Regularity, Level, Thickness, Density and Strength

Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

9.10 Traffic

No heavy commercial vehicles like trucks and buses shall be permitted on the dry lean concrete sub-base. Construction vehicles at slow speed may be permitted after 7 days of its construction with the prior approval of the Engineer.

10. CEMENT CONCRETE PAVEMENT

10.1Scope

10.1.1 The work shall consist of construction of un-reinforced, dowel jointed, plain cement concrete pavement in accordance with the requirements of these Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work that include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer.

10.1.2 The design parameters, viz., thickness of pavement slab, grade of concrete, joint details etc. shall be as stipulated in the drawings.

10.2 Materials

10.2.1Source of Materials

The Contractor shall indicate to the Engineer the source of all materials to be used in the concrete work with relevant test data sufficiently in advance, and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work in trial length. If the Contractor subsequently proposes to obtain materials from a different source during the execution of main work, he shall notify the Engineer, with relevant test data, for his approval, at least 45 days before such materials are to be used.

10.2.2Cement

Any of the following types of cement capable of achieving the design strength may be used with prior approval of the Engineer, but preference shall be to use at least the 43 grade or higher.

S.No.	Type	Conforming to
i)	Ordinary Portland Cement 43 Grade	IS:8112
ii)	Ordinary Portland Cement 53 Grade	IS:12269
iii)	Portlant slag cement	IS:455
iv)	Portland Pozzolana Cement	IS:1489-Part I

If the soil around concrete pavement has soluble salts like sulphates in excess of 0.5 percent, the cement used shall be sulphate resistant and shall conform to IS:12330.

Cement to be used may preferably be obtained in bulk form. If cement in paper bags is proposed to be used, there shall be bag-splitters with the facility to separate pieces of paper bags and dispose them off suitably. No paper pieces shall enter the concrete mix. Bulk cement shall be stored in accordance with Clause 1014. The cement shall be subjected to acceptance test.

Fly-ash upto 20 percent by weight of cementitious material may be used in Ordinary Portland Cement 43 and 53 Grade as part replacement of cement provided uniform blending with cement is ensured. The fly ash shall conform to IS:3812 (Part I).

Site mixing of fly ash shall be permitted only after ensuring availability of the equipments at site for uniform blending through a specific mechanised facility with automated process control like batch mix plants conforming to IS:4925 and IS:4926. Site mixing will not be allowed otherwise.

The Portland Pozzolana Cement produced in factory as per IS:1489-Part I shall not have fly-ash content more than 20 percent by weight of cementitious material. Certificate from the manufacturer to this effect shall be produced before use.

10.2.3 Chemical Admixtures

Admixtures conforming to IS:9103 and IS:6925 shall be permitted to improve workability of the concrete and/or extension of setting time, on satisfactory evidence that they will not have any adverse effect on the properties of concrete with respect to strength, volume change, durability and have no deleterious effect on steel bars. The particulars of the admixture and the quantity to be used, must be furnished to the Engineer in advance to obtain his approval before use. Satisfactory performance of the admixtures should be proved both on the laboratory concrete trial mixes and in the trial length paving. If air entraining admixture is used, the total quantity of air shall be 5±1.5 percent for 31.5 mm maximum nominal size aggregate (in air-entrained concrete as a percentage of the volume of the mix).

10.2.4 Silica Fumes

Silica fume conforming to a standard approved by the Engineer may be used as an admixture in the proportion of 3 to 10 percent of cement. Silica fume shall comply with the requirements given in IS:15388-2003, IS:456-2000, IRC:SP:76 and IRC:44-2008.

10.2.5 Fibres

Fibres may be used subject to the provision in the design/approval by the Engineer to reduce the shrinkage cracking and post-cracking. The fibres may be steel fibre as per IRC:SP:46 or polymeric Synthetic fibres within the following range of specifications:

Effective Diameter	10 micron — 100 micron
Length	6-48 mm
Specific gravity	more than 1.0
Suggested dosage	0.6-2.0 kg/cu.m (0.2 - 0.6% by weight of cement in mix) Usage will be regulated as stipulated in IRC:44/IS:456
Water absorption	less than 0.45 percent
Melting point of this fibre shall not be less than 160°C.	
The aspect ratio generally varies from 200 to 2000.	
These synthetic fibres will have good alkali and UV light resistance.	

When fibres are used, the mix shall be so designed that the slump of concrete at paving site is 25±15 mm.

10.2.6 Aggregates

10.2.6.1 Aggregates for pavement concrete shall be natural material complying with IS:383 but with a Los Angeles Abrasion Test value not exceeding 35 percent.

10.2.6.2 Coarse Aggregates

Coarse aggregates shall consist of clean, hard, strong, dense, non-porous and durable pieces of crushed stone or crushed gravel and shall be devoid of pieces of disintegrated stone, soft, flaky, elongated, very angular or splintery pieces. The maximum size of coarse aggregate shall not exceed 31.5 mm for pavement concrete. No aggregate which has water absorption more than 2 percent shall be used in the concrete mix. The aggregates shall be tested for soundness in accordance with IS:2386 (Part-5). After 5 cycles of testing, the loss shall not be more than 12 percent if sodium sulphate solution is used or 18 percent if magnesium sulphate solution is used. The Los Angeles Abrasion value shall not exceed 35. The combined flakiness and elongation index of aggregate shall not be more than 35 percent.

10.2.6.3 Fine Aggregates

The fine aggregates shall consist of clean natural sand or crushed stone sand or a combination of the two and shall conform to IS:383. Fine aggregate shall be free from soft particles, clay, shale, loam, cemented particles, mica and organic and other foreign matter. The fine aggregates shall have a sand equivalent value of not less than 50 when tested in accordance with the requirement of IS:2720 (Part 37).

10.2.6.4 Combined Gradation of Fine and Coarse Aggregates

The combined gradation of fine and coarse aggregates shall be as per Table 600-3.

Table 600-3 : Aggregate Gradation for Pavement Quality Concrete

Sieve Designation	Percentage by Weight Passing the Sieve
31.5 mm	100
26.5 mm	85-95
19.0 mm	68-88
9.5 mm	45-65
4.75 mm	30-55
600 micron	8-30
150 micron	5-15
75 micron	0-5

10.2.7 Water

Water used for mixing and curing of concrete shall be clean and free from injurious amount of oil, salt, acid, vegetable matter or other substances harmful to the finished concrete. It shall meet the requirements stipulated in IS:456.

10.2.8 Steel for Dowels and Tie Bars

Steel shall conform to the requirements of IS:432 and IS:1786 as relevant. The dowel bars shallconform to IS:432 of Grade I. Tie bars shall be either High yield Strength Deformed bars conforming to IS:1786 and grade of Fe 500 or plain bars conforming to IS:432 of Grade I. The steelshall be coated with epoxy paint for protection against corrosion.

10.2.9 Joint Filler Board

Synthetic Joint filler board for expansion joints shall be used only at abutting structures like bridges and shall be of 20-25 mm thickness within a tolerance of ± 1.5 mm and of a firm compressible material and complying with the requirements of IS:1838, with a compressibility more than 25 percent. It shall be 25 mm less in depth than the thickness of the slab within a tolerance of ± 3 mm and provided to the full width between the side forms. It shall be in suitable lengths which shall not be less than one lane width. If two pieces are joined to make up full width, the joint shall be taped such that no slurry escapes through the joint. Holes to accommodate dowel bars shall be accurately bored or punched out to give a sliding fit on the dowel bars.

10.2.10 Joint Sealing Compound

The joint sealing compound shall be of hot poured, elastomeric type or cold polysulphide/ polyurethene/silicone type having flexibility, resistance to age hardening and durability as per IRC:57. Manufacturer's certificate shall be produced by the Contractor for establishing that the sealant is not more than six months old and stating that the sealant complies with the relevant standard mentioned below. The samples shall meet the requirements as mentioned in IRC:57.

If sealant is of hot poured type, it shall conform to

Hot applied sealant : IS:1834 or ASTM : 3406-95, as applicable

Cold poured sealants shall be one of the following :

i)	polysulphide	IS:11433 (Part I), BS:5212 (Part II)
ii)	polyurethene	BS:5212
iii)	silicone	ASTM 5893-04

10.2.12 Storage of Materials

All materials shall be stored in accordance with the provisions of Clause 1014 of the Specifications. All efforts shall be made to store the materials in proper places so as to prevent their deterioration or contamination by foreign matter and to ensure their satisfactory quality and fitness for the work. The platform where aggregates are stock piled shall be paved and elevated from the ground atleast by 150 mm. The area shall have slope to drain off rain water. The storage space must also permit easy inspection, removal and storage of the materials. Aggregates of different sizes shall be stored in partitioned stack-yards. All such

materials even though stored in approved godowns must be subjected to acceptance test as per Clause 903 of these Specifications prior to their use.

10.3 Proportioning of Concrete

10.3.1 After approval by the Engineer of all the materials to be used in the concrete, the Contractor shall submit the mix design based on weighed proportions of all ingredients forthe approval of the Engineer vide Clause 10.3.4. The mix design shall be submitted at least 30 days prior to the paving of trial length and the design shall be based on laboratory trial mixes using the approved materials and methods as per IRC:44 or IS:10262. The target mean strength for the design mix shall be determined as indicated in Clause 10.3.3.1. The mix design shall be based on the flexural strength of concrete.

10,3.2 Cement Content

When Ordinary Portland Cement (OPC) is used the quantity of cement shall not be less than 360 kg/cu.m. In case fly ash grade I (as per IS:3812) is blended at site as part replacement of cement, the quantity of fly ash shall be upto 20 percent by weight of cementitious material and the quantity of OPC in such a blend shall not be less than 310 kg/cu.m. The minimum of OPC content, in case ground granulated blast furnace slag cement blended, shall also not be less than 310 kg/m'. If this minimum cement content is not sufficient to produce concrete of the specified strength, it shall be increased as necessary by the contractor at his own cost.

10.3.3 Concrete Strength

10.3.3.1 The characteristic flexural strength of concrete shall not be less than 4.5 MPa

unless specified otherwise. Target mean flexural strength for mix design shall be more than 4.5 MPa + 1.65s, where s is standard deviation of flexural strength derived by conducting test on minimum 30 beams. While designing the mix in the laboratory, correlation between flexural and compressive strengths of concrete shall be established on the basis of at least thirty tests on specimens. However, quality control in the field shall be exercised on the basis of flexural strength. It may, however, be ensured that the materials and mix proportions remain substantially unaltered during the daily concrete production. The water content shall be the minimum required to provide the agreed workability for full compaction of the concrete to the required density as determined by the trial mixes or as approved by the Engineer and *the* maximum free water cement ratio shall be 0.45 when only OPC is used and 0.50 when blended cement (Portland Pozzolana Cement or Portland Slag Cement or OPC blended with fly ash or Ground Granulated Blast Furnance Slag, at site) is used.

10.3.3.2 The ratio between the 7 and 28 day strength shall be established for the mix

to be used in the slab in advance, by testing pairs of beams and cubes at each stage on at six batches of trial mix. The average strength of the 7 day cured specimens shall be 'N' the average strength of the 28 day specimens for each batch, and the ratio "R' lined. The ratio 'R' shall be expressed to three decimal places.

If during the construction of the trial length or during some normal working, the average value of any four consecutive 7 day test results falls below the required 7 day strength as derived from the value of 'R' then the cement content of the concrete shall, without extra payment, be increased by 5 percent by weight or by an amount agreed by the Engineer. The increased cement content shall be maintained at least until the four corresponding 28 day strengths have been assessed for in conformity with the requirements as per Clause 10.3.3.1. Whenever the cement content is increased, the concrete mix shall be adjusted to maintain the required workability.

10.3.4 Workability

10.3.4.1 The workability of the concrete at the point of placing shall be adequate for the concrete to be fully compacted and finished without undue flow. The optimum workability for the mix to suit the paving plant being used shall be determined by the Contractor and approved by the Engineer. The control of workability in the field shall be exercised by the slump test as per IS:1199.

10.3.4.2 The workability requirement at the batching and mixing plant and paving site shall be established by slump tests carried during trial paving. These requirements shall be established from season to season and also when the lead from batching and mixing plant site to the paving site changes. The workability shall be established for the type of paving equipment available. A slump value in the range of 25 ± 15 mm is reasonable for paving works but this may be modified depending upon the site requirement and got approved by the Engineer. These tests shall be carried out on every tipping truck/dumper at batching and mixing plant site

and paving site initially when the work commences but subsequently the frequency can be reduced to alternate tipping trucks or as per the instructions of the Engineer.

10.3.5 Design Mix

10.3.5.1 The Contractor shall carry out laboratory trials of design mix with the materials from the approved sources to be used as per IRC:44. Trial mixes shall be made in presence of the Engineer or his representative and the design mix shall be subject to the approval of the Engineer. They shall be repeated, if necessary, until the proportions, that will produce a concrete which complies in all respects with these Specifications, and conform to the requirements of the design/drawings.

10.3.5.2 The proportions determined as a result of the laboratory trial mixes may be adjusted, if necessary, during the construction of the trial length. Thereafter, neither the materials nor the mix proportions shall be varied in any way except with the written approval of the Engineer.

10.3.5.3 Any change in the source of materials or mix proportions proposed by the Contractor during the course of work shall be assessed by making laboratory trial mixes and the construction of a further trial length of length not less than 50 m unless approval is given by the Engineer for minor adjustments like compensation for moisture content in aggregates or minor fluctuations in the grading of aggregate.

10.4 Sub-base

The cement concrete pavement shall be laid over the sub-base constructed in accordance with the relevant drawings and Specifications. It shall be ensured that the sub-base is not damaged before laying the concrete pavement. If the dry lean concrete sub-base is found damaged at some places or it has cracks wider than 10 mm, it shall be repaired with fine cement concrete (aggregate size 10 mm and down) or bituminous concrete before laying separation membrane layer.

10.5 Separation Membrane

A separation membrane shall be used between the concrete slab and the sub-base. Separation membrane shall be impermeable PVC sheet 125 micron thick transparent or white in colour laid flat with minimum creases. Before placing the separation membrane, the sub-base shall be swept clean of all the extraneous materials using air compressor. Wherever overlap of plastic sheets is necessary, the same shall be at least 300 mm and any damaged sheathing shall be replaced at the Contractor's cost. The separation membrane may be nailed to the lower layer with concrete nails. The separation membrane shall be omitted when two layers of wax-based curing compound is used.

10.6 Joints

10.6.1 The locations and type of joints shall be as shown in the drawing. Joints shall be constructed depending upon their functional requirement. The location of the joints should be transferred accurately at the site and mechanical saw cutting of joints done as per stipulated dimensions. It shall be ensured that the required depth of cut is made from edge-to-edge of the pavement. Transverse and longitudinal joints in the pavement and Dry Lean Concrete sub-base shall be staggered so that they are not coincident vertically and are at least 800 to 1000 mm and 300 to 400 mm apart respectively. Sawing of joints shall be carried out with diamond studded blades soon after the concrete has hardened to take the load of the sawing machine and crew members without damaging the texture of the pavement.

Sawing operation could start as early as 4-8 hours after laying of concrete pavement but not later than 8 to 12 hours depending upon the ambient temperature, wind velocity, relative humidity and required maturity of concrete achieved for this purpose.

When the kerb is cast integrally with the main pavement slab, the joint cutting shall also be extended to the kerb.

Where the use of maturity meter is specified, sawing should not be initiated when the compressive strength of the concrete is less than 2 MPa and should be completed before it attains the compressive strength of 7 MPa.

10.6.2 Transverse Joints

10.6.2.1 Transverse joints shall be contraction, construction and expansion joints constructed at the spacing described in the drawings. Transverse joints shall be straight within the following tolerances along the intended line of joints.

i) Deviations of the performed filler board (IS:1838) in the case of expansion joints from the intended line of the joint shall not be greater than ±10 mm.

ii) The best fit straight line through the joint grooves as constructed shall be not more than 25 mm from the intended line of the joint.

iii) Deviations of the joint groove from the best fit straight line of the joint shall not be greater than 10 mm.

iv) Transverse joints on each side of the longitudinal joint shall be in line with each other and of the same type and width. Transverse joints shall have a sealing groove which shall be sealed in compliance with Clause 10.10.

10.6.2.2 Contraction Joints

The contraction joints shall be placed transversely at pre-specified locations as per drawings/ design using dowel bars. These joints shall be cut as soon as the concrete has undergone initial hardening and is hard enough to take the load of joint sawing machine without causing damage to the slab.

Contraction joints shall consist of a mechanical sawn joint groove, 3 to 5 mm wide and one-fourth to one-third depth of the slab ± 5 mm or as stipulated in the drawings and dowel bars complying with Clause 10.6.5.

Contraction joint shall be widened subsequently to accommodate the sealant as per Clause 10.10, to dimensions shown on drawings or as per IRC:57.

10.6.2.3 Expansion Joints

The expansion joint shall consist of a joint filler board complying with Clause 10.2.9 and dowel bars complying with Clause 10.6.5 and as detailed in the drawings. The filler board shall be positioned vertically with the prefabricated joint assemblies along the line of the

joint within the tolerances given in Clause 10.6.2.1. The adjacent slabs shall be completely separated from each other by the joint filler board.

10.6.3 Transverse Construction Joint

Transverse construction joint shall be placed whenever concreting is completed after a day's work or is suspended for more than 30 minutes. These joints shall be provided at location of contraction joints using dowel bars. If sufficient concrete has not been mixed to form a slab extending upto a contraction joint, and if an interruption occurs, the concrete placed shall be removed upto the last preceding joint and disposed of. At all construction joints, steel bulk heads shall be used to retain the concrete. The surface of the concrete laid subsequently shall conform to the grade and cross sections of the previously laid pavement. When positioning of bulk head/stop-end is not possible, concreting to an additional 1 or 2 m length may be carried out to enable the movement of joint cutting machine so that joint grooves may be cut and the extra 1 or 2 m length is cut out and removed subsequently after concrete has hardened.

After minimum 14 days of curing, in case OPC cement is used and 16 days of curing when flyash or blended cement is used, the construction joint shall be widened to accommodate the sealant as per Clause 10.10 to dimensions shown on drawing or as per IRC:57.

10.6.4 Longitudinal Joint

10.6.4.1 The longitudinal joints shall be constructed by forming or by sawing as per details of the joints shown in the drawing. Sawed longitudinal joints shall be constructed when the concrete pavement placement width exceeds 4.5 m. The groove may be cut after the final set of the concrete. Joints should be sawn to at least one-third the depth of the slab ±5 mm as indicated in the drawing. The joint shall be widened subsequently to dimensions shown on the drawings.

Where adjacent lanes of pavement are constructed separately using slip form pavers or side forms, the tie bars may be bent at right angles against the vertical face/ side of the first lane constructed and straightened before placing concrete in the adjacent lane. Broken or damaged tie bars shall be repaired or replaced as required.

The groove for sealant shall be cut in the pavement lane placed later.

10.6.4.2 Tie Bars

Tie bars shall be provided at the longitudinal joints as per dimensions and spacing shown in the drawing and in accordance with Clause 10.6.6. The direction of the tie bars at curves shall be radial in the direction of the radius.

10.6.5 Dowel Bars

10.6.5.1 Dowel bars shall be mild steel rounds in accordance with Clause 10.2.8 with details/dimensions as indicated in the drawings and free from oil, dirt, loose rust or scale. They shall be straight, free of irregularities and burring restricting slippage in the concrete. The sliding ends shall be sawn or cropped cleanly with no protrusions outside the normal diameter of the bar. Any protrusions shall be removed by grinding the ends of the dowel bars. The dowel bar shall be supported on cradles/dowel chairs in pre-fabricated joint assemblies positioned prior to the construction of the slabs or mechanically inserted with vibration into the plastic concrete by a method which ensures correct placement of the bars besides full re-compaction of the concrete around the dowel bars.

10.6.5.2 Unless shown otherwise on the drawings, dowel bars shall be positioned at mid depth of the slab within a tolerance of ±20 mm, and centered equally about intended lines of the joint within a tolerance of ±25 mm. They shall be aligned parallel to the finished surface of the slab and to the centre line of the carriageway and to each other within tolerances given here-in-under, the compliance of which shall be checked as per Clause 10.11.7.

i) For bars supported on cradles prior to the laying of the slab:

a) All bars in a joint shall be within ±2 mm per 300 mm length of bar

b) 2/3rd of the number of bars shall be within ±3 mm per 500 mm length of bar

c) No bar shall differ in alignment from an adjoining bar by more than 3 mm per 300 mm length of bar in either the horizontal or vertical plane

d) Cradles supporting dowel bar shall not extend across the line of joint i.e. no steel bar of the cradle assembly shall be continuous across the joint.

ii) For all bars inserted after laying of the slab except those inserted by a Dowel Bar Inserter the tolerance for alignment may be twice as indicated in (i) above.

The transverse joints at curves shall be radial in the direction of the radius.

10.6.5.3 Dowel bars, supported on cradles in assemblies, when subject to a load of 110 N applied at either end and in either the vertical or horizontal direction (upwards and downwards and in both directions horizontally) shall conform to be within the limits given in Clause 10.6.5.2.

10.6.5.4 The assembly of dowel bars and supporting cradles, including the joint filler board in the case of expansion joints, shall have the following degree of rigidity when fixed in pofion:-

i) For expansion joints, the deflection of the top edge of the filler board shall be not greater than 13 mm, when a load of 1.3 kN is applied perpendicular to the vertical face of the joint filler board and distributed over a length of 600 mm by means of a bar or timber packing, at mid depth and midway between individual fixings, or 300 mm from either end of any length of filler board, if a continuous fixing is used. The residual deflection after load shall be not more than 3 mm.

ii) The fixings for joint assembly shall not fail under 1.3 kN load and shall fail before the load reaches 2.6 kN when applied over a length of 600 mm by means of a bar or timber packing placed as near to the level of the line of fixings as practicable.

iii) Fixings shall be deemed to fail when there is displacement of the assemblies by more than 3 mm with any form of fixing, under the test load. The displacement shall be measured at the nearest part of the assembly to the centre of the bar or timber packing.

10.6.5.5 Dowel bars in the contraction joints, construction joints and expansion joints shall be covered by a thin plastic sheath. The thickness of the sheath shall not exceed 0.5 rnm and shall be tightly fitted on the bar for at least two-thirds of the length from one end for dowel bars in contraction/construction joints and half the length plus 50 mm for expansion joints. The sheathed bar shall comply with the following pull-out tests:

Four bars shall be taken at random from stock and without any special preparation shall be covered by sheaths as required in this Clause. The ends of the dowel bars which have been sheathed shall be cast centrally into concrete specimens 150 mm x 150 mm x 600 mm, made of the same mix proportions to be used in the pavement, but with a maximum nominal aggregate size of 20 mm and cured in accordance with IS:516. At 7 days a tensile load shall be applied to achieve a movement of the bar of at least 0.25 mm. The average bond stress to achieve this movement shall not be greater than 0.14 MPa.

10.6.5.6 For expansion joints, a closely fitting cap 100 mm long consisting of water proofed cardboard or an approved synthetic material like PVC or GI pipe shall be placed over the sheathed end of each dowel bar. An expansion space (about 25 mm) at least equal in length to the thickness of the joint filler board shall be formed between the end of the cap and the end of the dowel bar by using compressible sponge. To block the entry of cement slurry into the annular space between the sheathing and dowel bar shall be taped around its mouth.

10.6.6 Tie Bars

10.6.6.1 Tie bars in longitudinal joints shall be deformed steel bars of strength 500 MPa complying with IS:1786 and in accordance with the requirements given in this Clause. The bars shall be free from oil, dirt, loose rust and scale.

10.6.6.2 Tie bars projecting across the longitudinal joint shall be protected from

corrosion for 75 mm on each side of the joint by a protective coating of bituminous paint with the approval of the Engineer. The coating shall be dry when the tie bars are used. In the case of coastal region and high rainfall areas, tie bars shall be epoxy coated in their full length as per IS:13620.

10.6.6.3 Tie bars in longitudinal joints shall be made up into rigid assemblies with

adequate supports and fixings to remain firmly in position during the construction of the slab. Alternatively, tie bars at longitudinal joints may be mechanically or manually inserted into the plastic concrete from above by vibration using a method which ensures correct placements of the bars and recompaction of the concrete around the tie bars.

10.6.6.4 Tie bars shall be positioned to remain in the middle from the top or within the

upper middle third of the slab depth as indicated in the drawings and approximately parallel to the surface and approximately perpendicular to the line of the joint, with the centre of each bar on the intended line of the joints within a tolerance of ±50 mm, and with a minimum cover of 30 mm below the joint groove. Spacing of tie bars on curves of radius less than 360 m shall not be less than 350 mm.

10.6.6.5 To check the position of the tie bars, one metre length, 0.5 m on either side of the longitudinal joint shall be opened when the concrete is green (within 20 to 30 minutes). The pit shall be refilled with the fresh concrete of same mix after checking.

10.7 Weather and Seasonal Limitations

10.7.1 Concreting during Monsoon Months

Concreting should be avoided during rainy season. However, when concrete is being placed during monsoon months and when it may be expected to rain, sufficient supply of tarpaulin or other waterproof cloth shall be provided along the line of the work. Any time when it rains, all freshly laid concrete which had not been covered for curing purposes shall be adequately protected. Any concrete damaged by rain shall be removed and replaced. If the damage is limited to texture, it shall be retextured in accordance with the directions of the Engineer.

10.7.2 Temperature Limitation

No concreting shall be done when the temperature of the concrete reaching the paving site is above 30°C. Besides, in adverse conditions like high temperature, low relative humidity, excessive wind velocity, imminence of rains etc., tents on mobile trusses may be provided over the freshly laid concrete for a minimum period of 3 hours as directed by the Engineer. To bring down the temperature, if necessary, chilled water or ice flakes should be.made use of. When the ambient temperature is more than 35°C, no concreting shall be permitted. The ice flakes should not be manufactured from chlorinated water. Generally the rate of evaporation of weer shall not exceed 1 kg/sqm/hour as per IRC:15.

No concreting shall be done when the concrete temperature is below 5°C and the temperature is further falling.

10.8 Fixed Form Paving

10.8.1 Side Forms and Rails

These shall be provided in case of fixed form paving. All side forms shall be of mild steel of derth equal to the thickness of pavement or slightly less to accommodate the surface irregularity of the sub-base. The forms can be placed in series of steel packing plates or shims to take care of irregularity of sub-base. They shall be sufficiently robust and rigid to support the weight and pressure caused by a paving equipment. Side forms for use with wheeled paving machines shall incorporate metal rails firmly fixed at a constant height below the top of the forms. The forms and rails shall be firmly secured in position by not less than 3 stakeslpins for every 3 m length so as to prevent movement in any direction. Forms and rails shall be straight within a tolerance of 3 mm in 3 m and when in place shall not settle in excess of 1.5 mm in 3 m while paving is being done. Forms shall be cleaned and oiled immediately before each use. The forms shall be bedded on a continuous bed of low moisture content lean cement mortar or concrete and set to the line and levels shown on the drawings within tolerances ±10 mm and ±3 mm respectively. The bedding shall not extend under the slab and there shall be no vertical step between adjacent forms of more than 3 mm. The forms shall be got inspected by the Engineer for his approval 12 hours before construction of the slab and shall not be removed until at least 12 hours afterwards. No concreting shall commence till formwork has been approved by the Engineer.

10.8.2 At all times sufficient forms shall be used and set to the required alignment for at least 300 m length of pavement immediately in advance of the paving operations, or the anticipated length of pavement to be laid within the next 24 hours whichever is more.

10.9 Construction

10.9.1 General

A systems approach may be adopted for construction of the pavement, and the Method Statement for carrying out the work, detailing all the activities, indication of time-cycle, equipment, personnel etc., shall be got approved from the Engineer before the commencement of the work. This shall include the type, capacity and make of the batching and mixing plant besides the hauling arrangement and paving equipment. The capacity of paving equipment, batching plant as well as all the ancillary equipment shall be adequate for a paving rate of atleast 500 m in one day. The paving speed of slip-form paver shall not be less than 1.0 m per minute. The concreting should proceed continuously without stops and starts.

10.9.2 Batching and Mixing

Batching and mixing of the concrete shall be done at a central batching and mixing plant with automatic controls, located at a suitable place which takes into account sufficient space for stockpiling of cement, aggregates and stationary water tanks. This shall be located at an approved distance, duly considering the properties of the mix and the transporting arrangements available with the Contractor.

10.9.3 Equipment for Proportioning of Materials and Paving

10.9.3.1 Proportioning of materials shall be done in the batching plant by weight, each type of material being weighed separately. The cement from the bulk stock may be weighed separately from the aggregates. Water shall be measured by volume. Specified percentage of plasticizer in volume will be added by weight of cement. Wherever properly graded aggregate of uniform quality cannot be maintained as envisaged In the mix design, the grading of aggregates shall be controlled by appropriate blending techniques. The capacity of batching and mixing plant shall be at least 25 percent higher than the proposed capacity of the laying/paving equipment.

10.9.3.2 Batching Plant and Equipment:

1) **General:** The batching plant shall include minimum four bins, weighing hoppers, and scales for the fine aggregates and for each size of coarse aggregate. If cement is used in bulk, a separate scale for cement shall be included. There shall be a separate bin for flyash, if this additive is specified. The weighing hoppers shall be properly sealed and vented to preclude dust during operation. Approved safety devices shall be provided and maintained for the protection of all personnel engaged in plant operation, inspection and testing. The batch plant shall be equipped with a sAable non-resettable batch counter which will correctly indicate the number of batches proportioned. A continuous type of mixing plant can also be used provided the ingredients are weighed through electronic sensors before feeding.

2) **Automatic weighing devices:** Batching plant shall be equipped to proportion aggregates and bulk cement by means of automatic weighing devices using load cells. The weighing devices shall have an accuracy within ±1% in respect of quantity of cement, admixtures and water and ±2% in respect of aggregates and the accuracy shall be checked at least once a month.

3) **Mixer:** Mixers shall be pan type, reversible type or any other mixer capable of combining the aggregates, cement, and water into a thoroughly mixed and uniform mass within the specified mixing period, and of discharging the mix, without segregation. Each stationary mixer shall be equipped with an approved timing device which will automatically lock the discharge lever when the drum has been charged and release it at the end of the mixing period. The device shall be equipped with a bell or other suitable warning device adjusted to give a clearly audible signal each time the lock is released. In case of failure of the timing device, the mixer may be used for the balance of the day while it is being repaired, provided that each batch is mixed in 90 seconds or as per the manufacturer's recommendation. The mixer shall be equipped with a suitable non-resettable batch counter which shall correctly indicate the number of batches mixed.

The mixer shall be cleaned at suitable intervals. The pick-up and throw-over blades in the drum or drums shall be repaired or replaced when they are worn down 20 mm or more. The Contractor shall (1) have available at the job site a copy of the manufacturer's design, showing dimensions and arrangements of blades in reference to original height and depth, or (2) provide permanent marks on blade to show points of 20 mm wear from new conditions. Drilled holes of 5 mm diameter near each end and at midpoint of each blade are recommended. Batching Plant shall be calibrated in the beginning and thereafter at suitable interval not exceeding 1 month.

4) Control cabin: An air-conditioned centralized computer control cabin shall be provided for automatic operation of the equipment.

5) The design features of the batching plant should be such that it can be shifted quickly.

10.9.3.3 Paving Equipment

The concrete shall be placed with an approved fixed form or slip form paver with independent units designed to (i) spread, (ii) consolidate, screed and float-finish, (iii) texture and cure the freshly placed concrete in one complete pass of the machine in such a manner that a minimum of hand finishing will be necessary and so as to provide a dense and homogeneous pavement in conformity with the plans and Specifications. The paver shall be equipped with electronic sensor controls to control the line and grade from either one side or both sides of the machine.

Vibrators shall operate at a frequency of 8000-10000 impulses per minute under load at a maximum spacing of 600 mm. The variable vibration setting shall be provided in the machine.

10.9.3.4 Concrete Saw

The Contractor shall provide adequate number of concrete saws with sufficient number of diamond-edge saw blades. The saw machine shall be either electric or petrol/diesel driven type. A water tank with flexible hose and pump shall be made available for this activity on priority basis. The Contractor shall have at least one standby saw in good working condition. The concreting work shall not commence if the saws are not in working condition.

10.9.4 Hauling and Placing of Concrete

10.9.4.1 Freshly mixed concrete from the central batching and mixing plant shall be transported to the paver site by means of tipping trucks or transit mixers of sufficient capacity and approved design in sufficient number's to ensure a constant supply of concrete. Covers shall be used for protection of concrete against the weather. While loading the concrete truck shall be moved back and forth under the discharge chute to prevent segregation. The tipping trucks shall be capable of maintaining the mixed concrete in a homogeneous state and discharging the same without segregation and loss of cement slurry. The feeding to the paver is to be regulated in such a way that the paving is done in an uninterrupted manner with a uniform speed throughout the day's work. Tipping trucks shall be washed at a regular frequency as prescribed by the Engineer to ensure that no left-over mix of previous loading remains stuck.

10.9.4.2 Placing of Concrete

The total time taken from the addition of the water to the mix, until the completion of the surface finishing and texturing shall not exceed 120 minutes when concrete temperature is less than 25°C and 90 minutes when the concrete temperature is between 25°C and 30°C, When the time between mixing and laying exceed these values, the concrete shall be rejected and removed from the site. Tipping trucks delivering concrete shall normally not run on plastic sheathing nor shall they run on completed slabs until after 28 days of placing the concrete.

The placing of concrete in front of the PQC paver should preferably be from the side placer to avoid damage to DLC by concrete tipping trucks. In case of unavoidable situation, truck supplying concrete to the paver may be allowed to ply on the DLC with the approval of the

Engineer. The paver shall be capable of paving the carriageway as shown in the drawings, in a single pass and lift.

10.9.4.3 Where fixed form pavers are to be used, forms shall be fixed in advance as per Clause 10.8. Before any paving is done, the site shall be shown to the Engineer, in order to verify the arrangement for paving besides placing of dowels, tie-bars etc., as per the relevant Clauses of these Specifications. The mixing and placing of concrete shall progress only at such a rate as to permit proper finishing, protecting and curing of the concrete in the pavement.

10.9.4.4 In areas inaccessible to paving equipment, the pavement shall be constructed using side forms, as per Clause 10.9.7.

10.9.4.5 In all cases, the temperature of the concrete shall be measured at the point of discharge from the delivery vehicle.

10.9.4.6 The addition of water to the surface of the concrete to facilitate the finishing operations will not be permitted except with the approval of the Engineer when it shall be applied as a mist by means of approved equipment.

10.9.4.7 If considered necessary by the Engineer, the paving machines shall be provided with approved covers to protect the surface of the slab under construction from direct sunlight and rain or hot wind.

10.9.4.8 While the concrete is still plastic, its surface shall be textured by brush or tines as per the instructions of the engineer in compliance with Clause 10.9.11. The surface and edges of the slab shall be cured by the application of a sprayed liquid curing membrane in compliance with Clause 10.9.12. After the surface texturing, but before the curing compound is applied, the concrete slab shall be marked with the chainage at every 100 m interval by embossing.

10.9.4.9 As soon as the side forms are removed, edges of the slabs shall be corrected wherever irregularities have occurred by using fine concrete composed of 1:1:2, cement : sand : coarse agg (10 mm down) with water cement ratio not more than 0.4 under the supervision of the Engineer.

10.9.4.10 If the requirement of Clause 902.4 for surface regularity fails to be achieved on two consecutive working days, then normal working shall cease until the cause of the excessive irregularity has been identified and remedied.

10.9.5.7 Tube Floating

Upon the instructions of the Engineer, Contractor shall scrape the concrete surface when in plastic state with a 3 m long tube float fixed with a long and stable handle before texturing. Tube float shall be of an alloy steel tube of 50 to 60 mm diameter with a long and stable handle. The length of tube float shall preferably be longer than half the length of slab i.e., half the distance between two transverse contraction joints. This operation shall be done to minimise surface irregularity caused due to varied causes like frequent stoppages of work, surface deformation due to plastic flow etc. The tube float shall be placed at the centre of the slab parallel to

longitudinal joint and pulled slowly and uniformly towards the edges. After the use of float tube, it shall be frequently cleaned before further use. The slurry removed shall be discarded. This activity shall be advanced laterally by providing an overlap of half the length of tube float. The removal of the cement slurry from the surface shall be sufficient enough such that the texture is formed on a firm surface and is more durable. This operation, however, shall be carried out after removing bleeding water.

10.9.8 Transition Slabs

At the interface of rigid and flexible pavement, at least 3 m long reinforced buried slab shall be provided to give a long lasting joint at the interface. The details shall be as given in IRC:15.

10.9.9 Anchor Beam and Terminal Slab Beam Adjoining Bridge Structures

RCC anchor beams shall be provided in the terminal slab adjoining bridge structures as per drawings and IRC:15.

10.9.10 The Treatment of Concrete Pavement on Culverts

The concrete pavement shall be taken over the culverts. At both ends of the culvert slab, a contraction joint shall be provided in the concrete pavement. Nominal reinforcement of 10 mm dia bars at 150 mm spacing in both directions shall be provided at 50 mm below the topof the slab. The reinforcement shall be stopped 50 mm short of the contraction joint. Such reinforcement shall also be provided in the next slab panel on either side.

10.9.11 Surface Texture

10.9.11.1 Tining

After final floating and finishing of the slab and before application of the liquid curing membrane, the surface of concrete slabs shall be textured either in the transverse direction (i.e., at right angles to the longitudinal axis of the road) or in longitudinal direction (i.e., parallel to the centreline of the roadway). The texturing shall be done by tining the finished concrete surface by using rectangular steel tines. A beam or a bridge mounted with steel tines shall be equipped and operated with automatic sensing and control devices from main paver or auxilary unit. The tining unit shall have facility for adjustment of the download pressure on the Ines as necessary to produce the desired finish. The tining rakes shall be cleaned often to remove snots of slurry. The tines shall be inspected daily and all the damaged and bent tines shall be replaced before commencing texturing. Tined grooves shall be 3 mm wide and 3 to 4 mm deep. Before commencing texturing, the bleeding water, if any, shall be removed and texturing shall be done on a firm surface. The measurement of texture depth shall be done as per Clause 10.12.

a) **Transverse tining: When the texturing** is specified in transverse direction, a beam of at least 3 m length mounted with tines shall be moved in transverse direction to produce the texture. The grooves produced shall be at random spacing of grooves but uniform in width and depth. The spacing shall conform to a pattern shown below:

Random spacing in mm

10	14	16	11	10	13	15	16	11	10	21	13	10

The above pattern shall be repeated. Texturing shall be done at the right time such that the grooves after forming shall not close and they shall not get roughened. Swerving of groove patterns will not be permitted. The completed textured surface shall be uniform in appearance.

b) Longitudinal tining: Longitudinal tining shall be done, if specified in the Contract. The texturing bridge shall be wide enough to cover the entire width of the carriageway but within 75 mm from the pavement edge. The centre to centre spacing between the tines shall be 18 to 21 mm. The width of tine texture shall be 3 mm and depth shall be 3 to 4 mm.

10.9.12 Curing

10.9.12.1 Immediately after the surface texturing, the surface and sides of the slab shall be cured by the application of approved resin-based aluminized reflective curing compound which hardens into an impervious film or membrane with the help of mechanical sprayer.

10.9.12.2 The curing compound shall not react chemically with the concrete and the film or membrane shall not crack, peel or disintegrate within three weeks of application. Immediately prior to use, the curing compound shall be thoroughly agitated In its containers. The rate of spread shall be in accordance with the manufacturer's instructions checked during the construction of the trial length and subsequently whenever required by the Engineer. The mechanical sprayer shall incorporate an efficient mechanical device for continuous agitation and mixing of the compound during spraying. The curing compound shall be sprayed in two applications to ensure uniform spread.

Curing compounds shall contain sufficient flake aluminum in finely divided dispersion to produce a complete coverage of the sprayed surface with a metallic finish. The compound shat become stable and impervious to evaporation of water from the surface of the concrete within 60 minutes of application and shall be of approved type. The curing compounds shall have a water retention efficiency index not less than 90 percent in accordance with BS Specification No. 7542 or as per ASTM C-309-81 Type 2.

10.3.12.3 In addition to spraying of curing compound, the fresh concrete surface shall be protected for at least 3 hours by covering the finished concrete pavement with tents mounted on mobile trusses as described in Clause 10.7.2, during adverse weather conditions as directed by the Engineer. After three hours, the pavement shall be covered by moist hessian laid in two layers and the same shall then be kept damp for a minimum period of 14 days after which time the hessian may be removed. The hessian shall be kept continuously moist. All damaged/torn hessian shall be removed and replaced by new hessian on a regular basis.

10.9.12.4 The Contractor shall be liable at his cost to replace any concrete damaged as a result of incomplete curing or cracked on a line other than that of a joint as per procedure in IRC:SP:83.

10.10 Preparation and Sealing of Joint Grooves

10.10.1 General

All joints shall be sealed using sealants described in Clause 10.2.10.

10.10.2 Preparation of Joint Grooves for Sealing

10.10.2.1 Grooves are saw cut in the first instance just to provide minimum width (3-5 rnm) to facilitate development of crack at joint locations, as shown In the drawing.

Subsequently before sealing, grooves are widened by sawing as per the dimensions in the drawing. Dimension of the grooves shall be controlled by depth/width gauge.

10.10.2.2 If rough arrises develop when grooves are made, they shall be ground to provide a chamfer approximately 5 mm wide. If the groove is at an angle upto 10° from the perpendicular to the surface, the overhanging edge of the groove shall be sawn or ground perpendicular. If spelling occurs or the angle of the former is greater than 10 degree, the joint sealing groove shall be sawn wider and perpendicular to the surface to encompass the defects upto a maximum width, including any chamfer, of 20 mm for transverse joints and 10 mm for longitudinal joints. If the spelling cannot be so eliminated then the arises shall be repaired by an approved thin bonded arrises repair using cementitious/epoxy mortar materials.

10.10.2.3 All grooves shall be cleaned of any dirt or loose material by air blasting with filtered, oil-free compressed air. The Engineer shall instruct cleaning by pressurized water jets. Depending upon the requirement of the sealant manufacturer, the sides of the grooves shall be sand blasted to increase the bondage between sealant and concrete.

10.10.2.4 The groove shall be cleaned and dried at the time of priming and sealing. If sand blasting is recommended by the supplier, the same shall be carried out.

10.10.2.5 Before sealing the temporary seal provided for blocking the ingress of dirt, soil etc., shall be removed. A highly compressible heat resistant paper-backed debonding strip as per drawing shall be inserted in the groove to serve the purpose of breaking the bond between sealant and the bottom of the groove and to plug the joint groove so that the sealant may not leak through the cracks. The width of debonding strip shall be more than the joint groove width so that it is held tightly in the groove. In the case of longitudinal joints, heat resistant tapes may be inserted to block the leakage through bottom of the joint where hot poured sealant is used. When cold poured sealant is used a debonding tape of 1.0-2.0 mm thickness and 6 to 8 mm width shall be inserted to plug the groove so that the sealant does not enter in the initially cut groove.

10.10.3 Sealing with Sealants

10.10.3.1 When sealants are applied, an appropriate primer shall also be used if recommended by the manufacturer and it shall be applied in accordance with his instructions. The sealant shall be applied within the minimum and maximum drying times of the primer recommended by the manufacturer. Priming and sealing with applied sealants shall not be carried out when the naturally occurring temperature in the joint groove to be sealed, is below 7°C.

10.10.3.2 If hot applied sealant is used it shall be heated and applied from a thermostatically controlled, indirectly heated preferably with oil jacketed melter and pourer having recirculating pump and extruder. For large road projects, sealant shall be applied with extruder having flexible hose and nozzle. The sealant shall not be heated to a temperature higher than the safe heating temperature and not for a period longer than the safe heating period, as specified by the manufacturer. The dispenser shall be cleaned out at the end of each day in accordance with

the manufacturer's recommendations and reheated material shall not be used. The Movement Accomodation Factor of the sealant shall be more than 10 percent.

10.10.3.3 Cold applied sealants with chemical formulation like polysulphide/polyurethane/ silicone as per IRC:57 shall be used These shall be mixed and applied within the time limit specified by the manufacturer. If primers are recommended they shall be applied neatly with an appropriate brush. The Movement Accomodation Factor shall be more than 25 percent.

10,10.3.4 The sealants applied at contraction phase of the slabs would result in bulging of the sealant over and above the slab. Therefore, the Contractor in consultation with the Engneer, shall establish the right temperature and time for applying the sealant. Thermometer shall be hung on a pole at the site for facilitating control during the sealing operation.

10.10.3.5 Sealant shall be applied, slightly to a lower level than the slab with a tolerance of 3(+/-)1 mm

10.10.3.6 During sealing operation, it shall be seen that no air bubbles are introduced in the sealant either by vapours or by the sealing process. The sealant after pouring, shall be allowed to cure for 7 days or for a period as per instructions of manufacturers.

10.11 Trial Length

10.11.1 The trial shall be constructed at least one month in advance of the proposed start of concrete paving work. At least one month prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a detailed method statement giving description of the proposed materials, plant, equipment and construction methods. All the major equipments like paving train, batching plant, tipping trucks etc., proposed in the conslruction are to be approved by the Engineer before their procurement. No trials of new materials, plant, equipment or construction methods, nor any development of them shall be permitted either during the construction of trial length or in any subsequent paving work, unless they form part of further trials. The trial lengths shall be constructed away from the carriageway.

10.11.2 The Contractor shall demonstrate the materials, plant, equipment and methods of construction that are proposed for concrete paving, by first constructing a trial length of slab, at least 100 m long for mechanised construction and at least 50 m long for hand guided methods. The width of the trial section shall be the full carriageway width as shown in the drawings. **If** the first trial is unsatisfactory, the Contractor shall have to demonstrate his capability to satisfactorily construct the pavement in subsequent trials.

10.11.3 The trial length shall be constructed in two parts over a period comprising at least part of two separate working days, with a minimum of 50 m constructed each day for mechanised construction and a minimum of 25 m on each day for hand guided construction. The trial length shall be constructed at a paving rate which is proposed for the main work.

10.11.4 Transverse joints including expansion joint and longitudinal joint that are proposed in the main work shall be constructed and assessed in the trial length.

10.11.5 The trial length shall comply with the Specifications in all respects including the test requirement of Table 900-6 with the following additions.

10.11.5.1 Surface Levels and Regularity

a) In checking for compliance with Clause 902.3 the levels shall be taken at intervals at the locations specified in this Clause along any line or lines parallel to the longitudinal centre line of the trial length.

b) The maximum number of permitted irregularities of pavement surface shall comply with the requirements of Clause 902.4. Shorter trial lengths shall be assessed pro-rata based on values for a 300 m length.

10.11.5.2 Joints

a) Alignment of dowel bars shall be inspected in any two consecutive transverse joints in a trial length construction by removing the fresh concrete in a width of 0.5 m on either side of the joint. The joint pit shall be refilled with freshly prepared concrete, after inspection. Alternatively, it can be tested by suitable device like MIT SCAN with the permission of the Engineer. If the position or alignment of the dowel bars at one of these joints does not comply with the requirements and if that joint remains the only one that does not comply after the next 3 consecutive joints of the same type have been inspected, then the method of placing dowels shall be deemed to be satisfactory. In order to check sufficient joints for dowel bar alignment without extending the trial length unduly joints may be constructed at more frequent joint intervals than the normal spacing required in trial slabs.

b) If there are deficiencies in the first expansion joint that is constructed as a trial, the next expansion joint shall be a trial joint. Should this also be deficient, further trial of expansion joints shall be made as part of the trial length which shall not form part of the permanent works, unless agreed by the Engineer.

10.11.5.3 Density

In-situ density in trial length shall be assessed as described in Clause 903.5.2.2 from at least 3 cores drilled from each part of the trial length when the concrete is not less than 7 days old. Should any of the cores show honey-combing in the concrete, the trail length shall be rejected and the construction in the main carriageway shall not be permitted until further trials have shown that modification has been made which would result in adequate compaction.

10.11.5.4 Strength

Minimum of thirty (30) beams for flexural strength and thirty (30) cubes for compressive strength shall be prepared from the concrete delivered in front of the paving plant. Each pair of beams and cubes shall be from the same location/batch but different sets of beams and cubes shall be from different locations/batches. Compressive and flexural strength shall be tested after 28 days water curing in the laboratory.

At the age of 28 days, thirty (30) cores with diameter 150 mm shall be cut from the pavement slab when the thickness of concrete pavement is more than 300 mm. In case the concrete pavement thickness is less than 300 mm, the dia of core shall be 100 mm. The cores shall be suitably cut at both ends to provide a specimen of plain surface on both ends. The dia to heght ratio of core shall be 1 to 2. For cylindrical specimen of PQC of dia 150 mm, the variation in dia shall be ± 0.5 mm, a

tolerance on height shall be ± 1 mm for a specimen of height 300 mm or more. For cylindrical specimen of dia 100 mm, the variation in dia shall be ± 0.3mm, and a tolerance on height shall be ±1 mm for a specimen height of 200 mm. The compressive strength test shall be conducted as per IS:516.

Concrete in the member represented by a core test shall be considered acceptable, if the average equivalent cube strength of the cores is equal to at least 85 percent of the cube strength (characteristic strength) of the grade of the concrete specified for the corresponding age of 28 days and no individual core has a strength less than 75 percent.

202.11.6 Approval and Acceptance

10.11.6.1 Approval of the materials, plant, equipment and construction methods shall be given when the trial length complies with the Specifications. The Contractor shall not proceed with normal working until the trial length has been approved. If the Engineer does not notify the Contractor of any deficiencies in any trial length within 7 days after the completion of that trial length, the Contractor may assume that the trial length, and the materials, plant, equipment and construction methods adopted are acceptable, provided that the 28 days strength of cubes and cores extracted from trial length meet the requirement of the Specified strength.

10.11.6.2 When approval has been given, the materials, plant, equipment and construction methods shall not thereafter be changed, except for normal adjustments and maintenance of plant, without the approval of the Engineer. Any changes in materials, plant, equipment, and construction methods shall entitle the Engineer to require the Contractor to lay a further trial length as described in this Clause to demonstrate that the changes will not adversely affect the permanent works.

10.11.6.3 Trial lengths which do not comply with the Specifications, with the exception of areas which are deficient only in surface texture and which can be remedied in accordance with Clause 10.9.11.6 shall be removed immediately upon notification of deficiencies by the Engineer and the Contractor shall construct a further trial length.

10.11.7 Inspection of Dowel Bars

10.11.7.1 Compliance with Clause 10.6.5 for the position and alignment of dowel bars at contraction and expansion joints shall be checked by measurements relative to the side forms or guide wires.

10.11.7.2 When the slab has been constructed, the position and alignment of dowel bars and any filler board shall be measured after carefully exposing them in the plastic concrete across the whole width of the slab. When the joint is an expansion joint, the top of the filler board shall be exposed sufficiently in the plastic concrete to permit measurement of any lateral or vertical displacement of the board. During the course of normal working, these measurements shall be carried out in the pavement section at the end of days work by extending slab length by 2 m. After sawing the transverse joint groove, the extended 2 m slab shall be removed carefully soon after concrete has set to expose dowels over half the length. These dowels can be tested for tolerances. This joint shall be treated as construction joint. The position of dowel bars in any type of transverse joint ie, contraction, construction or expansion

can alternatively be tested by suitable device like MIT SCAN with the permission of the Engineer.

10.11.7.3 If the position and alignment of the bars in a single joint in the slab isunsatisfactory then the next two joints shall be inspected. If only one joint of the three is defective, the rate of checking shall be increased to one joint per day until the Engineer is satisfied that compliance is being achieved.

10.11.7.4 After the dowel bars have been examined, the remainder of the concrete shall be removed over a width of 500 mm on each side of the line of the joint and reinstated to the satisfaction of the Engineer. The dowels shall be inserted on both sides of the 1 m wide slab by drilling holes and grouting with epoxy mortar. Plastic sheath as per Clause 10.6.5.5 shall be provided on dowels on one of the joints. The joint groove shall be widened and sealed as per Clause 10.10.

10.11.8 Inspection of Tie Bars

To check the position of the tie bars, one metre length 0.5 m on either side of the longitudinal joint shall be opened when the concrete is green (within 20 to 30 minutes of its laying). The pit shall be refilled with the fresh concrete of same mix after checking.

10.13 Opening to Traffic

No vehicular traffic shall be allowed to ply on the finished surface of a concrete pavement within a period of 28 days of its construction and until the joints are permanently sealed and cured. The road may be opened to regular traffic after completion of the curing period of 28 days and after sealing of joints is completed including the construction of shoulder, with the written permission of the Engineer.

10.14 Acceptance Criteria in Quality and Distress

i) **Tolerances for Surface Regularity, Level, Thickness and Strength:** The tolerances for surface regularity, level, thickness and strength shall conform to the requirements given in Clause 903.5. Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

ii) **Tolerances in Distress:** The acceptance criteria with regard to the types of distresses in rigid pavement shall be as per IRC:SP-83. "Guidelines for Maintenance, Repair and Rehabilitation of Cement Concrete Pavements". The cracks (of severity rating not more than 2) which may appear during construction or before completion of Defect Liability Period shall be acceptable with suggested treatments as given in IRC:SP-83.

Cement Concrete Pavement slabs having cracks of severity rating more than 2 i.e. cracks of width more than 0.5 mm for single discrete cracks, multiple and transverse cracks and cracks of width more than 3 mm in case of longitudinal cracks and of depth more than half of the concrete pavement slabs, shall be removed and replaced as per IRC:SP-83.

10.15 Measurements for Payment

10.15.1 Cement Concrete pavement shall be measured as a finished work in cubic metres of concrete placed based on the net plan area and thickness as measured in accordance with Clause 10.15.2.

10.15.2 The finished thickness of concrete for payment on volume basis shall be computed in the manner described in Clause 113.3 with the following modifications:

i) The levels shall be taken before and. after construction at grid points 5 m centre to centre longitudinally in straight as well as at curves.

ii) A day's work is considered as a 'lot' for calculating the average thickness of the slab. In calculating the average thickness, individual measurements which are in excess of the specified thickness by more than 10 mm shall be considered as the specified thickness plus 10 mm.

10.15.3 Individual areas deficient by more than 10 mm shall be verified by the Engineer by ordering core cutting and if in his opinion the deficient areas warrant removal, they shall be removed and replaced with concrete of the thickness shown on the plans.

11. ROAD MARKINGS

11.1 Scope: The provisions of clause No.803.1 of MoRTH specification shall apply. The work shall consist of providing road markings of specified width, layout and design using paint of the required specifications as given in the Contract and as per guidelines contained in from IRC:35-1997.

11.2 Materials: The provisions of clause No.803.2 of MoRTH specification shall apply. Road markings shall be Ordinary road marking paint, Hot applied thermoplastic compound, Reflectorised paint or Cold applied reflective paint as specified in the item and the material shall meet the requirements as specified in these specifications.

11.3 Ordinary Road Marking Paint: The provisions of clause No.803.3.1 of MoRTH specification shall apply. Ordinary paint used for road marking shall conform to Grade I as per IS:164.

The provisions of clause No.803.3.2 of MoRTH specification shall apply. The road marking shall preferably be laid with appropriate road marking machinery.

11.4 Hot Applied Thermoplastic Road Marking: The provisions of clause No.803.4 of MoRTH specification shall apply.

11.5 Thermoplastic Material: The provisions of clause No.803.4.1 of MoRTH specification shall apply.

11.5.1 General: The provisions of clause No.803.4.1.1 of MoRTH specification shall apply. The thermoplastic material shall be homogeneously composed of aggregate, pigment, resins and

glass reflectorizing beads. The colour of the compound shall be white or yellow (IS colour No.356) as specified in the drawings or as directed by the Engineer.

11.5.2 Requirements: The provisions of clause No.803.4.1.2 of MoRTH specification shall apply.

Composition: The pigment, beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800-9.

Table 800-9 : Proportions of Constituents of Marking Material (Percentage by Weight)

Component	White	Yellow
Binder	18.0 min	18.0 min
Glass Beads	30 – 30	30 - 30
Titanium Dioxide	10.0 min	--
Calcium Carbonate and Inert Fillers	42.0 max	See Note Below
Yellow Pigments	- -	See Note Below

Note: Amount of Yellow Pigment, Calcium Carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this specification are met.

i. Properties: The properties of thermoplastic material, when tested in accordance with ASTM D36/BS-3262-(Part I), shall be as below:
   a) Luminance:
      White: Daylight luminance at 45^{o} -65 percent min. as per AASHTO M 249
      Yellow: Daylight luminance at 45^{o} - 45 percent min. as per AASHTO M 249
   b) Drying time: When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to bear traffic in not more than 15 minutes.
   c) Skid resistance: not less than 45 as per BS:6044
   d) Cracking resistance at low temperature: The material shall show no cracks on application to concrete blocks.
   e) Softening point: 102.5^{o}C $\pm$ 9.5^{o}C as per ASTM D 36.
   f) Yellowness index (for white thermoplastic paint): not more than 0.12 as per AASHTO M 249.

ii. **Storage life:** The material shall meet the requirements of these specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or unmelted particles for the one year storage period. Any material not meeting the above requirements shall be replaced by the manufacturer/supplier/contractor.

iii. **Reflectorisation:** Shall be achieved by incorporation of beads, the grading and other properties of the beads shall be as specified in Clause 803.4.2.

iv. **Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:
   1) The name, trade mark or other means of identification of manufacturer
   2) Batch number
   3) Date of manufacture

4) Colour (White or Yellow)
5) Maximum application temperature and maximum safe hearing temperature.

v. **Sampling and Testing:** The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The contractor shall furnish to the Engineer a copy of certificate test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of the specification.

11.6 Reflectorizing Glass Beads : The provisions of clause No.803.4.2 of MoRTH specification shall apply.

11.6.1 General : The provisions of clause No.803.4.2.1 of MoRTH specification shall apply. This specification covers two types of glass beads to be used for the production of Reflectorised pavement markings.
Type 1 beads are those which are a constituent of the basic thermoplastic compound vide Table 800-9 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.4.

The provisions of clause No.803.4.2.2 of MoRTH specification shall apply. The glass beads shall be transparent, colourless and free form milkiness, dark particles and excessive air inclusions.

These shall conform to the requirements spelt out in Clause 803.4.2.3.

11.6.2 Specific Requirements: The provisions of clause No.803.4.2.3 of MoRTH specification shall apply.

a) Gradation: The glass beads shall meet the gradation requirements for the two types as given in Table 800-10.

Table 800-10 : Gradation Requirements for Glass Beads

Sieve Size	Percent Retained	
	Type 1	Type 2
1.18 mm	0 to 3	
850 micron	5 to 20	0 to 5
600 micron	--	5 to 20
425 micron	65 to 95	--
300 micron	- -	30 to 75
180 micron	0-10	10 to 30
Below 180 micron	- -	0 to 15

b) Roundness: The glass beads shall have a minimum of 70 percent true spheres.
c) Refractive Index: The glass beads shall have a minimum refractive index of 1.50.
d) Free Flowing properties: The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

11.6.3 Test Methods: The provisions of clause No.803.4.2.4 of MoRTH specification shall apply. The specific requirements shall be tested with the following methods:

i) **Free flow test:** Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter dessicator which is filled within 25mm of the top of a dessicator plate with sulphuric acid water solution (specific gravity 1.10). Cover the dessicator and let it stand for 4 hours at 20°C to 29°C. Remove sample from dessicator, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6mm orifice. If necessary, initiate flow by lightly; tapping the funnel. The glass spheres shall be free of lumps and clusters and shall flow freely through the funnel.

ii) The requirements of gradation, roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS:6088 and BS:3262 (Part I).

iii) The contractor shall furnish to the Engineer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests specified herein and shall certify that the material meets all requirements of these specifications. However, if so required, these tests may be carried out as directed by the Engineer.

11.6.4 Application Properties of Thermoplastic Material: The provisions of clause No.803.4.3.1 of MoRTH specification shall apply. The thermoplastic material shall readily get screended/extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

The provisions of clause No.803.4.3.2 of MoRTH specification shall apply. The material upon healing to application temperatures shall not exude fumes, which are toxic, obnoxious or injurious to persons or property.

11.6.5 Preparation: The provisions of clause No.803.4.4 of MoRTH specification shall apply.

i) The material shall be melted in accordance with the manufactures instructions in a heater with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

ii) After transfer to the laying equipment, the material shall be maintained with the temperature range specified by the manufacturer for achieving the desired consistency for laying.

11.7 Reflectorised Paint : The provisions of clause No.803.5 of MoRTH specification shall apply. Reflectorised pain, if used, shall conform to the Specification by the manufactures and approved by the Engineer. Reflectorising glass beads for refectorising paints where used shall conform to the requirements of Clause 803.4.2.

11.7.1. Application: The provisions of clause No.803.6.1 of MoRTH specification shall apply. Marking shall be done by machine. For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor

shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

11.7.2 The provisions of clause No.803.6.2 of MoRTH specification shall apply. Where the compound is to be applied to cement concrete pavement, a sealing primer as recommended by the manufacturer, shall be applied to the pavement in advance of placing of the stripes to ensure proper bonding of the compound. On new concrete surface any laitance and/or curing compound shall be removed before the markings are applied.

11.7.3 The provisions of clause No.803.6.3 of MoRTH specification shall apply. The thermoplastic material shall be applied hot either by screeding or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.

11.7.4 The provisions of clause No.803.6.4 of MoRTH specification shall apply. The pavement temperature shall not be less than 10C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt, grease, oil and all other foreign matter before application of the paint .

The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old line. Such new material shall so bond itself to the old line that no splitting or separation takes place. .

Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand-sprayed. In addition to the beads included in the material, a further quantity of glass beads of Type 2, conforming to the above noted Specification shall be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square metre area.

11.7.5 The provisions of clause No.803.6.5 of MoRTH specification shall apply. The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness measurement shall be in accordance with Appendices B and C of BS:3262(Part3).

11.7.6 The provisions of clause No.803.6.6 of MoRTH specification shall apply. The markings shall be done to accuracy within the tolerances given below:

i) Width of lines and other markings shall not deviate from the specified width by more than 5percent. .

ii) The position of lines, letters, figures, arrows and other markings shall not deviate from the position specified by more than 20 mm.

iii) The alignment of any edge of a longitudinal line shall not deviate from the specified alignment by more than 10mm to 15m.

iv) The length of segment of broken longitudinal lines shall not deviate from the specified length by more than 150 mm.

In broken lines, the length of segment 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.

11.8 Properties of finished road Markings: The provisions of clause No.803.6.7 of MoRTH specification shall apply. The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

a) The stripe shall not be slippery when wet.
b) The marking shall not lift from the pavement in freezing weather.
c) After application and proper drying, the stripe shall show no appreciable deformation or discoloration under traffic and under road temperature upto 60^0C.
d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil dripping from traffic.
e) The stripe or making shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.
f) The colour of yellow marking shall conform to IS Colour No. 356 as given in IS:164.

11.9 Measurements for Payment: The provisions of clause No.803.6.8 of MoRTH specification shall apply

The provisions of clause No.803.6.8.1 of MoRTH specification shall apply. The painted markings shall be measured in sq.meters of actual area marked (excluding the gaps, if any).

The provisions of clause No.803.6.8.2 of MoRTH specification shall apply. In respect of markings like directional arrows and lettering, etc., the measurement shall be by numbers.

11.10 Rate: The provisions of clause No.803.6.9 of MoRTH specification shall apply. The Contract unit rate for road markings shall be payment in full compensation for furnishing all labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing(s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these Specifications.

12. MATERIALS

12.0. GENERAL

12.1. Indian Standard

All materials shall, as far as possible be of Indian origin and conform to be latest editions of the Indian Standards. Standards issued elsewhere may be used only if approved by the Engineer and for those materials only, for which appropriate Indian Standards do not exists.

12.2. Sampling and Testing: All materials used in the works shall be subjected to inspection and test. Samples of all materials proposed to be employed in the Permanent Works shall be submitted to the Engineer for approval, before they are brought to the site.

Samples provided to the Engineer or his Representatives for their retention are to be in levelled boxes suitable for storage. Materials or workmanship not corresponding in character and quality with approved samples will be rejected by the Engineer or his Representative.

Samples required for approval and testing must be supplied in sufficient time to allow for testing and approval due allowance being made for the fact that if the first samples are rejected further samples may be required. Delay to the works arising from the late submission of samples will not be acceptable as a reason for delay in the completion of the works.

Materials shall be tested before leaving the manufacturer's premises, where possible. Materials shall also be tested at the site and they may be rejected if found not suitable or not in accordance with the specification notwithstanding the results of the tests at the manufacturer's works or elsewhere or of test certificates or of any approval given earlier

12.3. Despatch of Materials

Materials shall not be despatched from the Manufacturer's works or to the site without written authority from the Engineer or his Representatives.

12.4. Cost of Sampling and Testing

Sampling of materials for approval and testing as called for under the appropriate Indian Standard or other relevant Standard specification, and sampling and testing referred to in the preceding Sub-Clause and later in this specification, is to be done by the Contractor without charge to the Port and unless otherwise specified, the cost of all such

tests and sampling shall be deemed to be included in the rates and prices quoted in the bill of quantities.

12.5. Test Certificates

All manufacturer's certificates of test, proof sheets mill sheets etc., showing that the materials have been tested in accordance with the requirements of the appropriate Indian Standard, other relevant standard specification or this specification, are to be supplied free of charges on request to the Engineer or his Representatives.

12.6. Names of Manufacturers and Copies of Orders

Before ordering any materials of any description for the permanent works the Contractor shall submit for the approval of the Engineer, the names of the makers and suppliers proposed and any other detail required by the Engineer and shall afterwards send to the Engineer copies in quadruplicate, of the orders given by the Contractor for the materials.

12.7. Storage of Materials

All materials used in the Permanent Works shall be stored on racks, supports, in bins under cover etc., as appropriate to prevent deterioration or damage from any cause whatsoever to the entire satisfaction of the Engineer, or his Representatives and as amplified in the succeeding clauses.

12.8. Records and Usage of Materials

The Contractor shall maintain a detailed record of all materials received used and balance quantity on the site or in his stores or storage and working areas in the vicinity of the site and shall make such records available to the Engineer at such times as the later may reasonably require. Materials shall wherever possible and practicable be used in the order in which they arrive on the site and in the stores or storage and working areas in the vicinity of the site.

12.9. Notice for inspection of Materials

Where the Engineer or his Representative shall give notice to the Contractor that materials are to be inspected off the site, the Contractor shall, having regard to the location of the materials and the nature of the inspection, test or examination required, give to the Engineer or his Representative when such materials are ready for inspection, test or examination either during manufacture, fabrication etc., or on completion, such notice as the Engineer may reasonably require to enable the inspection, test or examination to be made.

Delay to the works arising from the later submission of such notice will not be acceptable as reason for delay in the completion of the works.

12.10. Removal of Improper Materials

The Engineer or his Representative shall during the progress of the works have powers to order in writing from time to time.

(a) The removal from the site within such time or times as may be specified in the order of any materials which in the opinion of the Engineer are not in accordance with the Contract.

(b) The substitution of proper and suitable materials.

13. CONCRETE AGGREGATE

13.1. Standards

Aggregate shall comply with the requirements of I.S.383 & 515 "Coarse and Fine Aggregate from Natural sources for concrete".

13.2. Quality

The aggregate shall be hard, strong, durable, clean and free from any adherent coatings or other deleterious matter and shall be obtained from an approved source. Aggregates which are chemically reactive with alkalies of cement shall not be used. Aggregates which are not perfectly clean shall be washed in clean fresh water to the satisfaction of the Engineer.

"The Contractor shall take away the rejected Materials and surplus materials (that are proclaimed to be his own) to the outside the Port premises between 8 AM and 6 PM on working days at site, after obtaining due permission of the Engineer's Representative in charge of work".

13.3. Testing

All aggregates shall be subject to inspection and testing sampling and Testing shall be carried out in accordance with I.S.2386 (Part I to Part VIII) "Methods of test for Aggregate for concrete".

13.4. Aggregates for Mass Concrete

Aggregate for mass concrete work shall be mechanically combined and shall be graded to the satisfaction of the Engineer.

13.5. Fine Aggregate for Structural Concrete

The grading of the fine aggregate for reinforced concrete shall be within the limits of grading zones I and II as defined in IS 383 "Coarse and Fine aggregate from Natural sources for concrete" Fine aggregate for use of concrete shall be washed, if ordered by the Engineer.

13.6. Fine Aggregates for Mortar and Grout

Fine aggregates for mortar and grout shall be obtained from an approved source. It shall comply with IS 383 and its grading shall be in accordance with grading zone III of Table III of IS 383.

13.7. Sand for Masonry Mortars

Sand specified for masonry mortars shall be natural sand, crushed stone sand or crushed gravel sand complying with IS 2116 "Sand for Masonry Mortars".

13.8. Sand for Plastering

Sand for use in mortars for internal wall and ceiling plastering and external plastering and renderings shall conform to class `A' grading of IS 1542 "Sand for Plaster"

13.9. Coarse Aggregate

Coarse aggregates for Reinforced concrete shall consist of hard broken granite stone metal free from flat laminated or elongated pieces and shall be within the limits of the relative grading in I.S. 383 Table II. Unless otherwise specified in the drawings, all coarse aggregates for reinforced concrete shall be graded aggregate of 20 mm nominal size.

13.10. Storage at Site

Aggregate shall be stored at the site on clean, well paved and drained areas which are not liable to flooding. The various sizes and types of aggregates shall be well separated and the layout and sitting of the storage areas shall be submitted to the Engineer for approval prior to start of construction.

13.11. Rejected Material

Any aggregate brought to the site which is not approved by the Engineer shall be immediately removed from the site.

14. CEMENT

14.1. Supply of Cement

The Contractor shall arrange for cement required for this work at his cost and quote the rates accordingly. Ordinary Portland Cement / PPC of the required grade viz. 43 or 53 grade conforming to I.S. Nos. 8112-1987, 12269-1987 and 1489 – 1991 respectively shall be procured by the Contractor at his cost. The Contractor shall produce to the Engineer a copy of the manufacturer's test certificate for each consignment of cement.

14.2. Tests

The Engineer may direct the Contractor to carry out such tests and analysis as he may consider necessary on each consignment of cement brought into the site. Cost of all such tests has to be borne by the Contractor. If such tests should lead to rejection of the consignment, cement from the rejected consignment shall not be used in the works and the Contractor shall forthwith remove the entire consignment from the site.

14.3. Stock of Cement

In order to ensure due progress, the Contractor shall at all time maintain on the site at least such a stock of cement as the Engineer may from time to time consider necessary. No cement shall be used upon the works until it has been accepted as satisfactory by the Engineer

14.4. Conditions for Cement

The Contractor shall procure OPC / PPC of 53 / 43 Grade, as required for the work, from reputed manufacturers of cement, such as ACC, Ultratech, India Cements, Madras Cements, Chettinad Cements, Birla Super and Cement Corporation of India, etc. or any other brand holding licence to use ISI certification mark for their product whose name shall be got approved from Engineer. Supply of cement shall bearing manufacturers name and ISI marking. Samples of cement arranged by the Contractor shall be taken by the Engineer's Representative and got tested in accordance with provisions of relevant BIS codes. In case test results indicate that the cement arranged by Contractor does not conform to the relevant BIS codes, the same shall stand rejected and shall be removed from the site by the Contractor at his own cost within a week's time of written order from the Engineer's Representative to do so. The cement shall be brought at Site in bulk supply.

If the supply of cement is in bags, the cement godown of the adequate capacity to store cement bags shall be constructed by the Contractor at Site of work for which no extra payment shall be made. Proper lock provision shall be made to the door of the cement godown. The Contractor shall be responsible for the Watch and Ward and safety of the cement godown. The Contractor shall facilitate the inspection of the cement godown by the Engineer's Representative at any time.

The Contractor shall supply free of charge the cement required for testing. The cost of tests shall be borne by the Contractor.

The actual receipt and consumption of cement on work shall be regulated and proper accounts maintained. The theoretical consumption of cement shall be worked out on the standard formula as laid down by the Engineer. Over this theoretical quantity shall be allowed a variation of minus 2%. In the event of it being discovered that the quantity of cement used is less than the quantity ascertained as hereinbefore provided (allowing variation on the minus side as stipulated above) the cost of quantity of cement not so used shall be recovered from the Contractor at the local market rate prevailed during that time.

Cement brought to site and cement remaining unused after completion of work shall not be removed from the site with written permission of the Engineer-in-charge.

Copy of manufacturer's test certificate confirms to BIS Codes for the particular consignment and invoice and bills shall be submitted by the Contractor for the supply of cement.

14.5. Storage of Cement

If the supply of the Cement in bags shall be unloaded under cover and stored (in accordance with the relevant BIS provision) in perfectly watertight and well ventilated building having a floor raised not less than 30 cm. from the ground. An air space shall be left between the floor and bottom layers of the bags. Each consignment shall be stacked separately therein to permit easy access for inspection and a record shall be kept so that each consignment may be identified by a serial number and date of delivery. The store building shall be erected by the Contractor at his own cost near the site of work in such a manner that it is protected from all external agents which may damage it. The Contractor is fully responsible for the proper storage watch of materials.

14.6. Shuttering

All materials for shuttering shall be provided by the Contractor at his cost. The Contractor shall be entirely responsible for the sufficiency of the shuttering and for the safe removal of same. Before commencing the work he shall submit for the approval of the Engineer details of the shuttering he proposes to use, but such approval shall in no way relieve him of any of his responsibility for the sufficiency and efficiency of the shuttering.

15. ADMIXTURES FOR CONCRETE

Admixtures to the cement shall be used only written approval of the Engineer. When permitted the Contractor shall furnish full details from the manufacturer and shall carryout such test as the Engineer may require before any admixture is used in the work.

16. SUPPLY OF STEEL

16.1. Procurement of Steel

The steel required for the work will not be supplied by the Port. The Contractor shall arrange to procure the steel for this work at his cost.

16.2. Steel Reinforcement

Steel reinforcing TMT bars for concrete shall be Fe500 of Grade I quality complying to relevant IS code "Mild Steel and Medium Tensile Steel Bars and Hard Drawn Steel Wire for Concrete Reinforcement" or high yield strength deformed round bars conforming to BIS 1786 "Specification for Cold Twisted Steel Bars for Concrete Reinforcement". Steel reinforcements of TMT bars as per IS 1786 may be used for works in lieu of CTD bars as per BIS 1786.

The Contractor shall procure steel reinforcement bars conforming to relevant BIS codes from main producers or authorized dealers such as TISCO, SAIL, RINL,Vizag Steel, JSW or any other brand containing IS / BIS codes and as approved by Engineer. The Contractor shall have to obtain and furnish test certificates to the Engineer in respect of all supplies of steel brought by him to the site of work. Samples shall also be taken and got tested by the Government Laboratory as per the provisions in this regard in relevant BIS codes. In case the test results indicate that the steel arranged by the Contractor does not confirm to BIS codes the same shall stand rejected and shall be removed from the site of work by the Contractor at his cost within a week's time from written orders from the Engineer to do so.

The steel reinforcement shall be stored by the Contractor at site of work in such a way as to prevent distortion and corrosion and nothing extra shall be paid on this account. Bars of different sizes and lengths shall be stored separately to facilitate easy counting and checking.

16.3. For checking nominal mass tensile strength, bend test, re-bend test etc., specimen of sufficient length shall be cut from each size of the bar of random at frequency not less than that specified below:

Size of Bar	*Frequency*
Under 10 mm dia.	One sample for each 40 tonnes or part thereof
10 mm to 16 mm dia.	One sample for each 100 tonnes or part thereof
Over 16 mm dia.	One sample for each 100 tonnes or part thereof

16.4. The Contractor shall supply free of charge the steel required for testing and cost of tests shall be borne by the Contractor.

16.5. The actual receipt and consumption of steel on work shall be regulated and proper accounts maintained. The theoretical calculation of steel shall be worked out as per procedure prescribed below:

Theoretical quantity of steel shall be taken as the quantity required or as authorized by the Engineer in charge including authorized Lappages. The quantity of steel exceeding this theoretical requirement including the permissible variation will be borne by the Contractor and no additional payment will be made for this.

16.6 Storage

Structural steel shall be kept in a clean condition until it is required to be used.

17. PAINT

17.1. General

All paints shall be of a quality approved by the Engineer and shall be obtained from only authorized suppliers/ directly from manufacturers as approved by Engineer.

17.2. General

All materials not herein fully specified and which may be offered for use in the works shall be subject to the approval of the Engineer, without which they shall not be used anywhere in the permanent works.

18. CONCRETE

18.1. Qualified Personnel - Voids

18.2. Strength of Concrete

a) Controlled / Design Mix

The grading and quality of aggregates shall be such that it shall give a minimum compressive strength on works tests for different mixes as given below, adopting I.S. 456-1978, I.S.10262-1982 and S.P.23 - Hand Book On Concrete Mixers by B.I.S. and also taking into consideration the water-cement ratio of prescribed I.S.4651 for Ports and Harbour structures. Wherever design mix not specified in the approved construction drawing volumetric mix shall be adopted.

Sl.	Component of work	Grade Designation	Characteristics compressive strength of 150mm cube @ 28 days cube strength (N/mm¨)	Minimum weight of cement per Cum. of concrete (Kg.)
1.	Road (cement concrete pavement)	M 40	40	400

18.3. Type of Concrete

M40 Grade of concrete shall be used and the relevant Design Mix shall be submitted by the contractor to the employer.

18.4. Proportion of Aggregate for Volumetric Mix

For volumetric concrete works as per mix design relavent IS standards.

18.5. Trial mixes and Preliminary Tests

The Contractor shall prepare trial mixes using the same type of plant and equipment as will be used for the Works. Trial mixes shall be made for concreting Grade of M30. From each trial mix 15 cm. concrete test cubes shall be made in sets of nine, three for test at 7 days and six for test at 28 days.

The preliminary cubes shall be made, cured and tested in accordance with IS 516. They shall be tested by the Contractor in a nominated laboratory or field laboratory and certified copies of the results of all tests shall be submitted to the Engineer. Preparation and testing shall be carried out in the presence of the Engineer if he so desires.

The appropriate strength requirements shall be satisfied if the average of the 28 day strengths of the six preliminary test cubes is at least 6 N/mm¨ above the specified characteristic strength and no cube fails to reach the characteristic strength. The difference between the maximum and the minimum strength shall be not more than 20% of the said average.

A trial mix shall be acceptable with respect to strength when three sets of six preliminary test cubes (tested at 28 days) made from consecutive trial batches of a particular concrete satisfy the requirements described above.

Using the same trial mix as that from which the preliminary test cubes are made, the consistency of the concrete shall be determined by the compacting factor test in accordance with IS 1199 or other method approved by the Engineer.

The remainder of the trial mix shall be cast in a mould and compacted. After 24 hours the sides of the mould shall be struck and the surface examined in order to determine whether or not, in the opinion of the Engineer, an acceptable surface can be obtained using the mix.

When all tests mentioned above for strength, consistency and surface finish are satisfactory, the mix will be approved by the Engineer.

When a proposed mix has been approved, no variation shall be made in the mix proportions, or in the type, grading zone or source of any of the constituents without the consent of the Engineer. However, the minimum quantity of cement as prescribed in Cl. 21.2 above, shall be used in the concrete mix irrespective of cement quantity of design mix.

18.6. Water and Slump Tests

The moisture content of the aggregate shall be determined before concreting begins, for the purpose of assessing the amount of free water to be added at the mixer, and the Contractor shall provide himself with a chart, a copy of which shall be given to the Engineer's Representative for approval, relating moisture content in aggregate to water to be added at the mixer for all classes of concrete in use.

The amount of water introduced into the mix shall be strictly controlled and shall be the minimum amount consistent with achieving satisfactory workability and compaction.

Frequent slump test shall be carried out in accordance with IS 1199 on samples of concrete taken immediately before placing to determine the consistency of concrete. The slumps of the trial mixes shall be recorded for identification purposes and for subsequent use as a routine check on workability. However, slump shall not be used as an official measure of the workability of any concrete.

18.7. Weigh Batching and Mixing

The Contractor's arrangements for handling, batching, transporting and mixing of materials for concrete, together with all control procedures, shall receive approval in principle from the Engineer before any concreting work commences on site.

Before the commencement of concreting operations for any particular section of the works, the Contractor shall satisfy the Engineer that sufficient plant like Transit mixture, concrete pump, vibrator etcis in working order, including adequate stand-by equipment, in order to ensure the proper mixing, production of concrete, transporting and placing in the quantity required to complete the section of the works.

The capacity and location of the main batching and mixing plant(s) shall be such as to ensure a production rate sufficient for all the construction needs throughout the Contract

Materials for all concrete classes shall be proportioned by weight in an approved weight-batcher and shall be thoroughly mixed in a batch mixer of an approved size and type so as to ensure a uniform distribution of the materials throughout the concrete.

18.8. Batching

Before commencement of work all weighing/measuring mechanism / Calibration shall be checked from the reputed lab and got approved from departmental officers.

Materials shall be weighed to an accuracy of +/- 2% apart from water which shall be weighed to an accuracy of +/- 1%.

The weighing mechanism shall be checked and adjusted monthly and the Contractor shall provide simple and convenient means for this. He shall supply to the Engineer on request, records of all checks tests to be made to the plant. The Engineer may, at any time, call for a check to be made.

The device for measuring water shall show accurately the quantity added and be so designed that the water supply will be automatically cut off while water is being discharged into the mix. Water shall not be added to the mixer until just prior to the time when the concrete is to be mixed.

Due allowance shall be made for the moisture content of the aggregates and the Contractor shall make readily available to the Engineer assistance and equipment as required to carry out moisture tests.

18.9. Mixing

If cement is delivered in individual bags or containers, the sizes of batches shall be such that only full bags or containers of cement area used.

The type of the mixer must be in accordance with the maximum nominal size of the aggregate. The materials shall be mixed for a period and at a drum speed specified by the manufacturer of the mixer.

Mechanical means shall be provided for recording the number of revolutions for each batch and automatically preventing the discharge of the mixer until the materials have been mixed the specified minimum time.

The maximum size of the batch shall not exceed the maximum rated capacity of the mixer as stated by the manufacturer and as stamped on the mixer. The batch size shall not be less than 75% of the rated capacity of the mixer.

Where small quantities of high class concrete or mortar or cement grout are required to be used for jointing and grouting of precast units, etc., the Contractor shall, if ordered by the Engineer, provide small portable covered pan mixers of approved type for this type of work.

The entire contents of the mixer shall be removed from the drum before materials for a succeeding batch are placed in it.

The first batch of concrete materials placed in the mixer shall contain a sufficient excess of cement, sand and water to coat the inside of the drum without reducing the required mortar content of the mix. Upon cessation of mixing for more than 20 minutes, the mixer shall be thoroughly cleaned and the process repeated.

The Engineer in charge may, at his discretion, forbid the mixing of any concrete if he considers the ambient temperature too high. The Contractor may also be required by the Engineer to carry out frequent cleaning of equipment to remove deposits of hardened or dried concrete which accrete rapidly at high air temperatures.

The Contractor shall make allowance for all contingencies which he may consider necessary for ensuring the production of concrete complying fully with this specification under any climatic conditions at any time during the Contract and to the entire satisfaction of the Engineer. Mixing by hand will not be permitted.

18.10. Inspection and Testing

As the work progresses inspection of cement, aggregate, reinforcing steel and testing of the concrete strength will be done by the Engineer or Engineers Representative. The Contractor's concrete plant and material stores shall be made accessible to the Engineer at all times for inspection and taking samples. The Contractor shall facilitate in all

possible ways the inspection and testing or sampling by the Engineer. Labour shall be provided by the Contractor for testing.

18.11. Test Cubes

Test cubes shall be made in accordance with IS 516 except that all test cubes unless otherwise ordered by the Engineer shall be compacted by vibration. The Contractor shall provide suitable portable vibration tables for compaction of cubes. Test cubes shall be cured and stored as provided in IS: 516. "Methods of Tests for strength of concrete". Test cubes used for checking early strength of precast units shall be stored under the same conditions and in contact with the units to which they relate.

18.12. Works Tests

Not less than six test cubes shall be taken at each "section" of the work and/or each day's work on each class of concrete. For the purposes of this specification "Section" of the work shall be as defined by the Engineer or Engineer's Representative.

18.13. Concrete Testing

All sampling and testing of concrete shall be carried out in accordance with IS **:** 1199 "Method of sampling and analysis of Concrete" unless otherwise specifically provided in the specification.

18.14. Testing

Testing of concrete shall be done in accordance with the relevant I.S. Codes.

18.15. Cost

The cost and charges for sampling and making concrete cubes and delivering the same to the office of the Engineer's Representative and/or other places including all incidentals in connection with the same as directed by the Engineer's Representative, shall be borne by the Contractor and shall be deemed to be included in the rates and prices quoted in the bill of quantities.

18.16 Testing Laboratory

The contractor has to establish laboratory at site for regular testing’s like cube compressive strength testing, sieve analysis, silt content and weighing machine etc with approved calibrated certificate. The testing of concrete cubes shall be done in the contractor laboratory in presence of department representatives. If it is not possible to conduct testing due to machine repair or any other reasons, the Contractor has to make

their own arrangements for testing concrete cubes at any Authorized Laboratory approved by the Engineer at his cost. The Contractor has to supply concrete, labour for collecting the concrete for cubes and making the cubes.

18.17. Measurement of Ingredients

The proportioning of ingredients and concrete for batch of concrete shall be performed by volume. Water shall be added to the required quantity determined for each class of concrete. Due allowance shall be made for the weight of water carried by the aggregates, the actual amount added at the mixer being reduced as necessary. For this purpose the moisture content of coarse and fine aggregate shall be ascertained daily and at any other times when alteration of the moisture content may be expected due to new deliveries of aggregates inclement weather or any other reasons.

18.18. Mixing

Concrete shall be thoroughly mixed to uniform consistency in approved type span or drum mixer. The use of continuous mixer will not be allowed. If the Contractor should find it expedient to use small type mixers for special or outlying portions of the work rather than to supply from the main batching plant or plants, he may, subject to the approval of the Engineer, use smaller approved concrete producing units of the weigh batch type. In such cases, the mix shall be adjusted to whole bags of cement and no splitting of bags will be allowed.

18.19. Discharge from Mixer

The concrete shall be discharged from the mixer on to a level, clean, watertight platform or floor or into watertight containers. The area surrounding the mixer shall be paved and kept clean.

18.20. Transporting of Concrete

The concrete shall be transported from the mixer to its place in the works as rapidly as possible and in such a manner that there shall be no separation or loss of its ingredients. In no circumstances shall more than half an hour lapse between the time water is added to the mix and the time when the concrete is finally compacted in position. No concrete shall be permitted to be used, in the works after initial set has taken place. The use of concrete distributing chutes at an angle of more than 45 degrees from the horizontal will not be permitted without the sanction of the Engineer. Transit mixers or concrete pumps shall be used wherever the distance of transportation is likely to cause settlement of concrete during transportation.

18.21. Authorization to Pour

Authorization to pour concrete shall be obtained from the Engineer or Engineer's Representative before pouring the concrete.

18.22. Depositing of Concrete

The arrangements for depositing concrete shall be subject to the approval of the Engineer. In no case shall the concrete be dropped or thrown from a height of more than 2 meters. Concreting of beams, slabs and similar members shall be carried out in one continuous operation to the full depth of the members and the sequence of placing shall be so arranged as to avoid disturbance of partially set concrete.

Freshly laid concrete shall not be wheeled over or otherwise disturbed. When depositing concrete adjacent to a construction joint special care shall be taken not to disturb the dowels or other reinforcing bars projecting from the existing concrete.

In foundations, walls, and columns where the full height is not being poured in one continuous operation the surface of each lift shall be finished horizontal and any laitance removed between the period of initial and final set.

18.23. Compaction of Concrete

The Contractor shall agitate the placed concrete thoroughly into place by means of sufficient number of approved mechanical vibrators of adequate power and having a frequency of not less than 6000 impulses per minute. The vibrator shall be allowed to sink freely of its own weight until enters the previous lift. It shall be withdrawn immediately at the same rate and used at a new location. Concrete once vibrated shall not be vibrated again. The Contractor shall ensure that the concrete is thoroughly worked around the reinforcement and against external shutters so that all entrained air is expelled and the concrete surface when exposed is found good and free from air pockets, honey-combing or other defects

18.24. Concreting in Inclement Weather

In the event of rain storm or any other severe conditions arising, concreting shall be stopped and appropriate temporary stop ends, vee grooves, etc., placed as may be necessary. During wet weather the concrete shall be adequately protected as soon as put into position. The Contractor shall always have in readiness approved framed sheeting, tarpaulins, etc., for the protection of newly placed concrete during inclement weather. Should any concrete be damaged due to rain storms or other weather

conditions, the Engineer may order the cutting out and replacement of the damaged concrete, all at the expenses of the Contractor.

18.25. Concrete Underwater

Where the concrete is to be deposited underwater greatest care shall be taken to prevent the cement being washed out. The concrete may be placed underwater through a tremie pipe provided with suitable hopper. Great care shall be taken that no segregation of the concrete takes place and the method of placing shall be approved by the Engineer who may direct which method is to be used. For underwater concreting the provision in IS code 456 : 2000 (Amendment no.4) shall apply.

18.26. Stop Ends

The position of temporary stop ends for vertical joints shall be as approved by the Engineer.

18.27. Construction Joints

Construction joints shall be in the position shown on the drawings or as approved by the Engineer.

The Contractor shall, wherever practicable, strip shutters as soon as possible after pouring, subject to the approval of the Engineer. Any skin or laitance should be removed and the tops of the large stones exposed by means of brushing and washing.

At horizontal construction joints, removal of laitance and exposure of the tops of the larger stones shall be accomplished, whenever practicable, by means of washing and brushing spotly after pouring, care being taken to obviate undue erosion of the mortar. After cleaning, excess water shall be removed immediately to limit absorption by the cement. In cases where the concrete has set but not set hard the removal of laitance and roughening shall be accomplished by wire brushing and washing, great care being taken not to damage the underlying mass.

Where, at either vertical or horizontal, joints, the concrete has set hard, any skin or laitance shall be removed and the surface roughened by hammering with an approved power operated "bush" hammer followed by wire brushing to remove all loose particles. When using this procedure, great care shall be taken to avoid breaking off the joint face and stunning the stones.

Whichever of the above treatments has been given to the exposed surface, foreign matter shall be cleaned off that surface by further wire brushing, if necessary before depositing fresh concrete. It shall then be thoroughly washed with clean fresh water and surplus blown off. The surface while still moist shall be covered evenly with a layer not less than 4 mm. thick of 1:1 cement mortar of medium consistency, which must be vigorously stippled into the surface by means of a suitable stiff brush the depositing of the fresh concrete following on closely.

It is of the utmost importance that the fresh concrete shall be forced hard on to the mortar layer and the set faces. To this end the compacting tools and vibrators, where appropriate, shall be worked right upto the old faces and into angles and corners formed between them and the shutters and the damping effect on vibration in such positions shall be allowed for.

18.28. Curing

All concrete shall be protected during hardening from the harmful effects of sunshine, moisture and drying winds. All exposed faces of concrete shall be kept continuously moist for a period of 21 days.

In the case of slabs or other pours of large surface area, timber frames, designed to the approval of the Engineer, and covered with two thickness of damp Hessian, shall be placed over the concrete immediately after pouring. When the concrete has set, the frames shall be removed and the covering laid directly on the concrete. For 21 days thereafter concrete shall be kept continuously damp by spraying the cover with clean fresh potable water or by covering it with not less than 25 mm. thickness of wet sand and kept continuously damp or by ponding where practicable.

18.29. Screening

All the surfaces of slab or other members not required to be shuttered are to be screeded in an approved manner and within a tolerance of plus or minus 3 mm. of true level and grade. In making such finish care shall be exercised not to work in excess fines to the top. Care is to be taken to ensure that the concrete is properly closed and for this purpose vibrator screed boards or plates will normally be required.

18.30. Concrete Below Specified Crushing Strength

Should the test cubes fail to meet the minimum specified crushing strength for each class of concrete, the Engineer may take one of the following decision.

a) Instruct the Contractor to carry out such additional tests and/or works to ensure the soundness of the structure at the Contractor's expenses.

b) The Engineer may accept the work. Any decision to accept the work shall be entirely at the discretion of the Engineer who may make a reduction in the rate of the appropriate item.

c) Reject the work and instruct the section of the works to which the failed cubes relate shall be cut out and replaced at the Contractor's expense.

18.31. Faulty Work

Concrete defective from any cause whatsoever shall, if so directed by the Engineer be cut out and the work reconstructed at the Contractor's cost. Concrete thus cut out shall not be used again. No reconstruction or repairs to faulty work shall be done without the permission of the Engineer, and in such a manner as he shall direct or approve.

19. SHUTTERING

19.1. General

All shuttering and supports included under the Contract shall be designed by the Contractor and relevant drawings together with calculation for strength and deflection shall be submitted to the Engineer for approval before commencement of the work, but such approval shall in no way relieve the Contractor of any of his responsibilities for sufficiency and efficiency of the shuttering.

19.2. Fixing

The Contractor shall fix all the form work in perfect alignment. The form work shall be securely braced so as to be able to withstand, without displacement / deflection or movement of any kind, weight of the construction or any movement of persons, material and plant. All the joints should be watertight to prevent leakage of cement slurry from the concrete. Wedges and clamps are to be used wherever practicable.

19.3. Removing

Forms or shutters shall not be disturbed until the concrete has sufficiently hardened. he proper time should be as per IS: 456 and as determined by the Engineer.

19.4. Special Provisions

Wherever the concreting of narrow members is required to be carried out within shutters of considerable depth, temporary openings in the sides of the shutters shall, if so directed by the Engineer, be provided to facilitate the pouring and compaction of the concrete. Small temporary openings shall be provided as necessary at the bottom of shutters of columns, walls and deep beams to permit the expulsion of rubbish, etc. All arises and returns to beam columns and slabs shall unless otherwise shown on the drawings, be provided with chambers of 20 x 20 mm. or as directed by the Engineer.

19.5. Preparation for Concreting

Before any concreting is commenced shutters and centering shall be carefully examined and the space to be occupied by the pour thoroughly cleaned out. The inside of the shutters shall be treated with a coating of an approved substance to obviate adhesion and where necessary to prevent absorption from the concrete, the shutters shall be thoroughly wetted shortly before concreting is commenced.]

19.6. Contractor's Responsibility

Any damage resulting from premature/removal of shutters or from any other cause shall be made good by the Contractor at his own expense.

20. REINFORCEMENT

20.1. General

The following clauses shall be read in conjunction with the section relating to concrete.

20.2. Storage

The reinforcing bars shall be stored on the site on timber or concrete supports suitably spaced and of sufficient height to keep the steel clear off the ground and should be covered with polythene / tarpaulin sheets.

20.3. Bar Bending Schedule

Bar Bending schedule will be prepared by the Contractor and shall be submitted to the Engineer, in triplicate, for approval at least two weeks before bars are to be bent. The Engineer will check and return one copy for the Contractor's use, with amendments noted, if any. Any approval given by the Engineer shall, in no case, relieve the Contractor from being responsible for the accuracy and correctness of the bar bending schedule

20.4. Bending Reinforcement

Bends, cranks or other labours on reinforcement shall be carefully formed in exact accordance with the drawings or bar bending schedule, otherwise all bars shall be truly straight. Bends shall be made cold, round a former having a diameter of four times the diameter of the bars. Stirrups and binders shall be bent to the radius of the bars against which they are to be in contact. Bending shall be in accordance with IS: 2502 "Code of practice for Bending and fixing of bars for concrete reinforcement". Heating of the bars will not be allowed. Bars incorrectly bends shall be used only if means for straightening and re-bending have been approved by the Engineer. No reinforcement bar shall be bent when in position without the Engineer's approval, whether or not it is partly embedded in the hard concrete.

20.5. Binding Wire

All bars shall be bound tightly, together where they cross with 16 gauge annealed G.I. Wire/welding as per standard specification. The free ends of the binding wire shall be bent in-wards.

20.6. Placing and fixing

The number, size and form of all reinforcement shall be in exact accordance with the Drawings. The reinforcement shall be placed, fixed and maintained in the forms within a tolerance of 5 mm. during the placing and compaction of the concrete. Horizontal bars shall be suspended or supported with concrete blocks to prevent them from sagging.

Such spacer blocks shall have dimensions not exceeding 50 mm. and shall be precast from concrete of the same grade as the concrete in which they are to be embedded except that the largest size of aggregate shall be 10 mm. Each block shall be cured for 10 days or more. Each block shall be secured to the reinforcement with wire or spring clip embedded on the centre of the block so that it shall not be in contact with the shuttering or subsequently cause much marks on the concrete. Where necessary, spacer bars, supporting stools and distance pieces shall be supplied and fixed by the Contractor to maintain the reinforcement rigidly in the correct position and to the satisfaction of the Engineer. Any ties or stirrups connecting the bars shall be taut so that the bars are properly braced, inside of their curved parts in actual contact with the bars round which they are intended to fit. The cost of providing tying wire as well as stools and concrete spacer blocks shall be deemed to be covered in the reinforcement steel.

20.7. Splicing Reinforcement

Where splicing and / or overlapping in reinforcement are required, the bars shall be provided with such splices or overlaps as are shown on the drawings and / or as directed by the Engineer

20.8. Butt Welding of Reinforcement

Butt welding of reinforcing bars steel shall be used wherever required. Where butt welding is carried out the ends of the bars shall be prepared with single 450 V and a backing plate shall be used. The minimum rect face will be one quarter of the bar diameter.

20.9. Reinforcement to be Clean

All steel reinforcement before the concrete is deposited shall be clean, free from dust, loose scales, oil, rust, grease or any other deleterious material. Particular care shall be taken to avoid contamination of reinforcement with mould oil.

20.10. Depositing Concrete

No concrete shall be deposited until all concrete and reinforcement have been inspected and approved by the Engineer. There shall be in attendance on each concreting gang and competent steel fixer who shall ensure that the reinforcement and other embedded fittings are kept in position during placing and compaction of the concrete.

20.11. Admixtures For Concrete

Admixtures to the cement shall not be used without the written approval of the Engineer. When permitted the Contractor shall furnish full details from the manufacturer and shall carryout such test as the Engineer may require before any admixture is used in the work.

21. CONDITIONS FOR BITUMEN:

(i) The bitumen will not be supplied by the Port. The Contractor have to arrange bitumen of grade 60 / 70 (Bulk) or as decided by the Engineer-in-charge required for the work at his cost and quote the rate accordingly. The Contractor shall obtain the bitumen from the approved manufacturers / dealers such as CPCL, IOCL, BPCL and HPCL and deliver to the site. Bitumen brought in damaged conditions shall not be accepted. The Engineer-in-charge will call upon the Contractor to produce invoices and bills for each consignment etc., so as to satisfy himself that the bitumen supplied by the Contractor confirm to relevant BIS Codes.

(ii) If any bitumen remains unused on completion of the work on account of lesser use of materials in actual execution of reasons other than authorized changes or specifications and abandonment of portion of work a corresponding deduction equivalent to the cost of unused materials as determined by the Engineer incharge shall be made from the bill.

22. WORKMANSHIP

22.1 GENERAL

22.1.1 A high standard of workmanship in all trades will be required. The Contractor shall ensure that only skilled and experienced tradesmen are employed.

Indian Standards where mentioned in this Specification shall be the latest editions including amendments, if any, issued by Indian Standards Institution, one month prior to the date of receipt of the Tenders.

22.1.2 The contractor shall be responsible for supply, use and maintenance of all construction plant and equipment and he shall ensure that it is suitable for the work and is maintained in such a manner as to ensure safe and efficient working. The Engineer may direct that plant which is not efficient and is prejudicial to the quality of the work be removed from the site and replaced by plant to his satisfaction.

22.1.3 The Contractor shall be responsible for all sub-contractors and he shall ensure their labour and plant is in keeping with the high standards required.

22.1.4 The Contractor's supervisory staff shall be fully experienced in the types of work being carried out under their supervision and capable of ensuring that it is done well and efficiently.

22.1.5 Where required, the Contractor shall furnish such details of his Temporary Works as may be called for by the Engineer and the Contractor shall satisfy the Engineer as to their safety and efficiency. The Engineer may direct that Temporary Works which he considers unsafe or inefficient shall be removed and replaced in a satisfactory manner.

22.1.6 Default of Contractor in Compliance

The Engineer shall have powers to order in writing for the removal of and proper re-execution of any work which in respect of workmanship or materials is not in the opinion of the Engineer in accordance with the Contract. In the case of default on the part of the Contractor in carrying out such order Engineer shall be entitled to employ and pay other persons to carry out the same and all expenses consequent thereon or incidental thereto shall be borne by the Contractor and shall be recoverable from him by the Engineer or may be deducted by the Engineer from any money due or which may become due to the Contractor.

22.2 SITE PREPARATION

22.2.1 The Contractor shall furnish all necessary supervision, labour, materials, equipment and tools for site preparation, clearing and all other works.

22.2.2 The areas required to be cleared shall consist of the work site as directed by the Engineer.

22.3 SUB-SOIL CONDITIONS:

If the results of sub-soil investigations carried out in the past in the vicinity of the proposed site are available with VOCPT will provide for reference.

22.4 EQUIPMENTS:

Dozers, vibratory rollers, dumpers, trucks etc. may be used for carrying out filling work. Three wheel 8 MT / 10 MT Power roller, vibratory roller or sheep foot roller giving a pressure required to obtain the specified density may be used for compaction. Water tankers may be used for watering.

22.5 EXCAVATION:

All excavations (in all sorts of soil, murram, Metal & Rubbles etc.) shall be carried out in conformity with the directions laid here under and in a manner approved by the Employer. The work shall be so done that the suitable materials available from excavation are satisfactorily utilized as decided upon beforehand.

While planning for excavation, the contractor shall take adequate precautions causing no damages of existing various cables or pipelines etc. The damages shall be made good at contractor's risk and cost.

The excavations shall conform to the lines, grades slopes and levels shown on the drawing or directed by the Engineer. The contractor shall not excavate outside the scope or below the limits of excavation. Subject to the permitted tolerances, any excess depth excavated below the specified levels shall be made good at the cost of the contractor with suitable material of similar characteristics to that removed and compacted as given here under.

All debris and loose material on the slopes of cuttings shall be removed. Necessary back-filling shall be allowed by the side of drains. Surplus excavated material shall be shifted to the designed dumping yard & necessary compaction etc. as per the directions of Engineering.

23. SCHEDULE -A

DETAILS OF PLANT AND EQUIPMENT

The Tenderer shall furnish in the format given below complete list of main plant and equipment available with the tenderer specification and year of manufacture and indication of which plant/ equipment is owned by him.

Description of Plant & equipment	Year of manufacture	Specification	Whether owned or hired	Period of retention in case of hiring

Only a format in which the information is to be given is indicated above. The contractor shall attach additional sheets of bigger sizes to accommodate the necessary information, if required.

24. SCHEDULE - B

The contractor shall submit the following along with the Tender in sufficient details to enable evaluation of their grasp of the work and ability to execute it within the Time of Completion.

i) Construction Schedule:

This shall consist of a CPM/Bar chart showing details of completion of various sections of work and the order in which the Contractor proposes to carry out different parts of the works. In preparation of the programme, appropriate allowance should be made for loss of time due to inclement weather. This construction schedule shall form the basis for preparation of detailed CPM schedule to be furnished after the award of the contract.

ii) Employment Schedule:

This shall consist of a chart showing deployment of manpower (including skilled and unskilled labour of various categories) commensurate with the Construction Schedule.

iii) Equipment Use Schedule:

This shall consist of a chart showing deployment of equipment (under various categories) commensurate with the Construction Schedule.

25. SCHEDULE – C

DETAILS OF SIMILAR WORK DONE RELEVANT TO THE QUALIFYING CRITERIA

Sl. No	Client with address	Description of the work	Value of contract (Rs.)	Executed value of Contract	Completion time as stated in the tender (months)	Actual completion of time (week)	Year of comple-tion	Remarks

Note : Copy of certificate from the Employer showing the above details shall be attached in respect of each work.

26. SCHEDULE – D

Sl. No	Client with address	Description of the work	Value of contract (Rs.)	Completion time as stated in the contract	% completion	Year of completion	Remarks
A	Current works in hand						
B	Immediate commitments						

Note: Copy of certificate from the Employer showing the above details shall be attached in respect of each work.

27. SCHEDULE - E

EXPERIENCE OF KEY PERSONNEL

The Tenderer shall furnish in the format given below details of the qualifications and experience of key technical personnel proposed for the Contract. Resumes of the key personnel shall be enclosed separately.

On site : Minimum Two Graduate Engineer with not less than 10 years experience in this nature of work

Name	**Professional Qualification**	**Age**	**Present Position with contractor**	**Experience**
1) On site				
2) Off site				

Off site : Minimum Two Graduate Engineers & Two Diploma Engineers with not less than 10 years experience in this nature of work

Only a format in which the information is to be given is indicated above. The contractor shall attach additional sheets of bigger sizes to accommodate the necessary information, if required.

28. SCHEDULE – F

FINANCIAL TURNOVER

The Tenderer shall furnish in the format given below details of its financial turnover during the last three years with authenticated supporting documents.

Year	Financial Turn over in Rs.
2020-21	
2021-22	
2022-23	

29. SPECIMEN FORM OF BANK GUARANTEE FOR PERFORMANCE SECURITY

1. In consideration of the Chairman representing the Board of Trustees of V.O.Chidambaranar Port (hereinafter called "the Port") having agreed to exempt ..... (hereinafter called "the said Contractor(s)" from the demand, under the terms and conditions of Contract awarded in No. .....dated.....made between.....and ..... for ..... (hereinafter called "the said Agreement") of Performance Security for the due fulfillment by the said Contractor (s) of the terms and conditions contained in the said Agreement, on production of Bank Guarantee for Rs.....(Rupees .... only).
2. We,*.....(hereinafter referred to as "the Bank") at the request of ..... (Contractor(s) do hereby undertake to pay to the Port an amount not exceeding Rs..... against any loss or damage caused to or suffered or would be caused to or suffered by the Port by reason of any breach by the said Contractor (s) of any of the terms and conditions contained in the said Agreement.
3. We,* ..... do hereby undertake to pay the amounts due and payable under this guarantee without any demur, merely on a demand from the Port stating that the amount claimed is due by way of loss or damage caused to or would be caused to or suffered by the Port by reason of breach by the said Contractor(s) of any of the terms and conditions contained in the said Agreement or by reason of the Contractor(s)' failure to perform the said Agreement. Any such demand made on the bank shall be conclusive as regards the amount due and payable by the bank under this guarantee. However, our liability under this Guarantee shall be restricted to an amount not exceeding Rs.....
4. We undertake to pay to the Port any money so demanded not withstanding any dispute or disputes raised by the Contractor(s) in any suit or preceding before any court or Tribunal relating thereto our liability under this present being absolute and unequivocal.
5. The payment so made by us under this bond shall be a valid discharge of our liability for payment there under and the Contractor(s) shall have no claim against us for making such payment.
6. We,* ..... further agree that the guarantee herein contained shall remain in full force and effect during the period that would be taken for the performance of the said Agreement and that it shall continue to be enforceable till all the dues of the Port under or by virtue of the said Agreement have been fully paid and its claims satisfied or discharged or till the Engineering Department, V.O.Chidambaranar Port Authority certifies that the terms and conditions of the said Agreement have been fully and

properly carried out by the said Contractor(s) and accordingly discharges this guarantee. Unless a demand or claim under this guarantee is made on us in writing within three months from the date of expiry of bank guarantee **..... we shall be discharged from all liability under this guarantee thereafter provided further that the Bank shall at the request of the Port but at the cost of the contractors renew or extend this guarantee for such further period or periods as the Port may require.

7. We,* ..... further agree with the Port, that the Port shall have the fullest liberty without our consent and without affecting in any manner our obligations here under to vary any of the terms and conditions of the said Agreement or to extend time of performance by the said Contractor(s) from time to time or to postpone for any time or from time to time any of the powers exercisable by the Port against the said Contractor(s) and to for bear or enforce any of the terms and conditions relating to the said Agreement and we shall not be relieved from our liability by reason of any such variation or extension being granted to the said Contractor(s) or for any forbearance, act or omission on the part of the Port, or any indulgence by the Port to the said Contractor(s) or by any such matter or thing whatsoever which under the law relating to sureties would, but for this provision, have effect of so relieving us.

8. This guarantee will not be discharged due to the change in the constitution of the Bank or the Contractor(s).

9. We,*..... lastly undertake not to revoke this guarantee during its currency except with the previous consent of the Port in writing.

10. This guarantee is valid upto .....(period)

Dated the..... day of..... 2021.

for*

* Indicate here the Name of the Bank

** Indicate here the period or

* * * *

30. FORM OF AGREEMENT

THIS AGREEMENT made this ..... day of ..... (Two Thousand ……) between the Board of Trustees of the V.O.Chidambaranar Port Authority, a body corporate under Major Port Trust Act, 1963 (hereinafter called the 'Board' which expression shall, unless excluded by, or repugnant to the context, be deemed to include their successors in office) on the one part AND .....…….....
..... (hereinafter called the "CONTRACTOR" which expression shall, unless excluded by, or repugnant to the context be deemed to include his heirs, executors, administrators, representatives and assigns or successors in office) on the other Part

WHEREAS the Board of Trustees of the V.O.Chidambaranar Port Authority is desirous of constructing the work **Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port**. WHEREAS the Contractor has offered to execute complete and maintain such works and whereas the Board has accepted the Tender of the Contractor and WHEREAS the Contractor has furnished a sum of **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** payment made by the bidders should only through online payment gateway in CPP Portal mode as Earnest Money Deposit at the time of tendering, which will be adjusted against Security Deposit at the rate mentioned there in for the due fulfillment of all the conditions of this Contract.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS:

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.

a) All Tender Documents as issued by the Employer for this work.

b) All amendments to the Tender documents as issued by the Employer prior to submission of the bids.

c) Acceptance Letter issued by the Employer vide No. ..... and all correspondence exchanged between the Employer and the Contractor upto the date of issue of acceptance letter as specifically referred to in the said acceptance letter.

3. The Contractor hereby covenants with the Board of Trustees of V.O.Chidambaranar Port to construct, complete and maintain the "Works" in conformity, in all respects with the provisions of the Contract.

4. The Board of the Trustees of V.O.Chidambaranar Port hereby covenants to pay the Contractor in consideration of such construction, completion and maintenance of the works the "Contract Price" at the time and in the manner prescribed by the Contract.

IN WITNESS WHEREOF the parties here unto have set their hands and seals the day and year first above written

SIGNED, SEALED AND DELIVERED

By the said: By the said:

....

Name.....	Name.....
on behalf of the Contractor	on behalf of the Employer
in the presence of:	in the presence of:
.....	.....
Name.....	Name.....
Address.....	Address.....
.....	.....
.....	.....

* * * *

31. PROFORMA OF INTEGRITY PACT

General

This pre-bid pre-contract Agreement (hereinafter called the Integrity Pact) is made on…… day of the …….. of …….., between, on one hand, the President of India acting through the **Chairman, V.O.Chidambaranar Port Authority,** Government of India (hereinafter called the "PORT", which expression shall mean and include, unless the context otherwise requires, his successors in office and assigns) of the First Part and **……** represented by Shri……, (hereinafter called the "BIDDER/Seller" which expression shall mean and include, unless the context otherwise requires, his successors and, permitted assigns) of the Second Part.

WHEREAS the PORT proposes to procure the work **Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port** and the BIDDER/Seller is willing to offer/has offered the stores and

WHEREAS the BIDDER is a private company/public company/Government undertaking/ partnership/ registered export agency, constituted in accordance with the relevant law in the matter and the PORT is a Ministry/Department of the Government of India/PSU performing its functions on behalf of the President of India.

NOW, THEREFORE,

To avoid all forms of corruption by following a system that is fair, transparent and free from any influence/prejudiced dealings prior to, during and subsequent to the currency of the contract to be entered into with a view to Enabling the PORT to obtain the desired said stores/equipment at a competitive price in conformity with the defined specifications by avoiding the high cost and the distortionary impact of corruption on public procurement, and

Enabling BIDDERs to abstain from bribing or indulging in any corrupt practice in order to secure the contract by providing assurance to them that their competitors will also abstain from bribing and other corrupt practices and the PORT will commit to prevent corruption, in any form, by its officials by following transparent procedures.

The parties hereto hereby agree to enter into this Integrity Pact and agree as follows:

1. Commitments of the PORT

1.1 The PORT undertakes that no official of the PORT, connected directly or indirectly with the contract, will demand, take a promise for or accept, directly or through intermediaries, any bribe, consideration, gift, reward, favour or any material or immaterial benefit or any other advantage from the BIDDER, either for themselves or for any person, organization or third party related to the contract in exchange for an advantage in the bidding process, bid evaluation, contracting or implementation process related to the contract.

1.2 The PORT will, during the pre-contract stage, treat all BIDDERs alike and will provide to all BIDDERs the same information and will not provide any such information to any particular BIDDER which could afford an advantage to that particular BIDDER in comparison to other BIDDERs.

1.3 All the officials of the PORT will report to the appropriate Government office any attempted or completed breaches of the above commitments as well as any substantial suspicion of such a breach.

2. In case any such preceding misconduct on the part of such official(s) is reported by the BIDDER to the PORT with full and verifiable facts and the same is prima facie found to be correct by the PORT, necessary disciplinary proceedings, or any other action as deemed fit, including criminal proceedings may be initiated by the PORT and such a person shall be debarred from further dealings related to the contract process. in such a case while an enquiry is being conducted by the PORT the proceedings under the contract would not be stalled.

3. Commitments of BIDDERs

3. The BIDDER commits itself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of its bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commit itself to the following:-

3.1 The BIDDER will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the PORT, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the contract.

3.2 The BIDDER further undertakes that it has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the PORT or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the contract or any other contract with the Government for showing or forbearing to show favour or disfavor to any person in relation to the contract or any other contract with the Government.

3.3 BIDDERs shall disclose the name and address of agents and representatives and Indian BIDDERs shall disclose their foreign principals or associates.

3.4 BIDDERs shall disclose the payments to be made by them to agents/brokers or any other intermediary, in connection with this bid/contract.

3.5 The BIDDER further confirms and declares to the PORT that the BIDDER is the original manufacturer/integrator/authorized government sponsored export entity of the defence stores and has not engaged any individual or firm or company whether Indian or foreign to intercede, facilitate or in any way to recommend to the PORT or any of its functionaries, whether officially or unofficially to the award of the contract to the BIDDER, nor has any amount been paid, promised or intended to be paid to any such individual, firm or company in respect of any such intercession, facilitation or recommendation.

3.6 The BIDDER, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the PORT or their family members, agents, brokers or any other intermediaries in connection with the contract and the details of services agreed upon for such payments.

3.7 The BIDDER will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

3.8 The BIDDER will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

3.9 The BIDDER shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the PORT as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The BIDDER also undertakes to exercise due and adequate care lest any such information is divulged.

3.10 The BIDDER commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

3.11 The BIDDER shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

3.12 If the BIDDER or any employee of the BIDDER or any person acting on behalf of the BIDDER, either directly or indirectly, is a relative of any of the officers of the PORT, or alternatively, if any relative of an officer of the PORT has financial interest/stake in the BIDDER's firm, the same shall be disclosed by the BIDDER at the time of filing of tender. The term 'relative' for this purpose would be as defined in Section 6 of the Companies Act 1956.

3.13 The BIDDER shall not lend to or borrow any money from or enter into any monetary dealings or transactions, directly or indirectly, with any employee of the PORT.

4. Previous Transgression

4.1 The BIDDER declares that no previous transgression occurred in the last three years immediately before signing of this Integrity Pact, with any other company in any country in respect of any corrupt practices envisaged hereunder or with any Public Sector Enterprise in India or any Government Department in India that could justify BIDDER's exclusion from the tender process,

4.2 The BIDDER agrees that if it makes incorrect statement on this subject, BIDDER can be disqualified from the tender process or the contract, if already awarded, can be terminated for such reason.

5. Earnest Money (Security Deposit)

5.1 While submitting commercial bid, the BIDDER shall deposit an amount **Rs.5,61,890/- (Rupees Five Lakhs Sixty One Thousand Eight Hundred and Ninety only)** as Earnest Money/Security Deposit, with the PORT through any of the following instruments:

(i) Bank Draft or a Pay Order in favour of
(ii) A confirmed guarantee by an Indian Nationalized Bank,
Promising payment of the guaranteed sum to the PORT on demand within three working days without any demur whatsoever and without seeking any reasons whatsoever. The demand for payment by the PORT shall be treated as conclusive proof of payment.
(iii) Any other mode or through any other instrument (to be specified in the RFP).

5.2 The Earnest Money/Security Deposit shall be valid upto a period of five years or the complete conclusion of the contractual obligations to the complete satisfaction of both the BIDDER and the PORT, including warranty period, whichever is later.

5.3 In case of the successful BIDDER a clause would also be incorporated in the Article pertaining to Performance Bond in the Purchase Contract that the provisions of Sanctions for Violation shall be applicable for forfeiture of Performance Bond in case of a decision by the PORT to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

5.4 No interest shall be payable by the PORT to the BIDDER on Earnest Money/Security Deposit for the period of its currency.

6. Sanctions for Violations

6.1 Any breach of the aforesaid provisions by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge. of the BIDDER) shall entitle the PORT to take all or any one of the following actions, wherever required:-

(i) To immediately call off the pre contract negotiations without assigning any reason or giving any compensation to the BIDDER. However, the proceedings with the other BIDDER(s) would continue.

(ii) The Earnest Money Deposit (in pre-contract stage) and/or Security Deposit/Performance Bond (after the contract is signed) shall stand forfeited either fully or partially as decided by the PORT and the PORT shall not be required to assign any reason therefore.

(iii) To immediately cancel the contract, if already signed, without giving any compensation to the BIDDER.

(iv) To recover all sums already paid by the PORT, and in case of an Indian. BIDDER with interest thereon at 2% higher than the prevailing Prime Lending Rate of State Bank of India, while in case of a BIDDER from a country other than India with interest thereon at 2% higher than the LIBOR. If any outstanding payment is due to the BIDDER from the PORT in connection with any other contract for any other stores, such outstanding payment could also be utilized to recover the aforesaid sum and interest.

(v) To encash the advance bank guarantee and performance bond/warranty bond, if furnished by the BIDDER, in order to recover the payments, already made by the PORT, along with interest.

(vi) To cancel all or any other Contracts with the BIDDER. The BIDDER shall be liable to pay compensation for any loss or damage to the PORT resulting from such cancellation/rescission and the PORT shall be entitled to deduct the amount so payable from the money(s) due to the BIDDER.

(vii) To debar the BIDDER from participating in future bidding processes of the Government of India for a minimum period of five years, which may be further extended at the discretion of the PORT.

(viii) To recover all sums paid in violation of this Pact by BIDDER(s) to any middleman or agent or broker with a view to securing the contract.

(ix) In cases where irrevocable Letters of Credit have been received in respect of any contract signed by the PORT with the BIDDER, the same shall not be opened.

(x) Forfeiture of Performance Bond in case of a decision by the PORT to forfeit the same without assigning any reason for imposing sanction for violation of this Pact.

6.2 The PORT will be entitled to take all or any of the actions mentioned at para 6.1(i) to (x) of this Pact also on the Commission by the BIDDER or any one employed by it or acting on its behalf (whether with or without the knowledge of the BIDDER), of an offence as defined in Chapter IX of the Indian Penal code, 1860 or Prevention of Corruption Act, 1988 or any other statute enacted for prevention of corruption.

6.3 The decision of the PORT to the effect that a breach of the provisions of this Pact has been committed by the BIDDER shall be final and conclusive on the BIDDER. However, the BIDDER can approach the Independent Monitor(s) appointed for the purposes of this Pact.

7. Fall Clause

7.1 The BIDDER undertakes that it has not supplied/is not supplying similar product/systems or subsystems at a price lower than that offered in the present bid in respect of any other Ministry/Department of the Government of India or PSU and if it is found at any stage that similar product/systems or sub systems was supplied by the BIDDER to any other Ministry/Department of the Government of India or a PSU at a lower price, then that very pr-ice, with due allowance for elapsed time, will be applicable to the present case and the difference in the cost would be refunded by the BIDDER to the PORT, if the contract has already been concluded.

8 Independent Monitors

8.1 The PORT has appointed Independent Monitors (hereinafter referred to as Monitors) for this Pact in consultation with the Central Vigilance Commission. The Independent External Monitors appointed by Port are as follows:

1. Shri. Trivikram Nath Tiwari, ILS (Retd.),
   301-B, Block-3B, HIG DDA flats,
   Rani Jhansi Road, DDA complex,
   Motia Khan
   New Delhi – 110 055.
   Phone No. +91 98717 88277
   Mail id: trivikramnt@yahoo.co.in

2. Shri. Hermanprit Singh, IPS, (Redt.),
   12, Belevedre Road,
   Alipore, Kolkata – 700 027.
   Phone No. +91 98301 97103
   e-mail id: hermanprit@gmail.com

8.2 The task of the Monitors shall be to review independently and objectively, whether and to what extent the parties comply with the obligations under this Pact.

8.3 The Monitors shall not be subject to instructions by the representatives of the parties and perform their functions neutrally and independently.

8.4 Both the parties accept that the Monitors have the right to access all the documents relating to the project/procurement, including minutes of meetings.

8.5 As soon as the Monitor notices, or has reason to believe, a violation of this Pact, he will so inform the Authority designated by the PORT.

8.6 The BIDDER(s) accepts that the Monitor has the right to access without restriction to all Project documentation of the PORT including that provided by the BIDDER. The BIDDER will also grant the Monitor, upon his request and demonstration of a valid interest, unrestricted and unconditional access to his project documentation. The same is applicable to Subcontractors. The Monitor shall be under contractual obligation to treat the information and documents of the BIDDER/Subcontractor(s) with confidentiality,

8.7 The PORT will provide to the Monitor sufficient information about all meetings among the parties related to the Project provided such meetings could have an impact on the contractual relations between the parties. The parties will offer to the Monitor the option to participate in such meetings.

8.8 The Monitor will submit a written report to the designated Authority of PORT/Secretary in the Department/ within 8 to 10 weeks from the date of reference or intimation to him by the PORT / BIDDER and, should the occasion arise, submit proposals for correcting problematic situations,

9. Facilitation of Investigation

In case of any allegation of violation of any provisions of this Pact or payment of commission, the PORT or its agencies shall be entitled to examine all the documents including the Books of Accounts of the BIDDER and the BIDDER shall provide necessary information and documents in English and shall extend all possible help for the purpose of such examination,

10. Law and Place of Jurisdiction

This Pact is subject to Indian Law. The place of performance and jurisdiction is the seat of the PORT.

11. Other Legal Actions

The actions stipulated in this Integrity Pact are without prejudice to any other legal action that may follow in accordance with the provisions of the extant law in force reiating to any civil or criminal proceedings.

12. Validity

12.1 The validity of this Integrity Pact shall be from date of its signing and extend upto 5 years or the complete execution of the contract to the satisfaction of both the PORT and the BIDDER/Seller, including warranty period, whichever is later. In case BIDDER is unsuccessful, this Integrity Pact shall expire after six months from the date of the signing of the contract.

12.2 Should one or several provisions of this Pact turn out to be invalid: the remainder of this Pact shall remain valid. In this case, the parties will strive to come to an agreement to their original intentions.

12.3 The parties hereby sign this Integrity Pact at _____ on _____

PORT	BIDDER
Name of the Officer.	CHIEF EXECUTIVE OFFICER
Designation	
V.O.Chidambaranar Port Authority	
Tuticorin	
Witness	Witness
1. _____	1. _____
2. _____	2. _____

32. EMPLOYEES STATE INSURANCE ACT, 1948

i. The contractor should adhere to the Employees State Insurance Act 1948 (34 of 1948

ii. The Tender shall be issued to the Contractor only if the contractor has registered under ESI Act 1948 and has obtained separate ESI Code.

iii. If the contractors failed to comply with the ESI Act, it is the duty of Principle Employer i.e Port to recover from the contractors bill and make payment to ESI.

33. EMPLOYEES PROVIDENT FUND (EPF) & MS ACT,1952

i. The Contractor has to comply with all provision contained in EPF & MS ACT, 1952.

ii. Rate quoted in BoQ (Price Bid) shall not include EPF component. The claim for EPF component shall be admitted as per actual on submission of documentary proof of payment made to EPF Authorities along with full details of manpower deployed and calculation of contribution.

iii. Tender shall be issued only if the contractor has separate EPF Code.

34. EXTRA ADDITIONAL SECURITY DEPOSIT (EASD):

Over and above the E.M.D, tenderer quoting rebate more than 15% on the cost of work put to tender shall have to pay an 'Extra / Additional Security Deposit (E/A.S.D)' separately. E/ASD wherever applicable will be collected from the successful bidder along with the Initial Security Deposit (ISD) after issuing the Letter of Intent (LOI). Back-out from the offer by the successful bidder after issue/ receipt of LOI or non deposit of E/ASD by the successful bidder will liable for forfeiture of EMD and debarment of the bidder from participating in any future tender of VOCPT. E/ASD may be accepted in form of RTGS/NEFT/any other e-mode payable V.O.Chidambaranar Port Authority, Tuticorin, Tamilnadu State, India or Bank Guarantee.

$$\text{Extra/Additional Security Deposit (E/A.S.D)} = \frac{A \times \text{cost of work put to tender}}{100}$$

Where A = Percentage rebate quoted on the cost of work put to tender by the tenderer minus 15 (Fifteen).

Example: If the tenderer desires to quote percentage rebate 25% (Twenty five) percent, then the Extra/Additional Security Deposit (E/A.S.D) shall be worked out as under.

$$\text{E/A.S.D Amount} = \frac{(25 - 15) \times \text{cost of work put to tender}}{100}$$

Note: The RTGS/NEFT or Bank Guarantee shall be valid upto maintenance period of contract. The E.A.S.D will be released on satisfactory completion of the work/after completion of maintenance period.

35. GOODS AND SERVICES TAX:

a) As per GST Act, invoice in the prescribed format has to be issued by a registered dealer on or before the time when goods are removed for supply (where supply involves movement) and on or before the time when delivery is received by the recipient (where movement of goods is not involved).

b) The law has laid down conditions to avail GST input tax credit on supply of goods or services. All of the following conditions need to be satisfied to avail GST Input credit:

- The dealer should be in possession of Tax Invoice / Debit or Credit Note / Supplementary Invoice issued by a supplier registered under GST Act.
- The said goods / services have been received.
- Returns (GSTR-3) have been filed.
- The tax charged has been paid to the Government by the supplier.

c) As a service provider, contractors / professionals etc., shall issue the invoice within 60 days to the Port from the date of providing service. If the invoice is not issued within the time limit, then penalty and / or interest shall be applicable. If any of the contractors / professionals do not issue invoices as aforesaid and do not file tax return by due date, Port cannot avail the ITC. Further, Port has to pay the said ITC availed with Interest and penalty as applicable under the GST rule. Therefore, in the event of default of the contractor on the above grounds, the said amount paid / payable to the Government by Port shall be recovered from any money due to the contractor or adjusted against the performance security / security deposit.

d) Similarly the claim of GST at a later stage i.e. in the next Financial Year shall not be admitted by Port as time limit has been fixed for availing tax credit.

e) For any correction in Invoice claimed, it shall be through Debit note / Credit note / supplementary invoice only, as all the invoices are to be uploaded in the GSTN portal.

36. RATES: -

The tenderers shall quote their rates for the finished items of work only as given in the schedule. It shall be clearly understood that no increase in the rates tendered for will be permissible on any account after the tenders are opened: The rates should be noted correctly both in figures and words.

The rates specified in the schedule of quantities include provision for maintaining the work executed under this contract free from defects for the period specified from the date of completion of the work.

Procedure for dealing with ambiguities in rates:

a) When there is difference between the rates given by the contractor in words, the rates which correspond to the amounts worked out by the contractor shall be taken as correct.

b) When the item of amount of an item is not worked out by the contractor, or if it does not correspond with rates written either in figure or in words, then the rate quoted by the contractor in words shall be taken as correct.

c) When the rate quoted by the contractor in figures and in words tallies, but the amount is not worked out correctly, the rates quoted by the contractor shall be taken as correct and the amount.

d) In the case of percentage rate tender, the tenderer's are required to quote their rates, both in amount as well as in the percentage below/above the rates entered in the schedule. In such a cases, in the event of arithmetical error committed in working out the amount by the contractor, the tendered percentage and not the amount should not be taken into account.

37. ACCEPTANCE OF BANK GUARANTEE: -

1. It is to inform that BG applicant (vendors/users/BG providers, etc.,) to furnish the Port's full Bank details, Bank Account Number, IFSC code with Address, Branch Code as given in NIT to the issuer of Bank Guarantee Via SFMS, while the bidders seek BG form any Bank.
2. In turn the Issuer Bank will transmit the Bank Guarantee via SFMS to the beneficiary Bank of the Port Digitally.
3. After successful creation of Bank Guarantee, the concerned Departments in turn shall take up the matter with beneficiary bank for further authenticity of BG mandatory, enabling port to get confirm the BG through Digital Mode by the beneficiary bank (that is port bank account).
4. Any BG received by the Port/submitted by the bidder without complying to the above such BG will be considered as not valid and shall not be considered for bid evaluation.
5. In turn Beneficiary Bank, (service bank) will confirm the veracity of the same to the respective department of the port.
6. "Bank Guarantee, obtained from the Nationalized/Scheduled bank in the format prescribed by the Port, Shall be in compliance with for a digital confirmation for the Bank Guarantee".

ANNEXURE-I

NOTICE INVITING e-TENDER FOR THE WORK "Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port."

TENDER ACCEPTANCE LETTER

(To be given on Company Letter Head)

To

The Chief Engineer,
V.O.Chidambaranar Port Authority,
Tuticorin – 4.

Sir,

Subject: Acceptance of Terms & Conditions of Tender for "Construction of new Cement Concrete approach road to a width of 16 meters for additional approach to both the Container Terminals of 8th & 9th Berth inside Green Gate in VOC Port." –Reg.

Tender Reference No:06CE/HMD/2024-25/D.3408 Dt:09.12.2024

1. I/ We have downloaded / obtained the tender document(s) for the above mentioned Tender/Work from the web site(s) namely: _____as per your advertisement, given in the above mentioned website(s).

2. I / We hereby certify that I / we have read the entire terms and conditions of the tender documents from Page No. _____ to _____ (including all documents like annexure(s), schedule(s), etc.,), which form part of the contract agreement and I / we shall abide hereby and agree the terms / conditions / clauses contained therein.

3. The corrigendum(s) issued from time to time by V.O.Chidambaranar Port Authority for the above subject work has also been taken into consideration, while submitting this acceptance letter.

4. I / We hereby unconditionally accept the tender conditions of above mentioned tender document(s) / corrigendum(s) in its totality / entirety.

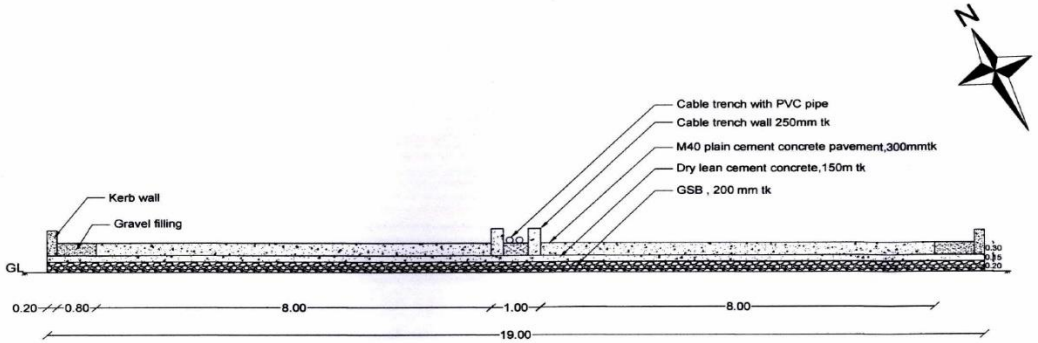
5. I / We do hereby declare that our firm has not been blacklisted/ debarred by any Govt. Department/Public sector undertaking.

6. I / We certify that all information furnished by me/ us is true & correct and in the event that the information is found to be incorrect/untrue or found violated, then V.O.Chidambaranar Port Authority shall without giving any notice or reason therefore, summarily reject the bid or terminate the contract, without prejudice to any other rights or remedy including the forfeiture of the full earnest money deposit absolutely.

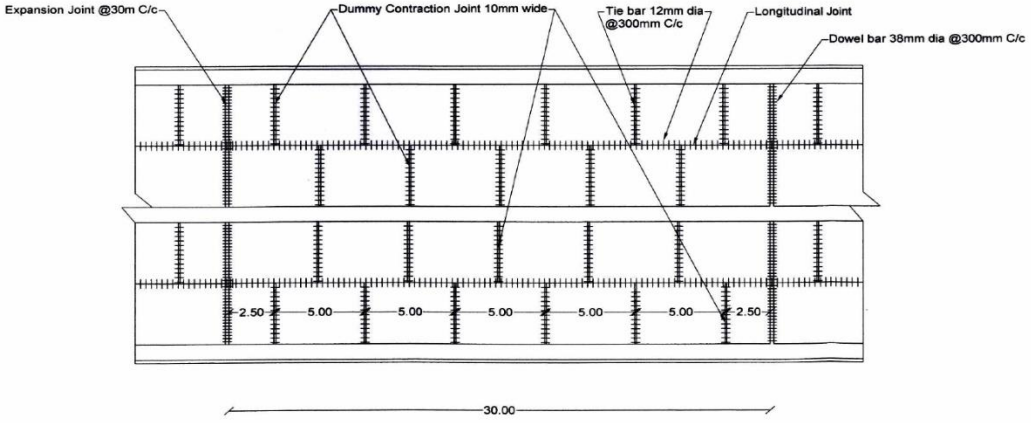
Yours Faithfully,

(Signature of the Bidder, with Official Seal)

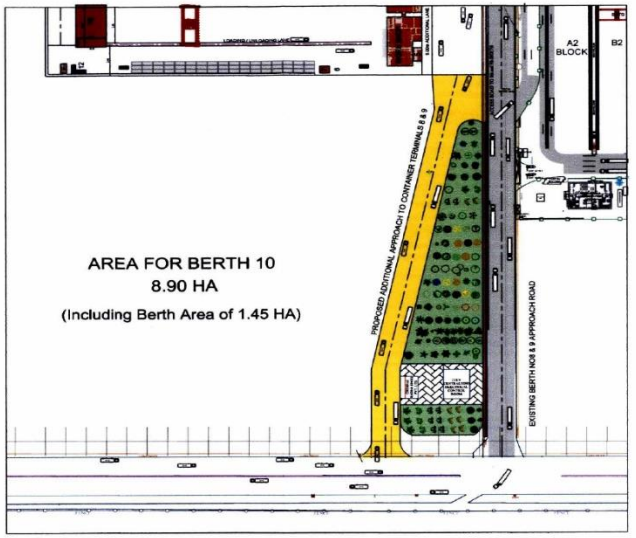
LAYOUT



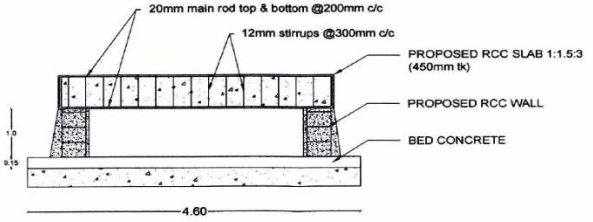
CROSS SECTION OF PROPOSED CONCRETE ROAD



PLAN OF PROPOSED CEMENT CONCRETE ROAD



KEY PLAN



CS OF PROPOSED CABLE DUCT APPROACH

ALL DIMENSIONS ARE IN 'M'

NOT TO SCALE